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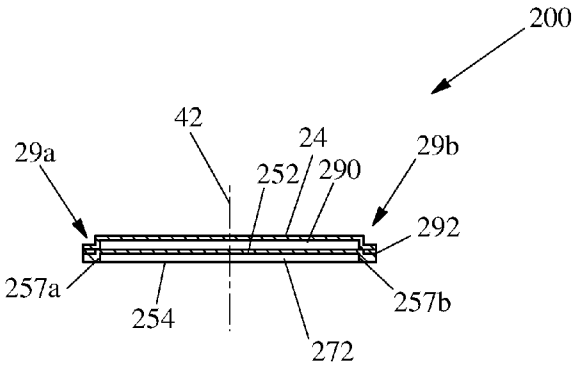


Fig. 15

(57) Abstract: A disposable article may comprise an absorbent assembly comprising an absorbent core. The article may also comprise a chassis comprising a longitudinal axis, a lateral axis, a front waist region comprising a front waist edge, a back waist region comprising a back waist edge, a crotch region between the waist regions, laterally opposing side edges extending between the front waist edge and the back waist edge, an exterior surface, and an interior surface. The chassis may form a waist opening and two laterally opposing leg openings when the front waist region and the back waist region are attached together. The chassis may also comprise a water-impermeable center sheet comprising laterally opposing side edges, an interior surface, and an exterior surface. The chassis may further comprise laterally opposing side sheets, each of the side sheets comprising first and second longitudinally extending edges. One of the first and second longitudinally extending edges of the side sheets may be disposed laterally inward of the side edges of the chassis and at least one of the layers of the side sheet may be attached to the center sheet adjacent to the side edges of the center sheet. Each of the side sheets may also comprise a longitudinally extending laterally proximal edge and a longitudinally extending first elastic gathering member attached adjacent to the proximal edge.

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# ABSORBENT ARTICLE COMPRISING SIDE SHEETS

## FIELD OF THE INVENTION

This invention relates to disposable absorbent articles such as disposable diapers and other articles intended for use on incontinent persons.

## BACKGROUND OF THE INVENTION

Disposable absorbent articles are designed to absorb and contain bodily waste in order to prevent soiling of the body and clothing of the wearer, as well as bedding or other objects with which the wearer comes into contact. As the usage of disposable absorbent articles has expanded, their complexity has increased with the incorporation of additional features serving to enhance their performance and appearance. The costs of the materials and the costs of the manufacturing processes have also increased in conjunction with the increase in complexity. As a result, the prices at which these articles are sold have risen to levels that many potential purchasers around the world cannot afford to pay. Thus, a need exists for a simple disposable absorbent article.

## SUMMARY OF THE INVENTION

A disposable article may comprise an absorbent assembly comprising an absorbent core. The article may also comprise a chassis comprising a longitudinal axis, a lateral axis, a front waist region comprising a front waist edge, a back waist region comprising a back waist edge, a crotch region between the waist regions, laterally opposing side edges extending between the front waist edge and the back waist edge, an exterior surface, and an interior surface. The chassis may form a waist opening and two laterally opposing leg openings when the front waist region and the back waist region are attached together.

The chassis may also comprise a water-impermeable center sheet comprising laterally opposing side edges, an interior surface, and an exterior surface. The chassis may further comprise laterally opposing side sheets, each of the side sheets comprising first and second longitudinally extending edges. One of the first and second longitudinally extending edges of the side sheets may be disposed laterally inward of the side edges of the chassis and at least one of the layers of the side sheet may be attached to the center sheet adjacent to the side edges of the center sheet. Each of the side sheets may also comprise a longitudinally extending laterally

proximal edge and a longitudinally extending first elastic gathering member attached adjacent to the proximal edge.

The chassis may also comprise a second elastic gathering member attached at or adjacent the side edge of the chassis. The second elastic gathering member may be disposed between a side barrier attachment zone and the side edges of the chassis. The front waist region and the back waist region may be attached together at or adjacent to the respective side edges of the chassis and thereby may form a waist opening and two laterally opposing leg openings.

The article may further comprise at least one abdominal stretch panel attached to the interior surface or the exterior surface of the chassis in the front waist region or the back waist region. The abdominal stretch panel may also have a laterally extending longitudinally distal edge disposed at or adjacent to the respective waist edge and a longitudinally opposing laterally extending longitudinally proximal edge. The abdominal stretch panel may provide a circumferential contractive force around the waist opening when the chassis is stretched laterally.

## BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawing figures, like reference numerals identify like elements, which may or may not be identical in the several exemplary embodiments that are depicted. Some of the figures may have been simplified by the omission of selected elements for the purpose of more clearly showing other elements. Such omissions of elements in some figures are not necessarily indicative of the presence or absence of particular elements in any of the exemplary embodiments, except as may be explicitly delineated in the corresponding written description.

In the drawing figures and in the written description, lowercase letters appended to reference numerals indicate generally symmetric elements, e.g., left and right symmetric elements may be respectively identified by the reference numerals 1a and 1b. A reference numeral without an appended lowercase letter identifies all of the elements to which that particular reference numeral applies, e.g., the same elements as a group may be designated 1.

The edges of various components are shown offset from each other for clarity; the depiction of parallel edges immediately adjacent to each other is intended to represent that these edges are disposed either collinearly or in close proximity to each other.

Figure 1 is a plan view of an exemplary disposable absorbent article in the form of a diaper 20, which is shown in its flat, uncontracted state, i.e., without the contraction induced by elastic members. In Figure 1, the interior of the diaper is shown facing the viewer.

Figure 2 is a plan view of the diaper 20 of Figure 1 with the exterior portion of the diaper 20 shown facing the viewer.

Figure 3 is a section view of the diaper 20 of Figure 1 taken at the section line 3-3.

Figure 4 is a section view of the diaper 20 of Figure 1 taken at the section line 4-4.

Figure 5 is a section view of the diaper 20 of Figure 1 taken at the section line 5-5.

Figure 6 is a section view of the diaper 20 of Figure 1 taken at the section line 6-6.

Figure 7 is a simplified side elevation view of an exemplary diaper 20 of Figure 1 being worn about a lower torso of a wearer.

Figure 8 is a front elevation view of the diaper 20 of Figure 7.

Figure 9 is a back elevation view of the diaper 20 of Figure 7.

Figure 10 is an elevation view of a laminate stretch panel.

Figure 11 is a view of the laminate stretch panel of Figure 10 in a stretched condition.

Figure 12 is a plan view of an exemplary absorbent assembly 200 with the interior portion of the absorbent assembly 200 shown facing the viewer.

Figure 13 is a section view of the absorbent assembly of Figure 12 taken at the section line 13-13.

Figure 14 is a section view of the absorbent assembly of Figure 12 taken at the section line 14-14.

Figure 15 is a section view of an alternative embodiment of the absorbent assembly 200 of Figure 12.

Figure 16 is a section view of an exemplary storage component 272.

Figure 17 is a section view of an alternative embodiment of the storage component 272 of Figure 16.

Figure 18 is a section view of an alternative embodiment of the side flaps 147 of Figure 1 taken at the section line 4-4.

Figure 19 is a section view of an alternative embodiment of the side flaps 147-19 of Figure 1 taken at the section line 4-4.

Figure 20 is a section view of an alternative embodiment of the side flaps 147 of Figure 1 taken at the section line 4-4.

Figure 21 is a section view of an alternative embodiment of diaper 20 of Figure 1 comprising an inner liner taken at the section line 3-3.

Figure 22 is a section view of an alternative embodiment of diaper 20 of Figure 1 comprising an inner liner taken at the section line 6-6.

Figure 23 is a plan view of an alternative embodiment of exemplary chassis web 149, which is shown in its flat, uncontracted state, i.e., without the contraction induced by elastic members, and prior to formation of the side flaps. In Figure 23, the exterior of the diaper is shown facing the viewer.

Figure 24 is a cross section view of the diaper 20 of Figure 23.

Figure 25 is a plan view of an alternative embodiment of the chassis web 149 of Figure 23.

Figure 26 is a cross section view of the chassis web 149 of Figure 25.

Figure 27 is a plan view of an alternative embodiment of the chassis web 149 of Figure 23.

Figure 28 is a cross section view of the chassis web 149 of Figure 27.

Figure 29 is a plan view of an alternative embodiment of an activation and attachment pattern 675 and 210 of Figure 1, which is shown in its flat, uncontracted state, i.e., without the contraction induced by elastic members. In Figure 29, the exterior of the diaper is shown facing the viewer.

Figure 30 is a plan view of an alternative embodiment of an attachment pattern 210 of Figure 1, which is shown in its flat, uncontracted state, i.e., without the contraction induced by elastic members. In Figure 30, the exterior of the diaper is shown facing the viewer.

Figure 31 is a section view of an alternative embodiment of the side flaps 147 of Figure 1 comprising attached side flaps taken at the section line 4-4.

Figure 32 is a section view of the abdominal stretch panel 370 of Figure 1 taken along the longitudinal axis 42.

Figure 33 is a section view of an alternative embodiment of the diaper 20 of Figure 1 taken along the longitudinal axis 42 comprising an inner liner.

Figure 34 is a simplified section view of an alternative embodiment of the interior surface 102 of Figure 1 taken at the section line 3-3.

Figure 35 is a plan view of an alternative embodiment of waist regions 36 and 38 of Figure 1, wherein the waist regions 36 and 38 comprise apertures 622.

Figure 36 is a plan view of an exemplary disposable absorbent article in the form of a diaper 20, which is shown in its flat, uncontracted state, i.e., without the contraction induced by elastic members. In Figure 36, the interior of the diaper is shown facing the viewer.

Figure 37 is a section view of the diaper 20 of Figure 36 taken at the section line 37-37.

Figure 38 is a section view of the diaper 20 of Figure 36 taken at the section line 38-38.

Figure 39 is a section view of the diaper 20 of Figure 36 taken at the section line 39-39.

Figure 40 is a section view of the diaper 20 of Figure 36 taken at the section line 40-40.

Figure 41 is a section view of an alternative embodiment of the diaper 20 of Figure 36 taken at the section line 38-38.

Figure 42 is a section view of an alternative embodiment of the diaper 20 of Figure 36 taken at the section line 38-38.

Figure 43 is a section view of an alternative embodiment of the diaper 20 of Figure 36 taken at the section line 38-38.

Figure 44 is a plan view of an exemplary disposable absorbent article in the form of a diaper 20, which is shown in its flat, uncontracted state, i.e., without the contraction induced by elastic members. In Figure 44, the interior of the diaper is shown facing the viewer.

Figure 45 is a section view of the diaper 20 of Figure 44 taken at the section line 45-45.

Figure 46 is a section view of the diaper 20 of Figure 44 taken at the section line 46-46.

Figure 47 is a section view of the diaper 20 of Figure 44 taken at the section line 47-47.

Figure 48 is a section view of the diaper 20 of Figure 44 taken at the section line 48-48.

Figure 49 is a plan view of an exemplary disposable absorbent article in the form of a diaper 20, which is shown in its flat, uncontracted state, i.e., without the contraction induced by elastic members. In Figure 49, the interior of the diaper is shown facing the viewer.

Figure 50 is a plan view of an alternative embodiment of exemplary chassis web 149, which is shown in its flat, uncontracted state, i.e., without the contraction induced by elastic members, and prior to formation of the side flaps. In Figure 50, the exterior of the diaper is shown facing the viewer.

Figure 51 is a plan view of an alternative embodiment of exemplary chassis web 149, which is shown in its flat, uncontracted state, i.e., without the contraction induced by elastic members, and prior to formation of the side flaps. In Figure 51, the exterior of the diaper is shown facing the viewer.

Figure 52 is a plan view of an exemplary fragment of a formed web material.

## DETAILED DESCRIPTION OF THE INVENTION

In this description, the following terms have the following meanings:

The term "absorbent article" refers to a device that absorbs and contains liquid, and more specifically, refers to a device that is placed against or in proximity to the body of the wearer to absorb and contain the various exudates discharged from the body.

The term "diaper" refers to an absorbent article that is generally worn by infants and incontinent persons about the lower torso and that is specifically adapted to receive and contain

urinary and fecal waste. A diaper may be in the form of a taped diaper or a pull-on (pant style) diaper.

The term "disposable" refers to the nature of absorbent articles that generally are not intended to be laundered or otherwise restored or reused as an absorbent article, i.e., they are intended to be discarded after a single use and, may be recycled, composted or otherwise disposed of in an environmentally compatible manner.

The term "longitudinal" refers to a direction running from a waist edge to an opposing waist edge of the article and generally parallel to the maximum linear dimension of the article. Directions within 45° of the longitudinal direction are considered to be "longitudinal".

The term "lateral" refers to a direction running from a side edge to an opposing side edge of the article and generally at a right angle to the longitudinal direction. Directions within 45° of the lateral direction are considered to be "lateral".

The term "circumferential" refers to a direction encircling the waist of the wearer generally parallel to the lateral direction.

The term "disposed" refers to an element being attached and positioned in a particular place or position in a unitary structure with other elements.

The term "attach" refers to elements being connected or united by adhering, bonding, fastening *etc.*, by any method suitable for the elements being attached together and their constituent materials. Many suitable means for attaching or joining elements together are well-known, including adhesive, pressure, thermal, mechanical, *etc.* Such attachment methods may be used to attach elements together over a particular area either continuously or intermittently. Unless indicated otherwise, elements that are described as being attached to each other are attached directly together, with either nothing or via one or more closure members 700, e.g., an adhesive or fastener, between them. Elements that are described as being attached to each other are attached together either permanently or temporarily, i.e., permanent attachment means that one or both of the elements and/or any closure members 700 that are present must be functionally damaged in order to separate them such that they are not reattachable or refastenable and temporary attachment, means that one or both of the elements and/or any closure members 700 that are present may be separated and reattached or refastened (i.e., opened and closed) multiple times while substantially maintaining functionality of the closure member.

The term "laminate" refers to elements being attached together in a layered arrangement.

The terms "water-permeable" and "water-impermeable" refer to the penetrability of materials in the context of the intended usage of disposable absorbent articles. Specifically, the

term "water-permeable" refers to a layer or a layered structure having pores, openings, and/or interconnected void spaces that permit liquid water to pass through its thickness in the absence of a forcing pressure. Conversely, the term "water-impermeable" refers to a layer or a layered structure through the thickness of which liquid water cannot pass in the absence of a forcing pressure. A layer or a layered structure that is water-impermeable according to this definition may be permeable to water vapor, *i.e.*, may be "water vapor-permeable". Such a water vapor-permeable layer or layered structure is commonly known in the art as "breathable". As is well known in the art, a common method for measuring the permeability to water of the materials typically used in absorbent articles is a hydrostatic pressure test, also called a hydrostatic head test or simply a "hydrohead" test. Suitable well known compendial methods for hydrohead testing are approved by INDA (formerly the International Nonwovens and Disposables Association, now The Association of the Nonwoven Fabrics Industry) and EDANA (European Disposables and Nonwovens Association).

The terms "proximal" and "distal" refer respectively to the location of an element near to or far from the center of a structure, *e.g.*, the proximal edge of a longitudinally extending element is located nearer to the longitudinal axis than the distal edge of the same element is located relative to the same longitudinal axis.

The terms "interior" and "exterior" refer respectively to the location of an element that is intended to be placed against or toward the body of a wearer when an absorbent article is worn and the location of an element that is intended to be placed against or toward any clothing that is worn over the absorbent article. Synonyms for "interior" and "exterior" include, respectively, "inner" and "outer", as well as "inside" and "outside". Also, when the absorbent article is oriented such that its interior faces upward, e.g., when it is laid out in preparation for setting the wearer on top of it, synonyms include "upper" and "lower", "above" and "below", "over" and "under", and "top" and "bottom", respectively.

The term "nonwoven" refers to a sheet, web, or batt of directionally or randomly oriented fibers, made by bonding or entangling the fibers through mechanical, thermal, or chemical means. Nonwoven materials exclude paper and products which are woven, knitted, tufted, or felted by wet milling. The fibers may be man-made synthetics.

The term "abdominal stretch panel" refers to a structural component that resists elongation by providing a circumferential contractive force around the waist opening of a diaper when it is stretched in the circumferential direction.

The term "application force" is the force required to extend the waist region of the diaper in order to apply the diaper onto the wearer.

The term "sustained fit force" is the force delivered by the diaper at the waist that provides the requisite body contact post application in order to deliver proper fit, gasketing, and sustained position (i.e., sustained fit).

Description of Exemplary Diaper Embodiments

In Figure 1, Figure 2, Figure 3, Figure 4, Figure 5, and Figure 6, the exemplary diaper 20 is shown in its flat uncontracted state prior to being formed into a pant. The finished pant product is shown in Figure 7, Figure 8, and Figure 9.

One end portion of the exemplary diaper 20 may be configured as a front waist region 36. The longitudinally opposing end portion may be configured as a back waist region 38. An intermediate portion of the diaper 20 extending longitudinally between the front waist region 36 and the back waist region 38 may be configured as a crotch region 37.

The basic structure of the diaper 20 may include a chassis 100. The chassis 100 has a laterally extending front waist edge 136 in the front waist region 36 and a longitudinally opposing and laterally extending back waist edge 138 in the back waist region 38. The chassis 100 has a longitudinally extending left side edge 137a and a laterally opposing and longitudinally extending right side edge 137b, both chassis side edges extending longitudinally between the front waist edge 136 and the back waist edge 138. The chassis 100 has an interior surface 102 and an exterior surface 104. The chassis 100 also has a longitudinal axis 42 and a lateral axis 44. The longitudinal axis 42 extends through the midpoint of the front waist edge 136 and through the midpoint of the back waist edge 138. The lateral axis 44 extends through the midpoint of the left side edge 137a and through the midpoint of the right side edge 137b. The exemplary chassis 100 shown in Figure 1 additionally has longitudinally extending and laterally opposing side flaps 147a and 147b that are described in more detail below. The portion of the chassis forming the backsheet and side flaps (including the side barriers and cuff flaps) may be formed by a web (herein, the "chassis web") comprising one or more layers. One or more of the layers forming the chassis web 149 may be water impervious. The layers forming the chassis web 149 may have different lateral extents or may be coterminus in width. And, the chassis web 149, as well as the layer or layers forming the chassis web 149, may be laterally and/or longitudinally continuous.

A portion or the whole of the chassis **100** may be made extensible to a degree greater than the inherent extensibility of the material or materials from which the chassis is made, e.g., the

backsheet **26**. The additional extensibility may be desirable in order to allow the chassis **100** to conform to the body of a wearer during movement by the wearer. The additional extensibility may also be desirable, for example, in order to allow the user of a diaper **20** including a chassis **100** having a particular size before extension to extend the front waist region **36**, the back waist region **38**, or both waist regions of the chassis **100** to provide additional body coverage for wearers of differing size, *i.e.*, to tailor the diaper to the individual wearer. Such extension of the waist region or regions may give the diaper a generally hourglass shape, so long as the crotch region **37** is extended to a relatively lesser degree than the waist region or regions, and may impart a tailored appearance to the diaper **20** when it is worn. In addition, the additional extensibility may be desirable in order to minimize the cost of the diaper. For example, an amount of material that would otherwise be sufficient only to make a relatively smaller diaper lacking this extensibility can be used to make a diaper capable of being extended to adequately cover a wearer that is larger than the non-extended, smaller, diaper would fit.

A portion of the chassis **100** in the front and/or back waist regions **36** and **38** may be made laterally extensible to a maximum extensibility greater than a maximum extensibility of another portion of the chassis **100** in the crotch region **37** such that a lateral extension of each of the portions in the front, back, and crotch regions **36**, **38**, and **37** to its maximum extensibility imparts an hourglass shape to the chassis **100**. As disclosed in U.S. Patent Serial No. 12/358,962, filed on January 23, 2009, titled, Extrusion Bonded Laminates for Absorbent Articles, one or more layers of the chassis web may comprise an elastomeric film which may provide the desired amount of extension and recovery forces during use of the laminate. As mentioned above, lateral extensibility may be achieved by incorporating an elastomeric film into one or more layers of the chassis web. Many suitable elastic materials that may be used for one or more layers of the chassis web include synthetic or natural rubbers (e.g., crosslinked polyisoprene, polybutadiene and their saturated versions (after hydrogenation), and polyisobutylene), thermoplastic elastomers based on multi-block copolymers, such as those comprising copolymerized rubber elastomeric blocks with polystyrene blocks (e.g., styrene-isoprene-styrene, styrene-butadiene-styrene, styrene-ethylene/butylene-styrene, styrene-ethylene/propylene-styrene, and styrene-butadiene/isoprene-styrene, including their hydrogenated and non-hydrogenated forms), thermoplastic elastomers based on polyurethanes, polyesters, polyether amides, elastomeric polyolefins including polyethylenes and polypropylenes, elastomeric polyolefin blends, and combinations thereof.

For instance, one useful group of elastomeric polymers that may be used in the chassis web are the block copolymers of vinyl arylene and conjugated diene monomers, such as AB, ABA, ABC, or ABCA block copolymers where the A segments may comprise arylenes such as polystyrene and the B and C segments (for those embodiments comprising B and/or C segments) may comprise dienes such as butadiene or isoprene. A similar, newer group of elastomeric polymers are the block copolymers of vinyl arylene and hydrogenated olefin monomers, such as AB, ABA, ABC, or ABCA block copolymers where the A segments may comprise arylenes such as polystyrene and the B and C segments (for those embodiments comprising B and/or C segments) may comprise saturated olefins such as ethylene, propylene, or butylene. Suitable block copolymer resins are readily available from KRATON® Polymers of Houston, Texas, Dexco™ Polymers LP of Planquemine, Louisiana, or Septon™ Company of America, Pasadena, Texas.

Another useful group of elastomeric polymers that may be used in the chassis web are olefin-based elastomers. In one embodiment, the elastomeric film comprises a polyolefinic elastomer (POE). Examples of POEs include olefin block copolymers (OBCs) which are elastomeric copolymers of polyethylene, sold under the trade name INFUSE™ by The Dow Chemical Company of Midland, Michigan. Other examples of POEs include copolymers of polypropylene and polyethylene, sold under the trade name VISTAMAXX® by ExxonMobil Chemical Company of Houston, Texas and/or VERSIFY by Dow Chemical, Midland, MI.

For the elastomeric film portion of the chassis web, other polymers may be blended into the compositions to enhance desired properties. For example, a linear low-density polyethylene may be added to the film composition to lower the viscosity of the polymer melt and enhance the processability of the extruded film. High-density polyethylene may be added to prevent age-related degradation of the other polymers. Polypropylene has been found to improve the robustness of the elastomer and improve the films' resistance to pinholing and tearing. Additionally, polypropylene-based thermoplastic elastomer reactor blends (e.g., ADFLEX, available from LyondellBasell Industries, Laporte, TX) may be used to increase the toughness the film, as disclosed in WO 2007/146149.

The basic structure of the diaper 20 may also include an absorbent assembly 200 that may be attached to the chassis 100. The absorbent assembly 200 has a laterally extending front edge 236 in the front waist region 36 and a longitudinally opposing and laterally extending back edge 238 in the back waist region 38. The absorbent assembly 200 has a longitudinally extending left side edge 237a and a laterally opposing and longitudinally extending right side edge 237b, both

absorbent assembly side edges extending longitudinally between the front edge 236 and the back edge 238. The absorbent assembly 200 has an interior surface 202 and an exterior surface 204. The absorbent assembly 200 may be disposed symmetrically with respect to either or both of the longitudinal axis 42 and the lateral axis 44. Alternatively, the absorbent assembly 200 may be disposed asymmetrically with respect to either or both of the longitudinal axis 42 and the lateral axis 44. For example, the absorbent assembly 200 shown in Figure 1 is disposed symmetrically with respect to the longitudinal axis 42 and asymmetrically with respect to the lateral axis 44. In particular, the absorbent assembly 200 shown in Figure 1 is disposed asymmetrically toward the front waist region 36.

The respective front edge 236, back edge 238, left side edge 237a, and right side edge 237b of the absorbent assembly 200 may lie inward of the respective front waist edge 136, back waist edge 138, left side edge 137a, and right side edge 137b of the chassis 100, as in the exemplary diaper 20 shown in Figure 1. In certain embodiments, the front edge 236 and back edge 238 of the absorbent assembly 200 may lie inward of the front and back interior abdominal stretch panels 370 and 390, e.g., between the proximal edges 372 and 392 of the interior abdominal stretch panels 370 and 390 and the lateral axis 44. Alternatively, one or more of the edges of the absorbent assembly 200 may coincide with the corresponding edge(s) of the chassis 100. In yet another alternative embodiment, as shown in Figures 1 and 32, the interior front and back abdominal stretch panels 370 and 390 may overlap a portion of the absorbent assembly 200. In such an overlapping configuration, it may be advantageous for the interior abdominal stretch panels 370 and/or 390 to remain unattached to the absorbent assembly 200 over a portion of the longitudinal extent of the abdominal stretch panel 370 and/or 390, particularly in the laterally central portions of the chassis, i.e., area between the laterally opposing side flaps 147, for example 117 and 118, to provide an abdominal stretch panel waist cap or stand up waist feature forming a pocket 650 which helps to prevent leakage of urine and/or feces at the waist.

The chassis 100 and 100 may additionally include an inner liner 22 attached to the backsheet 26 and/or the absorbent assembly 200 as illustrated in Figures 21 and 22. The inner liner 22 may form a portion of the interior surface 102 of the chassis 100 that is intended to be placed against the body of the wearer. The inner liner 22 may be formed of a soft material that will not irritate the skin of the wearer. Such an inner liner 22 may serve to isolate the skin of the wearer from a portion of the backsheet 26 as may be desirable, for example, when the diaper 20 is worn under conditions in which contact between the skin and a backsheet 26 could be uncomfortable. Many suitable materials for the inner liner 22 are well-known in the art, including

rayon and synthetic nonwovens such as spunbonded or carded polypropylene or polyester. The inner liner 22 may extend to the same width and the same length as the backsheet 26.

Alternatively, one or more of the edges of the inner liner 22 may lie inward of the edges (i.e., side edges 137a and b, and waist end edges 136 and 138) of the chassis 100. For example, with reference to the exemplary diaper 20 shown in Figure 1only the portions of the inner liner 22 (see Figures 21 and 22) lying in a front gap 606 between the front edge 236 of the absorbent assembly 200 and the front waist edge 136 of the chassis 100 and a back gap 607 between the back edge 238 of the absorbent assembly 200 and the back waist edge 138 of the chassis 100 are exposed, while the remainder of the inner liner 22 is covered by the absorbent assembly 200 and the side flaps 147a and b. Therefore, a laterally extending strip of the inner liner 22 disposed in the front gap 606 in the front waist region 36 and a similar laterally extending strip of the inner liner 22 disposed in the back gap 607 in the back waist region 38 may suffice to isolate the skin of the wearer from the backsheet 26 in these two gaps. The inner liner 22 may be partially disposed under the side flaps 147 or alternatively the inner liner 22 may be disposed on top of the side flaps 147 in one or both of the waist regions 36 and 38. In certain embodiments, as shown in Figure 33, the inner liner 22 may overlap a portion of the absorbent assembly 200. In such an overlapping configuration, it may be advantageous for the inner liner 22 to remain unattached to the absorbent assembly 200 over a portion of the longitudinal extent of the inner liner 22 particularly in the laterally central portions, area between the laterally opposing side flaps 147, for example 117 and 118, to provide an inner liner waist cap or stand up waist feature forming a pocket 650 which helps to prevent leakage of urine and/or feces at the waist.

The basic structure of the diaper 20 may also include at least one abdominal stretch panel that may be attached to the chassis 100 in a waist region. When the chassis 100 is stretched in the circumferential direction, the abdominal stretch panel resists by providing a circumferential contractive force around the waist opening of the diaper 20. In Figure 1, Figure 2, Figure 3, Figure 4, Figure 5, and Figure 6, the diaper 20 is shown as having four abdominal stretch panels. In particular, in Figure 1 and Figure 3, a front interior abdominal stretch panel 370 is shown attached interiorly to the chassis 100 in the front waist region 36 of the diaper 20. Similarly, in Figure 1 and Figure 6, a back interior abdominal stretch panel 390 is shown attached interiorly to the chassis 100 in the back waist region 38 of the diaper 20. In Figure 2 and Figure 3, a front exterior abdominal stretch panel 360 is shown attached exteriorly to the chassis 100 in the front waist region 36. Finally, in Figure 2 and Figure 6, a back exterior abdominal stretch panel 380 is shown attached exteriorly to the chassis 100 in the back waist region 38 of the diaper 20. The

abdominal stretch panel may be applied to the surface of the absorbent article in an untensioned state, i.e. the abdominal stretch panel applies little or no contractive force on the article until the waist region of the article is extended laterally, e.g. during application. Alternatively, the abdominal stretch panel my be applied to the surface of the absorbent article under tension and therefore applies some contractive force to the waist region of the article prior to use.

Alternatively, the diaper 20 may have four abdominal stretch panels as described above, or may have only one, two, or three abdominal stretch panels, as desired for providing an appropriate level of circumferential contractive forces around the waist of a wearer. For example, in some embodiments, the diaper 20 may have only a front exterior abdominal stretch panel 360, while in other exemplary embodiments, the diaper 20 may have both a front exterior abdominal stretch panel 360 and a back exterior abdominal stretch panel 380. In some exemplary embodiments, the diaper 20 may have only a front interior abdominal stretch panel 370, while in other exemplary embodiments, the diaper 20 may have both a front interior abdominal stretch panel 370 and a back interior abdominal stretch panel 390. In some exemplary embodiments, the diaper 20 may have an exterior abdominal stretch panel and an interior abdominal stretch panel in either the front waist region 36 or the back waist region 38, and only either an exterior abdominal stretch panel or an interior abdominal stretch panel in the opposing waist region. The exterior abdominal stretch panels 360 and 380 may be attached to the exterior surface of the backsheet 26. The interior abdominal stretch panels 370 and 390 may be attached to the interior surface of the chassis 102 and/or the interior surface of the absorbent assembly 202 and/or the upper surfaces 613a and b of the side flaps 147a and b.

During application of the diaper 20, particularly a diaper configured as a pull-on pant, the diaper 20 may be pulled upward along the legs and over the hips of the wearer to the waist. Several factors impact ease of application for pull-on style diapers. First, the wearer or caregiver should be able to get the wearer's legs through the leg openings easily. Second, the abdominal stretch panels 360, 370, 380, and 390 should have an acceptable application force (i.e., the force that allows a wearer or caregiver of the wearer to extend the abdominal stretch panels 360, 370, 380, and 390 and pull the diaper upward over the wearer's buttocks and hips without excessive effort). Excessive application force makes application of the diaper 20 more difficult for both the caregiver and/or the wearer, for example a potty training child who pulls the pant up and down on their own. Finally, the abdominal stretch panels 360, 370, 380, and 390 should provide an adequate level of wearing force or sustained fit force (i.e., the force that the abdominal stretch panels 360, 370, 380, and 390 apply to the waist of the wearer during wear providing the requisite

sustained fit, including maintaining the position, fit, and gasketing of the diaper 20 at the waist, without marking the skin).

As shown in Figure 7, Figure 8, and Figure 9, when the diaper 20 is worn on the lower torso of a wearer, the front waist edge 136 and the back waist edge 138 of the chassis 100 encircle the waist of the wearer, while at the same time the chassis side edges 137a and 137b encircle the legs of the wearer. At the same time, the crotch region 37 may be positioned between the legs of the wearer and the absorbent assembly 200 extends from the front waist region 36 through the crotch region 37 to the back waist region 38.

Description of the Chassis

The chassis 100 may include a water-impermeable backsheet 26. The backsheet 26 forms an exterior surface that is intended to be placed toward any clothing that is worn over the diaper 20. Many suitable materials for use as the backsheet 26 are well-known, including films of polyethylene and other polyolefins. Multi-layer backsheets, such as a laminate of a film 30 and a nonwoven material 31 or a laminate of multiple nonwoven layers, may also be suitable for use as the backsheet 26. Such a backsheet may be oriented with the nonwoven 31 disposed exteriorly of the film, as shown in Figure 1, Figure 2, Figure 3, Figure 4, Figure 5, and Figure 6, to provide the feel and appearance of a more cloth-like outermost layer than would be provided by using the film 30 as the outermost layer. A multi-layer backsheet 26, such as a laminate of a film 30 and a nonwoven 31, may also be suitable for use with the nonwoven 31 disposed interiorly to separate the film 30 from the skin of the wearer, or with nonwoven 31 disposed both exteriorly and interiorly, such that the film 30 is sandwiched. In addition, the nonwoven 31 and film 30 layers of the multi-layer laminate may have different widths, for example the film 30 may be wider than the nonwoven 31 or alternatively the nonwoven 31 may be wider than the film 30.

As shown in Figures 36-43, the chassis web 149 may be formed from multiple pieces, including a center sheet 726 and laterally opposing side sheets 60. The center sheet 726 and the side sheets may be formed from the same or different material types. For example, the center sheet 726 may comprise a water vapor impermeable material and the side sheets may comprise a water vapor permeable material. Exemplary materials suitable for use in the side sheets 60 include polyolefinic films, microporous or other breathable formed films, breathable monolithic films, and hydrophobic nonwovens. Suitable hydrophobic nonwovens include SM (spunbond meltblown), SMS (spunbond meltblown spunbond), and SMMS (spunbond meltblown meltblown spunbond) composites. The materials of the water vapor-permeable side sheets 60 may be

selected to balance overall product economics and function. For example, a relatively more expensive nonwoven material having a relatively high basis weight may provide an acceptable level of water-impermeability for use in a single layer side flap construction. Alternatively, a relatively less expensive nonwoven having a relatively lower basis weight may provide the requisite level of water-impermeability only if it is doubled, thereby requiring a relatively greater area of material. As another example, a microporous film may provide a relatively optimal combination of water-impermeability and material cost. In a multi-layer chassis web 149 configuration one of the layers may comprise the center sheet 726 and side sheets forming a first multi-piece layer. The first multi-piece layer may be attached to a separate layer which may comprise a single continuous material or may be in the form of a second multi-piece web. One such embodiment comprises a multi-piece film layer having a water vapor impermeable center sheet 726 and water vapor permeable side sheets. The multi-piece film layer may be laminated to a one piece nonwoven to form a multi-layer chassis web 149.

As shown in Figures 36-43, the exemplary chassis 100 has longitudinally extending and laterally opposing breathable side flaps 147a and 147b that are disposed on the interior portion of the diaper 20 that faces inwardly toward the wearer and contacts the wearer. The side flaps are formed by folding portions of the chassis 100 including the water vapor-permeable side sheets 60 laterally inward, *i.e.*, toward the longitudinal axis 42, to form both the respective side flaps 147a and 147b and the side edges 137a and 137b of the chassis 100. The side sheets 60 of the chassis 100 may be folded laterally inward to form the side flaps. Alternatively, the chassis may be folded such that each side flap may include the respective side sheet 60 and a portion of the center sheet 726. In either configuration, at least a portion of each side flap is breathable due to its inclusion of at least a portion of the respective water vapor-permeable side sheet. Alternatively, the side sheet may be water vapor impermeable and the center sheet 726 may be water vapor permeable.

As shown in Figure 1, Figure 2, Figure 3, Figure 4, Figure 5, and Figure 6, the exemplary chassis 100 has longitudinally extending and laterally opposing side flaps 147 that are disposed on the interior portion of the diaper 20 that faces inwardly toward the wearer and contacts the wearer. The side flaps 147 may be formed by folding portions of the chassis 100 laterally inward, *i.e.*, toward the longitudinal axis 42, to form both the respective side flaps 147 and the side edges 137 of the chassis 100. Alternatively, as shown in Figure 31, the side flaps 147 may be formed by attaching an additional layer or layers to the chassis 100 at or adjacent to each of the respective side edges 137 of the chassis 100.

Each side flap 147 has a proximal edge 157. In the exemplary diaper 20 shown in Figure 1, the side flaps 147 overlap the absorbent assembly 200, *i.e.*, the proximal edges 157 lie laterally inward of the respective side edges 237 of the absorbent assembly 200. Such an overlapped configuration may be desirable in order to impart a more finished appearance to the diaper 20 than that imparted by a non-overlapped configuration. Alternatively, the side flaps 147 may not overlap the absorbent assembly 200.

Each of the side flaps 147 may be attached to the interior surface 102 of the chassis 100 in longitudinally oriented side flap attachment zones 151 in the front waist region 36 and longitudinally oriented side flap attachment zones 152 in the back waist region 38.

In the exemplary chassis 100 shown in Figure 1, the side flaps 147 may also be attached to the interior surface 102 of the chassis 100 in laterally oriented side flap attachment zones 153 adjacent to the front waist edge 136 and in a longitudinally opposing laterally oriented side flap attachment zones 154 adjacent to the back waist edge 138.

In embodiments in which the front edge 236 or the back edge 238 of the absorbent assembly 200 coincides with the respective front waist edge 136 or back waist edge 138 of the chassis 100 and the side flaps 147 overlap the absorbent assembly 200, the side flaps 147 may be attached to the absorbent assembly 200 instead of, or in addition to, being attached to the interior surface 102 of the chassis 100.

In embodiments in which the chassis 100 comprises a multi-layer chassis web 149, such as a laminate of a film 30 and a nonwoven 31, the nonwoven 31 may extend laterally to the full extent, width of the film 30 or alternatively the nonwoven 31 may have a width that is less than or greater than that of the film 30 layer. In an embodiment where the nonwoven 31 has a width, lateral extent, that is less than that of the film 30, the portion of the chassis web 149 that is folded to form the side flap 147 may consist solely of the film 30 layer, or may consist substantially of the film 30 layer (in other words, for a multilayered chassis web 149, the nonwoven 31 may extend across the exterior surface 104 from one chassis side edge 137a to the opposing side edge 137b; or alternatively, the nonwoven 31 may wrap the chassis side edges 137a and b and cover a portion of the side flaps 147a and b). In an embodiment where the nonwoven 31 has a width, lateral extent, that is greater than that of the film 30, the portion of the chassis web 149 that is folded to form the side flap 147 may consist solely of the nonwoven 31 layer, or may consist substantially of the nonwoven 31 layer. Furthermore, the nonwoven 31 of a multi-layer chassis web 149 may extend longitudinally to the full extent, length, of the film 30 or alternatively the nonwoven 31 may have a longitudinal extent that is less than that of the film 30 layer. In an

embodiment where the nonwoven 31 has a length, longitudinal extent, that is less than that of the film 30, the portion of the chassis 100 uncovered by the nonwoven 31 in the front and/or back waist regions 36 and 38 may be covered by the abdominal stretch panels 360, 370, 380, and 390.

As illustrated in Figures 23-28, 50 and 51, one or more of the layers (e.g., the film 30 and nonwoven 31) of the chassis web 149 may comprise one or more design fields for example 615 and 618a and 618b. A first design field 615 may be in contrast to other design fields (i.e., it exhibits a difference when compared with another design field, for example, a second design field 618a and third design field 618b) or to other portions of backsheet 26 or other portions of the viewable surfaces (of an intact diaper viewed with the naked eye) of the diaper 20, for example, the abdominal stretch panels 360 comprising fourth design field 660 and 380 comprising fifth design field 680. The design fields 615, 618a, 618b, 660 and 680 may comprise one or a combination of individual graphic elements (e.g., the hair of a human image may be a first graphic element and the eyes of the same image may be a second graphic element), patterns of graphic elements, and solid or interrupted colored regions. For example, the various design fields may be comprised of a continuously repeating pattern formed in a longitudinally extending direction. Alternatively, the design fields 615, 660 and 680 may be comprised of graphic elements (not shown) designed for a specific size diaper 20 or to provide specific design language associated with a specific region (e.g., front waist region 36, back waist region 38, or crotch region 37 of the diaper 20. Such graphic elements are often referred to as pitched graphics meaning the design is linked or associated with the pitch (i.e., length) of the diaper 20 or portions of the diaper 20 linked to the diaper's pitch. Further, two or more design fields can be partially overlapped with one another to form a mixed design field.

In certain embodiments of the present invention, particularly those embodiments where a portion of the chassis web 149 is folded to form longitudinally extending laterally opposing side flaps 147a and b, the design field 615 may extend to cover (or be viewable over) the entirety of the exterior surface 104 of the absorbent article, as well as cover (or be viewable on) a portion of the upper surfaces 613a and b of the side flaps 147a and b. To be clear, the design fields may be viewable through the nonwoven 31 that forms the exterior surface 104 of the backsheet 26 or the upper surfaces 613a and b of the side flaps 147a and b when printed on the film 30 that the nonwoven 31 may be exteriorly bonded to. In such a case, the design fields 615 and 618 would be viewable due to the properties of the nonwoven 31 (e.g., thinness, transparency, opacity, etc.).

In one embodiment, a first design field 615 extends laterally from one side edge 137a to the laterally opposing side edge 137b of the chassis 100. In addition to covering the exterior surface

104 of the chassis 100 it may be desired to have the first design field 615 wrap over the side edge(s) 137a and b of the chassis 100 and extend laterally inward to cover at least a portion of the side flaps 147a and b. Alternatively, the side flaps 147a and b may comprise a second and third design fields 618 a and b respectively. In certain embodiments, the design fields 615, 618 a and b, 660 and 680 may provide not only a pleasing aesthetic visual appearance to the viewable portions of the absorbent article, but it may also distinguish the side flaps 147a and b from the backsheet 26, or portions of the side flaps 147a and b from itself (e.g. distinguishing the cuff flaps 631 from the side barriers 633) such that the wearer or caregiver is assisted with proper placement of the side flaps 147a and b during application of the diaper 20. See Figures 23 and 24, for example, the backsheet 26 has a first design field 615 undulating along a left fold line 608a of the chassis web 149 and terminating at a right fold line 608b of the chassis web 149. The fold lines 608a and b are the lines that the chassis web 149 is folded along to form backsheet 26 side flaps 147a and b and side edges 137a and b. A second design field 618 may extend from the right side edge 619 of the first design field 615 to the unfolded right side edge 155b (which becomes the proximal edge 157b of the side flap 147b when the chassis 100 is folded to form the side flaps 147a and b). Alternatively, as shown in Figures 25 and 26, the first design field 615 may extend from a point at or adjacent the left side edge 137a to a point at or adjacent 137b of the chassis 100 such that the side flaps 147a and b become visually distinct elements. Both the first design field 615, second design field 618 a, and third design field 618 b, when present, can make portions of the side flaps 147a and b (e.g. the cuff flaps 631 and side barriers 633) more visually distinct, especially when a second elastic strand 168a and b is used, such that the double cuff feature (i.e., incorporation of a first and second elastic strands 167a and b and 168a and b, wherein the first elastic strands 167a and b is immediately adjacent the proximal edges 157a and b of the side flaps 147a and b and the second elastic strand 168a and b is oriented immediately adjacent the side edge 137a and b of the chassis 100) is visually highlighted. It should be understood that, as shown in Figures 27 and 28, the double cuff feature may also be highlighted by the first design field 615 being contrasted against side flaps 147a and b which do not comprise graphic elements in the second or third design field 618a and b, and therefore comprise a solid color (single color) and texture of the backsheet 26 making it up. In a muli-piece chassis web 149 construction as described above, design field 615 may be disposed on the center sheet 726 and design field 618 may be disposed on the side sheets 60.

As shown in Figures 50 and 51, the abdominal stretch panels 360, 370, 380, and 390 comprise design fields 660, 670, 680 and 690, fourth, sixth, fifth and seventh design fields

respectively. In one embodiment, the design field 660 and/or 680 may comprise the only graphic elements visible on the exterior of the absorbent article (when being worn), i.e., the remainder of the viewable exterior of the article (when being worn) has no additional graphic elements. In an alternative embodiment, design field 660 and/or 680 on the viewable exterior of the abdominal stretch panel (when being worn) may comprise a multi-color graphic element or design field and the remainder of the viewable exterior of the absorbent article (when being worn) may comprise a single color design field. In yet another alternative embodiment, the design field 660 and/or 680 of the abdominal stretch panel may comprise a single color design field and design fields 615 or 618 may comprise a multi-color design field. Alternatively, design field 660 and/or 680 may comprise a single color design field, or multicolor design field and/or multi-color graphic elements and may be combined with a backsheet comprising no graphic elements, a single color design field or single or multicolor graphic elements.

Furthermore the design field 660 of the abdominal stretch panel disposed in the front waist region may comprise a graphic element or elements intended to indicate the front of the absorbent article while the design field 680 of the abdominal stretch panel disposed in the back waist region may comprise a graphic element or elements intended to indicate the back of the absorbent article thereby helping the caregiver or wearer to orient the product accurately for application. Likewise, the backsheet comprising design field 615 disposed in the front waist region may comprise a graphic element or elements intended to indicate the front of the absorbent article while the design field 615 of the backsheet disposed in the back waist region may comprise a graphic element or elements intended to indicate the back of the absorbent article.

Between the longitudinally opposing side flap attachment zones, the proximal edges 157 of the side flaps 147 remain free, *i.e.*, are not attached to the interior surface 102 of the chassis 100 or to the absorbent assembly 200. Also between the longitudinally opposing side flap attachment zones, each side flap may include one or more (specifically including one, two, three, or four strands per side flap) longitudinally extensible flap elastic gathering members that may be attached adjacent to the proximal edge of the side flap by any of many well-known means. Each of such flap elastic gathering members may be attached over its entire length or over only a portion of its length. For example, such flap elastic gathering members may be attached only at or near its longitudinally opposing ends and may be unattached at the middle of its length. Such flap elastic gathering members may be disposed in the crotch region 37 and may extend into one or both of the front waist region 36 and the back waist region 38. For example, in the exemplary chassis 100 shown in Figure 1, an elastic strand 167 may be attached adjacent to the proximal

edge 157 of each of the side flaps 147 and extends into both the front waist region 36 and the back waist region 38.

Each flap elastic gathering member may be enclosed inside a folded hem. For example, in the exemplary chassis 100 shown in Figure 4 and Figure 5, each of the elastic strands 167 may be enclosed inside a hem 170 formed adjacent to the proximal edge 157 of the respective side flap 147. Alternatively, the flap elastic gathering member(s) may be sandwiched between two layers of the chassis or may be attached on a surface of the chassis 100 and remain exposed.

When stretched, the flap elastic gathering member disposed adjacent to each side flap proximal edge allows the side flap edge to extend to the flat uncontracted length of the chassis, *e.g.*, the length of the chassis 100, as shown in Figure 1. When allowed to relax, the flap elastic gathering member contracts to pull the front waist region 36 and the back waist region 38 toward each other and thereby bend the diaper 20 into a "U" shape in which the interior of the "U" shape may be formed by the portions of the diaper 20 that are intended to be placed toward the body of the wearer. Because each of the proximal edges 157 remains free between the longitudinally oriented side flap attachment zones 151 and 152, the contractive force of the elastic strand 167 lifts the proximal edge 157 of the side flap 147 away from the interior surface 102 of the chassis 100. This lifting of the proximal edges 157 when the diaper 20 is in the relaxed condition lifts the side flaps 147 into position to serve as side barriers adjacent to the side edges 237 of the absorbent assembly 200.

As shown in Figures 1, 2, 4, 5, 18, 19, and 20, one or more (specifically including one, two, three, or four strands per side flap) second elastic strands 168a and b may be attached at or adjacent the chassis side edges 137a and b of the chassis 100 where it is folded to form the side flaps 147a and b. When allowed to relax, the second elastic strands 168a and b may gather the side edges 137a and b of the chassis 100 to form side barriers 633a and b and function as a barrier to leakage of urine and fecal waste. A channel 621a and b may be formed adjacent the side edge 137a and b of the chassis 100 where it is folded to form the side flap 147a and b such that the portion of the chassis web 149 forming the channel 621a and b remains largely non-adhered to itself or to the second elastic strands 168a or b, particularly in each of the opposing waist regions 36 and 38, such that the second elastic strands 168a and b floats in the hollow of the channels 621a and b to enable the second elastic strands 168a and b to snap back to its glued-in length once the diaper 20 is cut to length during manufacture.

As shown in Figures 2, 4, 5, 18, 19 and 20 the side flaps 147 may be formed into cuff flaps 631 and side barriers 633. Particularly, side barrier attachments 630 may be oriented between the

first and second elastic strands 167 and 168. The placement of side barrier attachments 630 relative to the longitudinal axis 42 has a direct and coupled effect on the depth of cuff flaps 631 and the size of the side barriers 633. For example, when the side barrier attachments 630 are moved laterally inward, the depth of the cuff flaps 631 decreases and the size of the side barriers 633 increases. Conversely, as shown in Figure 18, when the side barrier attachments 630 are moved laterally outward, the depth of the cuff flaps 631 increases and the size of the side barriers 633 decreases. The depth and/or size of the cuff flaps 631 and side barriers 633 may be adjusted for various applications to provide enhanced functionality. In one such embodiment, as shown in Figure 19, it has been found that reduced depth cuff flaps 631 and larger side barriers 633 provides better application ease with regard to a pull-on pant style application. This configuration increases the size of the leg opening (not shown in Figure 19) enabling the wearer to step into the diaper 20 more easily. In yet another embodiment, it has been found that increasing the depth of the cuff flaps 631 and reducing the size of the side barriers 633 provides improved leakage protection and increased perception of capacity.

The depth of the cuff flaps 631 as measured from the proximal edge 157 of the side flap 147 to the side barrier attachment 630 may be from about 2 cm to about 7 cm, from about 2.5 cm to about 6.5 cm, or from about 3 cm to about 6 cm. The length of the side flap 147, as measured from the proximal edge 157 of the side flap 147 to the side edge 137 of the chassis 100 may be from about 4.5 cm to about 9.5 cm, from about 5 cm to about 8.5 cm, or from about 5.5 cm to about 7.5 cm. Alternatively, as shown in Figure 20, a second pair of side barrier attachments 630c and d may be used such that one can adjust the height of the cuff flaps 631 of the side flaps 147 without impacting the height of the side barriers 633. A channel 634a and b may be formed between side barrier attachments 630a and c and/or 630b and d and may comprise one or more additional elastic gathering members/strands 635a and b disposed therein.

For embodiments wherein the side flaps 147 are formed by attaching additional layers (e.g., film 30 and/or nonwoven 31) to the chassis 100 at or adjacent to each of the respective side edges 137a and b of the chassis 100, the second elastic strand 168a and b may be oriented and attached between the layers (e.g., film 30 and nonwoven 31) see Figure 32. The layers (e.g., film 30 and nonwoven 31) may also form a channel (e.g., 621a and b) and provide the functionality associated with it as described above.

As shown in Figures 44-49, the basic structure of the diaper 20 may include a chassis 100. The chassis 100 has a laterally extending front waist edge 136 in the front waist region 36 and a longitudinally opposing and laterally extending back waist edge 138 in the back waist region 38.

The finished chassis 100 has longitudinally extending front folded side edge segments 133a and 133b in the front waist regions, longitudinally opposing longitudinally extending back folded side edge segments 133c and 133d in the back waist region, and longitudinally extending cut side edge segments 135 in at least the crotch region, each of the cut side edge segments 135 connecting the respective front and back folded side edge segments 133. In combination, the respective folded side edge segments 133 and cut side edge segments 135 form the composite side edges 137, which connect the front waist edge and the back waist edge. The chassis 100 has an interior surface 102 and an exterior surface 104. The chassis 100 also has a longitudinal axis 42 and a lateral axis 44. The longitudinal axis 42 extends through the midpoint of the front waist edge 136 and through the midpoint of the back waist edge 138. The lateral axis 44 extends through the midpoint of the left side edge 137a and through the midpoint of the right side edge 137b. The exemplary chassis 100 shown in Figure 44 additionally has longitudinally extending and laterally opposing side flaps 147a and 147b that are described in more detail below.

In the finished diaper, the chassis has a generally "hourglass" shape, as in the exemplary diaper 20 shown in Figure 44. Such a non-rectangular shape may be desirable in order to impart a tailored appearance to the diaper 20 when it is worn. Such a non-rectangular shape may also be desirable in order to impart an impression that the diaper 20 will fit comfortably between the legs of a wearer.

The chassis 100 is given the hourglass shape by the removal of laterally opposing portions of the chassis 100 from at least the crotch region 137, to form laterally opposing side notches 139. This formation of the side notches 139 in the chassis makes its lateral dimension at and adjacent to the lateral axis 44 smaller than its lateral dimension at and adjacent to the front waist edge 136 and smaller than its lateral dimension at and adjacent to the back waist edge 138, *i.e.*, makes the chassis narrower in the crotch region 37 than at the waist edges 136 and 138.

The contour of the side notch 139 that is formed by the removal folded material along the cut side edge segment 135 is defined by the contour of that cut side edge segment. The contour may be continuously arcuate. Alternatively, the contour may be a composite formed by two longitudinally opposing arcuate portions 140 and a generally straight intermediate portion 141 connecting the arcuate portions, and thus not continuously arcuate, as in the exemplary diapers 20 shown in Figure 44. The side notches 139 may be disposed symmetrically with respect to either or both of the longitudinal axis 42 and the lateral axis 44 of the chassis 100. For example, the side notches 139 are shown disposed symmetrically with respect to both the longitudinal axis 42 and the lateral axis 44 in Figure 44. Alternatively, the side notches 139 may be disposed

asymmetrically with respect to either or both of the longitudinal axis 42 and the lateral axis 44. For example, the side notches 139 may be disposed symmetrically with respect to the longitudinal axis 42 and asymmetrically with respect to the lateral axis 44, for example where the side notches are offset toward the front waist edge 136.

The formation of the side notches 139 by the removal of the laterally opposing portions of the chassis leaves only longitudinally separated segments of the folded side edges 133 intact to prevent any bodily waste material from migrating laterally and escaping from the diaper 20. In particular, only the front folded side edge segments 133a and 133b and the back folded side edge segments 133c and 133d remain intact. The removal of the side portion 142 to form each side notch 139 detaches the respective side flap 147 from the underlying layer of the chassis along the contour of each cut side edge segment 135, thus creating an opening through which bodily waste material could escape. Therefore, the chassis 100 may include at least one longitudinally extending continuous barrier attachment 630 disposed laterally proximally of each cut side edge segment 135. Each side flap 147 is attached to the underlying layer of the chassis 100 at the barrier attachment 630. Each barrier attachment 630 is water-impermeable at least laterally and thereby preferably acts as a dam to prevent the lateral escape of bodily waste material in the gap between the longitudinally separated front and back folded side edge segments.

A single barrier attachment 630 may be used to attach each side flap 147 or, alternatively, two or more barrier attachments 630 may be used to attach each side flap 147. One or more barrier attachments 630 used to attach each side flap can be described as forming a barrier attachment zone (that is, each side flap having its own barrier attachment zone). For example, in the exemplary diaper 20 shown in Figure 44, two laterally spaced barrier attachments 630 may be used to attach each side flap 147. As another example, a single barrier attachment 630 may be used to attach each side flap 147 in the exemplary diapers 20. As yet another example, four laterally spaced barrier attachments 630 may be used to attach each side flap 147 in the exemplary diaper 20. The use of a single barrier attachment 630 for each side panel 147 may help to minimize the cost of the diaper 20. On the other hand, the use of more than one barrier attachment 630 for each side panel 147 may help to prevent the lateral escape of bodily waste materials in the event that one side seal is not perfectly continuous and thereby allows flow past itself.

The barrier attachments 630 may be oriented generally parallel to the longitudinal axis 42 and to each other, as shown in Figure 44. The barrier attachments 630 may be configured as mirror images of each other.

The barrier attachments 630 may be formed by heat bonding, pressure bonding, a combination of heat bonding and pressure bonding, ultrasonic bonding, adhesive bonding, or in any other way or combination of ways known in the art for forming laterally water-impermeable bonds. Each barrier attachment 630 may extend from the front waist edge 136 to the back waist edge 138, as shown in Figure 44. Alternatively, a barrier attachment 630 may extend less far in the longitudinal direction. For example, a barrier attachment 630 may extend longitudinally only as far as the respective cut side edge segment 135 extends.

The barrier attachment 630 may initially extend through the side portion of the chassis 100 that is eventually removed to form the side notch 139. Exemplary barrier attachments 630 remaining longitudinally continuous after the formation of the side notches 139 are also shown in the finished exemplary diaper 20 of Figure 44 and Figure 49.

The barrier attachments 630 may be substantially linear in form as shown in Figure 44. Alternatively, a barrier attachment 630 may be curvilinear in form. For example, a barrier attachment 630 may have a contour generally concentric to the contour of the cut side edge segment 135 and thereby "follow" the contour of the cut side edge segment from a point at or adjacent to a respective front folded side edge segment 133a or 133b to the respective corresponding back folded side edge segment 133c or 133d. In such a configuration, the combination of the front folded side edge segment, the side seal, and the back folded side edge segment may form a longitudinally continuous barrier to the lateral flow of bodily waste material between the front and back waist edges. As another alternative in which a combination of the front folded side edge segment, the side seal, and the back folded side edge segment may form a longitudinally continuous barrier to the lateral flow of bodily waste material, a barrier attachment 630 may be sufficiently wide to extend from laterally inward of the cut side edge segment 135 to the folded side edge segments 133, such as the exemplary side seals shown in Figure 49.

Each barrier attachment 630 may be formed as a relatively narrow stripe being at least ten times as long as it is wide, such as the exemplary side seals shown in Figure 44. Alternatively, each barrier attachment 630 may be formed as a relatively wide band being less than ten times as long as it is wide, such as the exemplary side seals shown in Figure 49.

At and/or adjacent to each of the side edges 137 of the chassis, the front waist region 36 and the back waist region 38 are attached together to form the finished pant product having a waist opening 10 and two leg openings 12. This attachment may have the form of side seams 115. Such a side seam may be formed where the waist regions are overlapped such that the interior surface of one lies against the exterior surface of the other. In another form, a side seam may be

formed where the side edges in the waist regions are abutted. In another form, a side seam may be formed where either the interior surfaces or the exterior surfaces of the waist regions are in face-to-face contact, i.e., in a so-called flanged attachment. Such flanged attachments are shown in Figure 7, Figure 8, and Figure 9.

Referring to Fig. 7, side seam 115 may comprise primary closure members 700 which are refastenable. The primary closure members 700 may comprise any refastenable fastening components known in the art. For example, the primary closure members 700 may comprise mechanical fasteners, e.g. hook and loop fasteners, hook and hook fasteners, macrofasteners, buttons, snaps, tab and slot fasteners, tape fasteners, adhesive fasteners, cohesive fasteners, magnetic fasteners, hermaphrodidic fasteners and the like. Some suitable examples of fastening systems and/or fastening elements are discussed in U.S. Patent Nos. 3,848,594; 4,662,875; 4,846,815; 4,894,060; 4,946,527; 5,151,092; 5,221,274; 6,251,097; 6,669,618; and 6,432,098; U.S. Patent Application Serial Nos. 11/240,943, entitled, "Anti-Pop Open Macrofasteners" filed on September 30, 2005; and 11/240,838, entitled, "A Fastening System Having Multiple Engagement Orientations", filed on September 30, 2005. Additionally, various suitable pant configurations are disclosed in U.S. Patent Nos. 5,246,433; 5,569,234; 6,120,487; 6,120,489; 4,940,464; 5,092,861; 5,897,545; 5,957,908; and U.S. Patent Publication Nos. 2003/0233082; 2005/0234419A1; 2003/0088220; 2005/0130821; 2003/0233082; 2005/0215971; 2005/0215970; 2007/0078427; 2007/0093769; 2007/0074381; 2007/0078426A1; and 2008-0107861.

A side seam may be formed where the waist regions are overlapped such that the interior surface of one lies against the exterior surface of the other. In such an embodiment, one closure member 700 may be disposed on the interior surface of the side flap while the other closure member 700 is disposed on the exterior surface of the backsheet. In an alternative embodiment, a side seam may be formed where the side edges in the waist regions are abutted. In such an embodiment, the closure member 700 may be disposed on the outer surface of the backsheet in both the front and back waist regions and/or on the inner surface of the side flaps in the front and back waist regions such that it spans from one waist region to the opposing waist region. In yet another embodiment, a side seam may be formed where either the interior surfaces or the exterior surfaces of the waist regions are in face-to-face contact, i.e., in a so-called flanged attachment. Such flanged attachments are shown in Figure 7, Figure 8, and Figure 9.

In other embodiments, closure members 700 may be employed to enable adjustment of the article once the article has been applied to a wearer. Secondary closure members (not shown) serve to increase the tension (i.e., "cinch") in the waist hoop subsequent to application in order to

provide enhanced sustained fit of the article. Secondary closure members (not shown) may include any type of fastener as known in the art and may be associated with a stretch element that aids in increasing the tension in the waist hoop. A secondary closure member (not shown) may be disposed adjacent one of the primary closure members 700 or may be made unitarily with one of the primary closure members 700, The purpose of a secondary closure member (not shown) is to allow the user to adjust the fit of the article. It should be understood that multiple closure members, i.e. primary, secondary, tertiary, etc. may be incorporated into one or all of the components forming the refastenable side seam 115.

Further, it should be appreciated that closure members 700 need not have an infinite life span, but it is sufficient that the closure members 700 attached in a refastenable manner can be separated and re-attached successively several times over the typical use life span of the absorbent article. It will also be appreciated that the aggressiveness of actual fastening may be reduced significantly from fastening to refastening in absolute terms, but that such reduction is not "substantial degradation" of fastener performance if the resulting refastened strength is sufficient for the fastening system's purpose of use.

A portion or the whole of the chassis 100 may be made extensible to a degree greater than the inherent extensibility of the material or materials from which the chassis is made, e.g., the backsheet 26. The additional extensibility may be desirable in order to allow the chassis 100 to conform to the body of a wearer during movement by the wearer. The additional extensibility may also be desirable, for example, in order to allow the user of a diaper 20 including a chassis 100 having a particular size before extension to extend the front waist region 36, the back waist region 38, or both waist regions of the chassis 100 to provide additional body coverage for wearers of differing size, *i.e.*, to tailor the diaper to the individual wearer. Such extension of the waist region or regions may give the diaper a generally hourglass shape, so long as the crotch region 37 is extended to a relatively lesser degree than the waist region or regions, and may impart a tailored appearance to the diaper 20 when it is worn. In addition, the additional extensibility may be desirable in order to minimize the cost of the diaper. For example, an amount of material that would otherwise be sufficient only to make a relatively smaller diaper lacking this extensibility can be used to make a diaper capable of being extended to adequately cover a wearer that is larger than the unextended smaller diaper would fit.

A portion of the chassis 100 in the front and/or back waist regions 36 and 38 may be made laterally extensible to a maximum extensibility greater than a maximum extensibility of another portion of the chassis 100 in the crotch region 37 such that a lateral extension of each of the

portions in the front, back, and crotch regions 36, 38, and 37 to its maximum extensibility imparts an hourglass shape to the chassis 100. In one embodiment, the portion of the chassis 100 underlying and/or immediately adjacent an abdominal stretch panel (e.g., back/front interior/exterior abdominal stretch panels 360, 370, 380, and 390) may be made laterally extensible to a maximum extensibility greater than a maximum extensibility of another portion of the chassis 100, for example the crotch region 37, such that a lateral extension of each of the portions to its maximum extensibility facilitates application of the diaper 20 onto the body of a wearer by enabling the waist opening 10 to be extended to fit over the wearer's hips and in addition, opening and orienting the leg openings 12 enabling the wearer to place the legs through the leg openings 12 more effectively.

Additional lateral extensibility in the chassis 100 may be provided in a variety of ways. For example, a material or materials from which the chassis 100 is made may be pleated by any of many known methods. Alternatively, all or a portion of the chassis may be intermittently activated to create a structured elastic-like formed web material or a formed laminate of web materials like those described in U.S. Patent No. 5,518,801 issued on 21 May 1996 in the name of Chappell *et al.* This formed web material may include distinct laterally extending regions in which the original material has been altered by embossing or another method of deformation to create a pattern of generally longitudinally oriented alternating ridges and valleys and also may include laterally extending unaltered regions between the laterally extending altered regions. The formed web material can be extended in a direction perpendicular to the ridges up to the point where the ridges and valleys flatten with substantially less force than is required to extend beyond that point. In addition to lateral extensibility, the creation of a formed laminate web as described above provides the backsheet 26 with improved texture and cloth-like appearance and feel. The deformation creates a cloth-like pattern in the film and increases the loft of the nonwoven 31 in multi-layer film 30 and nonwoven 31 laminate backsheets 26.

An exemplary fragment 300 of such a formed web material 305 is shown in Figure 52. This formed web material 305 may include distinct laterally extending regions 310 in which the original material has been altered by embossing or another method of deformation to create a pattern of generally longitudinally oriented alternating ridges 312 and valleys 314. The formed web material 305 may also include laterally extending unaltered regions 316 located between the laterally extending altered regions 310.

Such a formed web material 305 can be laterally extended beyond its original dimension with the application of relatively less force than that required to extend the same material to the

same extent when undeformed. In particular, the effects of an application of opposing divergent forces directed generally perpendicular to the ridges 312 and valleys 314 include an extension of such a formed web material along an axis between the opposing forces and the generation of a resistive contractive force, primarily in the unaltered regions 316. This resistive force is relatively smaller than the resistive force that is generated by the same material in its unaltered form when extended to the same extent, at least up to an extension at which the ridges and valleys in the altered regions flatten and begin to contribute to the resistive force. Thus, such formed web materials exhibit an extensible behavior resembling that of traditional elastic materials in the range of extensibility that is useful for the type of lateral extension desired for use in absorbent articles. However, such formed web materials may be made of relatively less expensive materials that are not inherently elastic and, thus, their use may provide an advantage in terms of the cost of manufacturing the absorbent articles.

Alternatively, a portion of the chassis can be continuously activated (e.g., ring-rolled and thus rendered highly extensible as described in U.S. Pat. No. 5,366,782 (issued Nov. 22, 1994 to Curro, et al)). Specifically, a ring-rolling apparatus (not shown), which comprises opposing rolls (not shown) having intermeshing teeth (not shown) that incrementally stretch and thereby plastically deform the chassis (or a portion thereof) thereby rendering the chassis extensible in the ring-rolled regions. In one embodiment, the backsheet 26 can be ring-rolled in a portion of at least one of the front or back waist regions 36 and 38, for example the portion of the chassis 100 underlying and/or immediately adjacent the back/front interior/exterior abdominal stretch panels 360, 370, 380, and 390, while other regions may comprise a structured elastic-like formed web material.

The activation approaches described above are achieved by using a set of opposing rolls comprising a staggered orientation of teeth such that when a material such as the chassis web 149 or backsheet passes through the intermeshing rolls, the material is deformed to create the desired activation pattern in the web. Alternatively, the teeth of one of the rolls may be continuous around the circumference of the roll while the teeth on the opposing roll may be discontinuous forming intermittent activation (e.g. a structured elastic-like formed web) or a pitched continuous activation (e.g. continuously activated in the opposing waist regions and not the crotch region). The depth to which the teeth intermesh, i.e. depth of engagement, will determine to what degree the web is incrementally stretched and/or plastically deformed and therefore the degree of extensibility imparted to the web.

In some embodiments, the chassis web 149 can be activated in a portion of side barriers or cuff flaps to a greater extent, for example, length of the activated/deformed region or the depth of engagement. For example, in these embodiments, one or both of the waist regions of the chassis immediately adjacent the side edges may comprise longer longitudinally oriented ridges and valleys while other portions of the waist region may comprise relatively shorted longitudinally oriented ridges and valleys. Alternatively, one or both of the waist regions of the chassis immediately adjacent the side edges and or end edges may comprise a material that has been deformed to a greater extent forming larger (i.e. deeper) longitudinally oriented ridges and valleys while other portions of the absorbent article may comprise relatively smaller (i.e. shallower) longitudinally oriented ridges and valleys.

In certain embodiments, the activated portion of the chassis web 149 disposed in one of the front or back waist region may comprise a continuous activation pattern (e.g., via ring rolling) and an intermittent activation pattern (i.e., a structured elastic-like formed web material). These two activation patterns may be disposed in an overlapping or side-by-side relationship. For example, as a more particular embodiment, the entire chassis web 149 may be intermittently activated to form a structured elastic-like formed web material and the portion of the chassis web 149 disposed in one or both of the waist regions may be continuously activated, such that the continuously activated region overlaps the intermittently activated region..

As illustrated in Figure 34, when exterior abdominal stretch panels 360 and 380 are used, but not interior abdominal stretch panels 370 and 390, ring-roll type (e.g. continuous) activation may create corrugations 636 in the interior of the waist regions 36 and 38. Specifically, the chassis 100 (including the backsheet 26, side flaps 147, and inner liner 22 (when present)), may be corrugated to provide an undulating inner surface 102, forming the corrugations 636. These corrugations 636 are believed to promote breathability and, overall, a healthier environment for the wearer's skin, particularly in the waist region.

Alternatively, when interior abdominal stretch panels 370 and 390 are used, but not exterior abdominal stretch panels 360 and 380, ring-roll type (e.g. continuous) activation may create corrugations 636 on the exterior of the waist regions 36 and 38. Specifically, the chassis 100 (including the backsheet 26, side flaps 147, and inner liner 22 (when present)), may be corrugated to provide an undulating outer surface 104, forming the corrugations 636. These corrugations 636 are believed to provide an impression of extensibility as the waist region of the article is extended during application.

The chassis 100 may be ring-rolled across the entire width in one or both of the front/back waist regions 36 and 38 or alternatively may be ring-rolled over only a portion of the chassis 100 width. In yet another embodiment the portion of the chassis 100 may be ring-rolled where the side flaps 147a and b overlap and are joined to the chassis 100 in the side flap attachment zones 151, 152, 153, and 154. The ring-rolling may take place prior to folding portions of the chassis 100 to form the side flaps 147a and b or alternatively after the side flaps 147a and b have been formed and/or attached. Further, ring-rolling may take place after the back/front interior/exterior abdominal stretch panels 360, 370, 380, and 390 are attached.

The front laterally central portion 117 and the back laterally central portion 118 of the chassis 100 may have a different range of extensibility from the portions of the chassis in the side flap attachment zones 151, 152, 153, and 154 where the side flaps 147a and 147b may be attached to the interior surface 102 of the chassis. Additionally or alternatively, the laterally central portions 117 and 118 may be extensible to a greater or lesser degree when subjected to a given level of opposing tensile forces, *i.e.*, may be more easily or less easily extensible, than the portions of the chassis in the side flap attachment zones. For example, if the chassis is made uniformly extensible across its entire width prior to the formation of the side flaps, the double layering in the areas of the side flap attachment zones after the formation of the side flaps may have an effect of decreasing the degree of lateral extensibility of those areas under a given level of opposing tensile forces, such as by the side flaps acting as parallel "springs" that may be extended in order to extend the underlying attached portion of the chassis. As another example, the altered regions in the laterally central portions of the chassis may be deformed to a greater or a lesser degree than the altered regions in the side flap attachment zones to render the laterally central portions more easily or less easily extensible than the respective portions in the side flap attachment zones.

Additionally, as shown in Figures 29 and 30, a portion of one or a combination of the backsheet, side barriers, and cuff flaps may be activated as described above to provide a greater level of longitudinal extensibility. In such an embodiment, at least one of the opposing rolls may include a staggered orientation of teeth such that when engaged with the opposing roll, a curved or shaped activation pattern is formed in the web. This curved pattern may be useful for activating the side barriers of a shaped diaper (e.g., a side notched diaper) or useful for activating around particular diaper elements (e.g., graphic elements). Alternatively, the teeth of the rolls may be oriented in a substantially non-staggered pattern thereby creating a longitudinally extending area of extensibility that comprises a substantially straight pattern formed in the web.

The depth to which the teeth intermesh, i.e. depth of engagement, will determine to what degree the web is incrementally stretched and/or plastically deformed and therefore the degree of extensibility imparted to the web.

In some embodiments, the chassis web 149 can be activated in a portion of side barriers or cuff flaps. For example, in these embodiments, as shown in Figures 29 and 30, the portion of the chassis immediately adjacent the side edges can comprise laterally oriented alternating ridges 712 and valleys 714 while other regions may comprise longitudinally oriented alternating ridges 312 and valleys 314.

In certain embodiments, the activated portion of the chassis web 149 disposed in the front or back waist region comprises a longitudinally continuously activation pattern (e.g., via ring rolling) and a longitudinally intermittent activation pattern (i.e., a structured elastic-like formed web material). These two activation patterns may be disposed in an overlapping or side-by-side relationship.

In certain embodiments, the activated portion of the chassis web 149 disposed adjacent the side edges, for example, the side barriers and/or cuff flaps may comprise a laterally continuous activation pattern comprising laterally oriented ridges 712 and valleys 714 (e.g., via ring rolling) and a longitudinally intermittent activation pattern (i.e., a structured elastic-like formed web material). These two activation patterns may be disposed in an overlapping or side-by-side relationship. In other words, the overlapping orientation of the two distinct types of activation may be performed sequentially on the same region of the diaper. For example, as a more particular embodiment, the entire chassis web 149 may be longitudinally intermittently activated in the machine direction to form a structured elastic-like formed web material and the portion of the chassis web 149 forming the side barriers and/or cuff flaps may be continuously activated to form laterally oriented ridges712 and valleys 714, such that the side barriers and/or cuff flaps are activated in both the longitudinal and lateral directions.

Description of the abdominal stretch panel(s)

As shown in the figures, each abdominal stretch panel has a laterally extending longitudinally distal edge that is disposed at or adjacent to the respective waist edge of the chassis 100 and a longitudinally opposing laterally extending longitudinally proximal edge that is disposed relatively nearer to the lateral axis 44 than the longitudinally distal edge of the same abdominal stretch panel is disposed. Each abdominal stretch panel also has laterally opposing longitudinally extending side edges, an interior surface, and an exterior surface.

In particular, the front interior abdominal stretch panel 370, when present, has a laterally extending longitudinally distal edge 371 and a longitudinally opposing laterally extending longitudinally proximal edge 372. The front interior abdominal stretch panel 370, when present, also has laterally opposing longitudinally extending side edges 373, an interior surface 374, and an exterior surface 375. Similarly, when present, the back interior abdominal stretch panel 390 has a distal edge 391, a proximal edge 392, side edges 393, an interior surface 394, and an exterior surface 395. Similarly, when present, the front exterior abdominal stretch panel 360 has a distal edge 361, a proximal edge 362, side edges 363, an interior surface 364, and an exterior surface 365. Similarly, when present, the back exterior abdominal stretch panel 380 has a distal edge 381, a proximal edge 382, side edges 383, an interior surface 384, and an exterior surface 385.

Each of the abdominal stretch panels shown in Figure 1, Figure 2, Figure 3, and Figure 6 has a circumferential extent that is substantially equivalent to the lateral extent of the chassis 100 in the respective waist region. In such embodiments, each abdominal stretch panel may be attached to the chassis 100 where the front waist region 36 and the back waist region 38 are attached together. For example, if a side seam 115 is formed by means of pressure bonding or thermal bonding in any of their forms, including ultrasonic bonding, an abdominal stretch panel may be attached to the chassis in the same side seam, such that the side seam effectively extends through the thicknesses of the chassis 100 and the abdominal stretch panel. An ability to bond all of the layers together in one side seam may have advantages in terms of manufacturing simplicity and cost, because the side seam can be formed in a single bonding process.

Alternatively, any of the abdominal stretch panels may have a circumferential extent that is less than the lateral extent of the chassis 100 in a particular waist region. For example, an interior abdominal stretch panel 370 and/or 390 may have a lateral extent only approximately as great as the distance between the proximal edges 157 of the side flaps 147. As another example, an interior abdominal stretch panel 370 and/or 390 may have a lateral extent greater than the distance between the proximal edges 157 of the side flaps 147 but less than the distance between the side edges 137 of the chassis 100. The portions of such an interior abdominal stretch panel that lie laterally outboard of the proximal edges 157 of the side flaps 147 may be sandwiched between the side flaps 147 and the interior surface 102 of the chassis 100.

Further the abdominal stretch panel may be formed from one or more discrete elements disposed on the interior and/or exterior surface of the chassis. For example, as shown in Figs. 36 and 44, an abdominal stretch panel may comprise two discrete laterally opposing elements (e.g.,

390a and 390b) disposed on opposing sides of the longitudinal centerline 42. In such embodiments, the laterally opposing portions of the chassis comprising elements 390a and 390b may be made laterally extensible to a greater extent than a portion of the chassis disposed between the laterally opposing elements 390a and 390b. The discrete laterally opposing elements may be elastomeric and may comprise strands. The strands may be oriented longitudinally and/or laterally. For instance a grid-like elastomeric matrix of elastomeric strands may be sandwiched between nonwovens.

The interior surface of each interior abdominal stretch panel contacts the skin of the wearer when the diaper 20 is worn. Therefore, the layer forming the interior surface may be formed of a soft material that will not irritate the skin of the wearer. Many suitable materials are known in the art, including rayon and synthetic nonwovens, such as spunbonded or carded polypropylene, polyethylene, or polyester or other olefinic materials.

An abdominal stretch panel may have a laminate structure. In particular, an abdominal stretch panel may include an interior layer and an additional layer or layers disposed exteriorly of the interior layer. An elastic version of one of the aforementioned suitable materials, may comprise a nonwoven exhibiting substantial elastic properties, such a material may be used for any of the layers. For example, a front interior abdominal stretch panel 370 having a laminate structure in shown in Figure 10. This abdominal stretch panel may include both an interior skin-contacting layer 82 and one or more elastic layers 83 laminated to the interior layer 82. Suitable materials for the elastic layer 83 are well-known in the art, including natural rubber strands, synthetic rubber strands, elastomeric films, *etc.* The material chosen for the elastic layer 83 may exhibit a force response proportional to its elongation. As shown in Figure 10, an abdominal stretch panel may also include an exterior cover layer 84 laminated to the elastic layer 83 on its surface opposite the interior layer 82, thereby forming a trilaminate in which the elastic layer 83 is sandwiched between the interior layer 82 and the exterior cover layer 84.

The layers of an abdominal stretch panel may be laminated by any method suitable for the elements being attached together and their constituent materials. For example, the elastic layer 83 may be maintained in a stretched condition while being attached to a relaxed interior layer 82 (and/or a relaxed exterior cover layer 84 if present) and then allowed to relax. The resultant contraction of the elastic layer 83 may gather the interior layer 82 in such a way as to create rugosities and the laminate thus formed may be extended in the direction of the original stretch up to the original dimension of the interior layer 82 (and/or the exterior cover layer 84 if present) with only the elastic layer 83 resisting the extension. A similar result may be achieved by, for

example, first gathering the interior layer 82 (and/or the exterior cover layer 84 if present), such as by pleating it, and then attaching the elastic layer 83 in a relaxed condition. The resultant laminate may be extended in a direction perpendicular to the pleat ridges up to the original dimension of the interior layer 82 (and/or the exterior cover layer 84 if present) with only the elastic layer 83 resisting the extension.

In some exemplary methods, the lamination may be performed with both the elastic layer 83 and the interior layer 82 (and/or the exterior cover layer 84 if present) relaxed. All or a portion of the resultant laminate abdominal stretch panel may subsequently be "activated" by subjecting it to elongation to create localized ruptures or regions of deformation in a portion 85a of the interior layer 82 (and/or a portion 85c of the exterior cover layer 84 if present). In Figure 11, a stretched abdominal stretch panel having an activated portion 85 is shown, with the ruptured/deformed portion 85a of the interior layer 82 and the ruptured/deformed portion 85c of the exterior cover layer 84 shown in dashed lines representing exemplary deformation of, breaks in and/or separation of the fibers in nonwoven materials. The ruptured/deformed portion 85a of the interior layer 82 (and/or the ruptured/deformed portion 85c of the exterior cover layer 84 if present) in the resultant activated portion 85 of the laminate provides little or no resistance to extension in the direction of the original elongation. For example, when a nonwoven is used for the interior layer 82 (and/or the exterior cover layer 84 if present), the ruptured/deformed portion(s) typically include(s) areas of deformation, breaks in and/or separation of the fibers that render the ruptured/deformed portion(s) substantially incapable of transmitting tensile forces in the plane of the nonwoven. Some suitable activation methods are known in the art as "ring-rolling" processes.

A combination of lamination methods may be used, if desired, so long as they are suitable for the elements being attached together and their constituent materials. For abdominal stretch panel embodiments comprising an elastic film and a nonwoven, the film and nonwoven may differ in size both laterally and longitudinally. For example, an abdominal stretch panel may comprise a laminate of film and nonwoven wherein the film extends laterally only partially across the width of the nonwoven of the abdominal stretch panel. In yet another embodiment, the film layer of the abdominal stretch panel may extend longitudinally only partially across the longitudinal length of the nonwoven of the abdominal stretch panel. Such designs minimize the amount of active stretch material and help minimize overall cost of the structure.

An abdominal stretch panel may have uniform extension characteristics throughout its area or may have different extension characteristics in different portions. For example, a portion of an

abdominal stretch panel may be made laterally extensible to a maximum extensibility greater than a maximum extensibility of an adjacent portion, such that a desired fit on a wearer can be achieved. The difference in extensibility may be provided by varying the lamination and/or activation process, for example by varying the localized elongation in an activation process.

Some users may desire to tear open the diaper 20 in order to remove it from the body of the wearer. In order to provide guidance regarding where the product may be torn open, a visible tear locator line may be printed on an abdominal stretch panel and the adjacent portion of the chassis 100. For example, a pair of laterally opposing tear locator lines 72a, 72b may be printed exteriorly on a front exterior abdominal stretch panel 360 as shown in Figure 8. Tearing an exterior abdominal stretch panel and the underlying portion of the chassis 100 (and the underlying interior abdominal stretch panel, if present) at both of two laterally opposing tear locator lines will release the diaper 20 from the waist and both legs of the wearer.

Such a tear locator line 72 may be printed on any abdominal stretch panel(s). For some users, locating the tear locator lines 72 on a front exterior abdominal stretch panel may be preferable, because they may prefer to lay their infants down on their backs while removing the diaper, and tear locator lines 72 disposed on a front abdominal stretch panel are likely to be more easily visible than tear locator lines 72 disposed on a back abdominal stretch panel.

In order to minimize the level of tensile force required to tear open the diaper 20 for removal from the wearer, frangible tear lines may be provided. Such a frangible tear line may be formed in a layer or a laminate of layers by perforation, by the formation of a brittle area or areas at which the material will preferentially fracture when stressed, by the formation of a weaker area or areas at which the material will preferentially tear when stressed, by the formation of a friable area or areas at which the material will preferentially crumble when stressed and/or bent, or by any other method of providing frangibility that is suitable for the materials involved.

For example, a pair of laterally opposing frangible tear lines 80a, 80b may be formed in a back exterior abdominal stretch panel 380 as well as the portion of the chassis 100 overlain by the back abdominal stretch panel, as shown in Figure 9. In this embodiment, the frangible tear lines 80 intersect the distal edge 381 of the back exterior abdominal stretch panel 380 laterally inboard of its side edges 383 and intersect its proximal edge 382 at the intersection of the proximal edge 382 and the side edge 137 of the chassis 100 at the margin of each leg opening. The frangible tear lines 80 may be disposed elsewhere, but the depicted configuration may be preferred in some embodiments. For example, if the frangible tear lines 80 continued generally linearly toward the lateral axis 44, continuous portions of the diaper 20 would remain in place around the legs of the

wearer. When the frangible tear lines 80 are shaped to intersect the margins of the respective leg openings as described above, tearing the diaper 20 at both of the laterally opposing frangible tear lines 80 will release the diaper 20 from the waist and both legs of the wearer.

Such frangible tear lines 80 may be disposed in any abdominal stretch panel(s). For some users, locating the frangible tear lines 80 in a front abdominal stretch panel may be preferable, because they may prefer to lay their infants down on their backs while removing the diapers, and frangible tear lines 80 in a front abdominal stretch panel are likely to be more easily visible and more easily usable than frangible tear lines 80 disposed in a back abdominal stretch panel. If both an exterior abdominal stretch panel and an interior abdominal stretch panel are present in a waist region, the frangible tear lines may be formed in both of the abdominal stretch panels as well as the portion of the chassis 100 sandwiched between them.

In some embodiments, both frangible tear lines and tear locator lines may be provided. For example, tear locator lines may be printed at or adjacent to frangible tear lines. In such an embodiment, the presence of the visible tear locator lines may prove helpful to the user in locating the frangible tear lines for use in removal of the diaper 20.

The diaper 20 may comprise apertures 622 as illustrated in Figure 35 disposed through one or both of the front and back waist regions 36 and 38. For example, the apertures 622 may extend through the back interior abdominal stretch panel 390, the backsheet 26, including the nonwoven 31, and the back exterior abdominal stretch panel 380 to provide air passages for breathability. The apertures 622 may be formed by any suitable means known in the art including hot needle aperturing, laser cutting, die cutting, slitting, etc. One such method achieves apertures 622 using an apparatus (not shown) comprising a pair of counter-rotating, intermeshing rollers, wherein a first roller comprises circumferentially-extending ridges and grooves, and a second roller comprises teeth being tapered from a base and a tip, the teeth being joined to the second roller at the base, the base of the tooth having a cross-sectional length dimension greater than a cross-sectional width dimension; and moving the back interior abdominal stretch panel 390, the backsheet 26, (which may comprise a film layer 30, a nonwoven 31 or both), and the back exterior abdominal stretch panel 380 through a nip of the counter-rotating, intermeshing rollers; wherein apertures 622 are formed in the back interior abdominal stretch panel 390, the backsheet 26, (which may comprise a film layer 30, a nonwoven 31 or both), and the back exterior abdominal stretch panel 380 as the teeth on one of the rollers intermesh with grooves on the other of the rollers. An exemplary method of forming the apertures 622 is disclosed in U.S. App. No. 11/249,618 to O'Donnell (U.S. Pub. No. 2006-0087053).

The number of apertures 622 per unit area of apertured web (i.e., the area density of apertures 622) can be varied from about 1 aperture 622 per square centimeter to as high as 60 apertures 622 per square centimeter. There can be at least 10 or at least 20 apertures 622 per square centimeter, depending on the end use. In general, the area density need not be uniform across the entire area of web, but apertures 622 may be oriented in only certain regions (e.g., the front or back waist regions 36 and 38) of the chassis 100, and can be disposed in a variety of shapes, including lines, stripes, bands, circles, and the like.

The abdominal stretch panels attached to the chassis as described herein are desirable from the standpoints of comfort and appearance. For example, unlike typical stretch waistbands, each abdominal stretch panel covers some portion of a waist region of the diaper 20, i.e., is disposed on one or both of the interior and exterior surfaces rather than being hidden between layers of the chassis 100. Therefore, if the abdominal stretch panel is formed from soft and attractive materials, such as one of the aforementioned nonwovens, the exposed abdominal stretch panel can provide a finished appearance resembling that of cloth underwear and thereby convey an impression of softness and comfort to the user.

Description of the Absorbent Assembly(ies)

As shown in Figures 12, 13, 14, and 15, the absorbent assembly 200 may include an absorbent core 250 that serves to absorb and retain liquid bodily waste materials. The absorbent core 250 has a laterally extending front edge 256 and a longitudinally opposing and laterally extending back edge 258. The absorbent core 250 also has a longitudinally extending left side edge 257a and a laterally opposing and longitudinally extending right side edge 257b, both absorbent core side edges extending longitudinally between the front edge 256 and the back edge 258. The absorbent core 250 also has an interior surface 252 and an exterior surface 254.

The absorbent assembly 200 may be attached to the interior surface 102 of the chassis 100 over any part or the whole of the area of the absorbent assembly 200. The absorbent assembly 200 may be attached on its exterior surface 204 to the chassis 100 in a shaped attachment pattern, for example a cruciform attachment pattern, *i.e.*, an attachment pattern that forms or is arranged in a cross or "+" shape.

Suitable configurations of cruciform attachment patterns are disclosed in U.S. Patent No. 6,962,578 to La Von issued on 8 November 2005.

Alternatively, the absorbent assembly 200 may be attached to the interior surface 102 of the chassis 100 in a convexly-shaped attachment pattern 210', which may be in the shape of an oval

or may be egg-shaped. The convexly-shaped attachment pattern 210' may be contiguous, *i.e.*, all of its portions may be touching or connected throughout the pattern in an unbroken sequence. Alternatively, it may include detached portions and thereby lack contiguity but still be arranged such that the shape of the overall pattern is in the form of, for example, an oval. For example, a discontiguous convexly-shaped attachment pattern 210' may include a longitudinally extending portion disposed along the longitudinal axis 42 and separate left and right laterally spaced portions disposed along or adjacent to the lateral axis 44, the laterally spaced portions having extending longitudinally to different lengths thereby forming an oval shaped pattern. In one embodiment, shown in Figure 29, the oval-like attachment pattern 210 comprises 5 laterally spaced stripes of adhesive 624-628 attaching the absorbent assembly 200 to the interior surface 102 of the chassis 100. The central stripe 626 may be disposed at or adjacent the longitudinal axis 42 and is shown as having the greatest longitudinal extent. The most distal of the adhesive stripes 624 and 628 are shown as having the least longitudinal extent and the intermediate stripes 625 and 627, those located between the distal stripes 624 and 628 and the central stripe 626 are shown having a longitudinal extent between that of the central stripe 626 and the distal stripes 624 and 628.

The portions of the chassis 100 that lie outside such a convexly-shaped attachment pattern 210 or oval-like attachment pattern 210 are not restrained by attachment to the absorbent assembly 200 and therefore remain extensible. Thus, in embodiments where the absorbent assembly 200 is attached to the backsheet 26 in the convexly-shaped attachment pattern 210, the backsheet 26 substantially loses its extensibility in the area of attachment. The portion of the backsheet 26 disposed outside of the convexly-shaped attachment pattern 210 may remain extensible. Thus, it may be desirable to activate the backsheet 26 in a pattern complimentary with a given attachment pattern (e.g., a concave activation pattern 675 to compliment a convexly-shaped or oval-like attachment patterns 210).

Within the extent of the shaped attachment patterns (e.g., the cruciform, convexly-shaped, and oval-like attachment patterns 210), the absorbent assembly 200 may be attached to the chassis 100 continuously or intermittently as shown in Figures 29 and 30. For example, a film of adhesive (not shown) may be applied continuously over the entire area of the cruciform attachment pattern 210 and then used to continuously attach the absorbent assembly 200 to the chassis 100. As an alternative example, an adhesive may be applied discontinuously at and inside the boundaries of the convexly shaped attachment pattern 210'', such as in the form of dots,

stripes (e.g., stripes 624-628), beads, spirals, *etc.*, and then used to attach the absorbent assembly 200 to the chassis 100.

The shaped attachment patterns (e.g., the cruciform, convexly-shaped, and oval-like attachment patterns 210) may be disposed symmetrically or asymmetrically with respect to either or both of the longitudinal axis 42 and the lateral axis 44 of the chassis 100. In addition, the shaped attachment patterns (e.g., the cruciform, convexly-shaped, and oval-like attachment patterns 210) may be disposed symmetrically or asymmetrically with respect to either or both of the side edges 237a and b and the front and back edges 236 and 238 of the absorbent assembly 200. Other suitable configurations of cruciform attachment patterns 210 are disclosed in U.S. Patent No. 6,962,578 issued on 8 November 2005.

The absorbent core 250 may be disposed between a lower covering sheet that is disposed on the exterior face of the absorbent core 250 and an upper covering sheet that is disposed on the interior face of the absorbent core 250. Such an upper covering sheet and lower covering sheet may be attached together to contain the absorbent core 250 between them and thereby form the absorbent assembly 200. For example, in the exemplary absorbent assembly 200 shown in Figures 12, 13, 14 and 15, an upper covering sheet 24 and a lower covering sheet 25 are attached together at or adjacent to the side edges 237 of the absorbent assembly 200 in longitudinally extending adhesive attachment zones 29. Alternatively, the upper covering sheet 24 and the lower covering sheet 25 may be attached together in places other than the side edges 237, *e.g.*, at or adjacent to the end edges 236 and 238 of the absorbent assembly 200, or at or adjacent to both the end edges 236 and 238 and the side edges 237. Both the upper covering sheet and the lower covering sheet are water vapor-permeable, i.e., breathable.

The upper covering sheet 24 may be water-permeable and may allow liquid waste to pass through to the absorbent core 250, where the liquid waste may be absorbed. The lower covering sheet 25 may be water-impermeable. However, alternatively, the lower covering sheet 25 may be water-permeable.

In the exemplary absorbent assembly 200 shown in Figures 12, 13, 14 and 15, the upper covering sheet 24 and the lower covering sheet 25 are of the same size, *i.e.*, both the upper covering sheet 24 and the lower covering sheet 25 extend to the front edge 236 and back edge 238, as well as to the side edges 237 of the absorbent assembly 200. Alternatively, the upper covering sheet 24 and the lower covering sheet 25 may differ in size.

As another example, the upper covering sheet 24 may be larger than the lower covering sheet 25 and may be wrapped over the side edges 257 of the absorbent core 250 onto the interior

surface of the absorbent core 250, where the upper covering sheet 24 and the lower covering sheet 25 may be attached together. Alternatively, in place of a separate upper covering sheet 24 and a separate lower covering sheet 25, a single covering sheet may be wrapped around the absorbent core 250 and attached to itself to contain the absorbent core 250.

The absorbent core 250 may include a storage component 272 that serves to absorb and retain liquid bodily waste materials. Suitable known materials for the absorbent core storage component include cellulose fibers in the form of comminuted wood pulp, commonly known as "airfelt", natural or synthetic fibrous materials, and superabsorbent polymers, used either singly or in mixtures and commonly formed into layers or sheets, *etc.*

The absorbent core may include an acquisition component in addition to one or more storage components. The absorbent core acquisition component serves to acquire deposited liquid bodily waste material and transfer it to the absorbent core storage component. Any porous absorbent material which will imbibe and partition liquid bodily waste material to the storage component or components may be used to form the acquisition component. Examples of such acquisition materials are more fully described in U.S. Patent No. 4,950,264 issued to Osborn on August 21, 1990.

Such an absorbent core acquisition component 290 is shown overlying the absorbent core storage component 272 in Figure 15. A separation sheet 292 of, e.g., a tissue or a nonwoven material, may be disposed between the absorbent core storage component 272 and the absorbent core acquisition component 290 to help ensure that none of the gel formed by a superabsorbent polymer that may be included in the absorbent core storage component reaches the skin of the wearer.

In some exemplary embodiments, an absorbent core storage component may include the discrete form of an absorbent material that is immobilized in pockets formed by a layer of a thermoplastic material, such as a hot melt adhesive material, that intermittently contacts and adheres to a substrate sheet, while diverging away from the substrate sheet at the pockets. Absorbent core components having such structures and being suitable for the storage of liquid bodily wastes are described in U.S. Patent Application Publication Nos. 2004/0162536 dated 19 August 2004 and 2004/0167486 dated 26 August 2004, as well as U.S. Application Nos. 60/936,102, to Hundorf, dated June 18, 2007, 60/936,109, to Hundorf, dated June 18, 2007, 60/936,149, to Hundorf, dated June 18, 2007, 60/936,036, to Hundorf, dated June 18, 2007, 60/936,068, to Hundorf, dated June 18, 2007, 60/936,150, to Hundorf, dated June 18, 2007,

60/936,085, to Ashton, dated June 18, 2007, 60/936,084, to Ashton, dated June 18, 2007, and 60/936,146, to Ashton, dated June 18, 2007.

An exemplary absorbent core storage component 272 having such a structure is shown in Figure 16. In this absorbent core storage component 272, particles 270 of a superabsorbent polymer are contained inside pockets 280 formed by a layer 275 of a thermoplastic material. The layer 275 of the thermoplastic material intermittently contacts and adheres to a substrate sheet 274 at the areas of attachment 282. Between the areas of attachment 282, the layer 275 diverges away from the substrate sheet 274 to form the pockets 280. The layer 275 may have the form of a sheet of fibers of the thermoplastic material through which the liquid waste may pass to the particles to be absorbed by the particles 270 of the superabsorbent polymer.

In Figure 16, a separate thermoplastic layer covering sheet 276 is shown overlying the layer 275 of the thermoplastic material. Alternatively, the separate thermoplastic layer covering sheet 276 may be omitted.

As another alternative, as shown in Figure 17, two absorbent core storage components 272 may be superposed with one absorbent core storage component 272 inverted such that its pockets 280 nest into the recesses at the areas of attachment 282 of the other absorbent core storage component 272 and the respective single substrate sheets 274 distally oppose each other. In such an absorbent core 250, the distally opposing single substrate sheets 274 may serve respectively as the upper covering sheet 24 and the lower covering sheet 25.

Statements of Incorporation by Reference and Intended Scope of Claims

The disclosures of all patents, patent applications and any patents which issue thereon, as well as any corresponding published foreign patent applications, and all publications listed and/or referenced in this description, are hereby incorporated herein by reference. It is expressly not admitted that any of the documents or any combination of the documents incorporated herein by reference teaches or discloses the present invention. 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.

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, 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. A disposable article comprising:

an absorbent assembly comprising an absorbent core;

a chassis comprising a longitudinal axis, a lateral axis, a front waist region comprising a front waist edge, a back waist region comprising a back waist edge, a crotch region between the waist regions, laterally opposing side edges extending between the front waist edge and the back waist edge, an exterior surface, and an interior surface, the chassis forming a waist opening and two laterally opposing leg openings when the front waist region and the back waist region are attached together;

the chassis comprising a water-impermeable center sheet comprising laterally opposing side edges, an interior surface, and an exterior surface;

the chassis further comprising laterally opposing side sheets, each of the side sheets comprising first and second longitudinally extending edges, one of the first and second longitudinally extending edges of the side sheets being disposed laterally inward of the side edges of the chassis and at least one of two layers of the side sheet being attached to the center sheet adjacent to the side edges of the center sheet and each of the side sheets also comprising a longitudinally extending laterally proximal edge and a longitudinally extending first elastic gathering member attached adjacent to the proximal edge;

the chassis also comprising a second elastic gathering member attached at or adjacent the side edge of the chassis, the second elastic gathering member disposed between a side barrier attachment zone and the side edges of the chassis;

the front waist region and the back waist region being attached together at or adjacent to the respective side edges of the chassis and thereby forming a waist opening and two laterally opposing leg openings; and

at least one abdominal stretch panel attached to the interior surface and/or the exterior surface of the chassis in the front waist region and/or the back waist region and having a laterally extending longitudinally distal edge disposed at or adjacent to the respective waist edge and a longitudinally opposing laterally extending longitudinally proximal edge, the at least one abdominal stretch panel providing a circumferential contractive force around the waist opening when the chassis is stretched laterally.

2. The disposable absorbent article of Claim 1, wherein the at least one abdominal stretch panel comprises two laterally opposing elements disposed on opposing sides of the longitudinal axis.

3. The disposable absorbent article according to any of the preceding claims, wherein a potion of the chassis comprising the laterally opposing elements is laterally extensible to a greater extent than a portion of the chassis between the laterally opposing elements.

4. The disposable absorbent article according to any of the preceding claims, wherein the laterally opposing elements are elastomeric panels.

5. The disposable absorbent article of Claim 4, wherein the laterally opposing elements comprise elastomeric strands.

6. The disposable absorbent article according to any of the preceding claims, wherein the chassis comprises a first activation pattern in the front waist region and/or the back waist region, and wherein the crotch region of the chassis is not activated or comprises a second activation pattern which is different from the first activation pattern.

7. The disposable absorbent article according to any of the preceding claims, wherein the absorbent article further comprises a closure member that maintains waist and leg openings of the absorbent article in a closed configuration to form a pant.

8. The disposable absorbent article of Claim 7, wherein the closure member is refastenable.

9. The disposable absorbent article according to any of the preceding claims, wherein at least one of the longitudinally extending edges of the side sheet is nonlinear.

10. The disposable absorbent article according to any of the preceding claims, wherein two layers of the side sheets are attached to the center sheet at or adjacent the side edges of the center sheet.

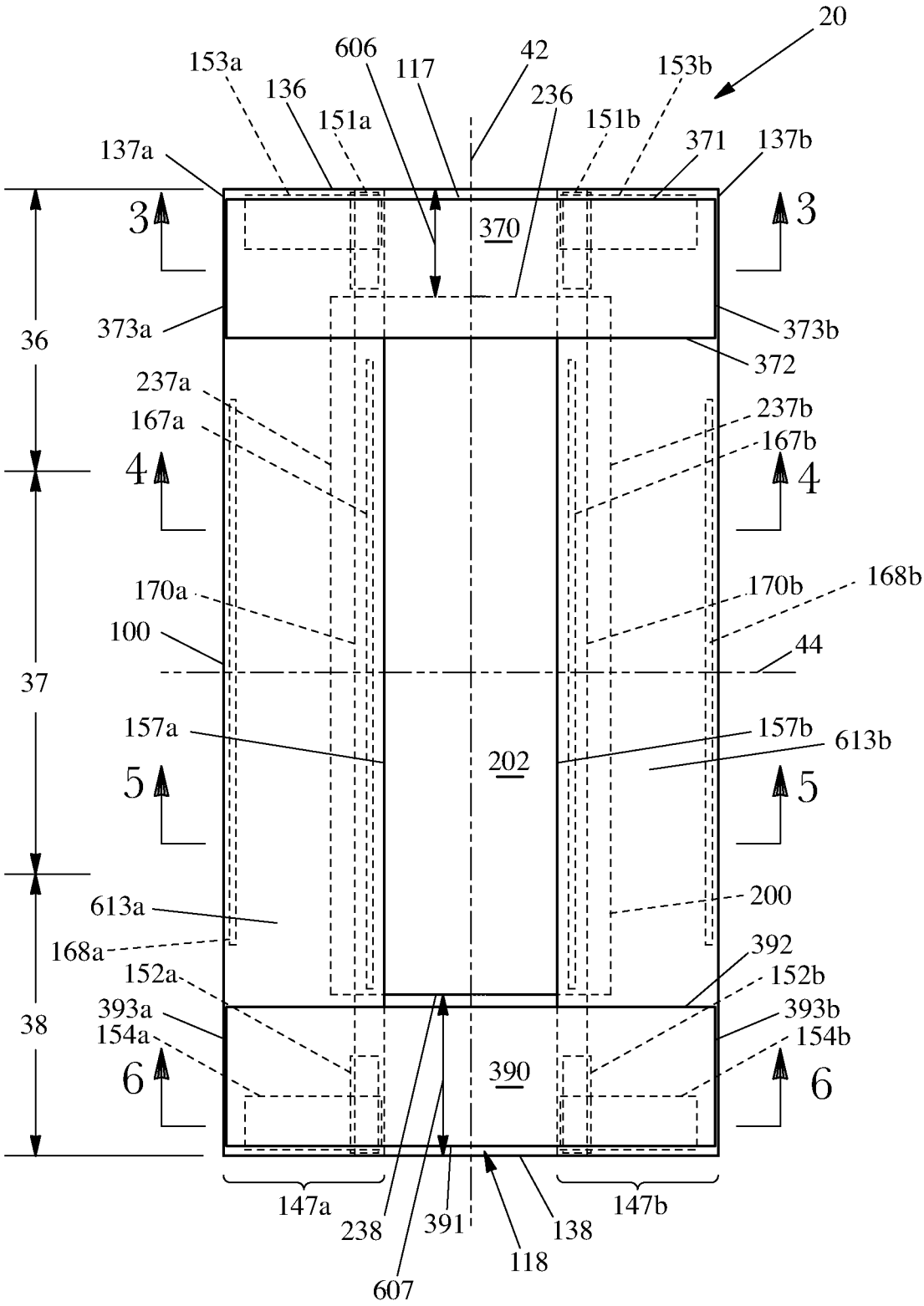
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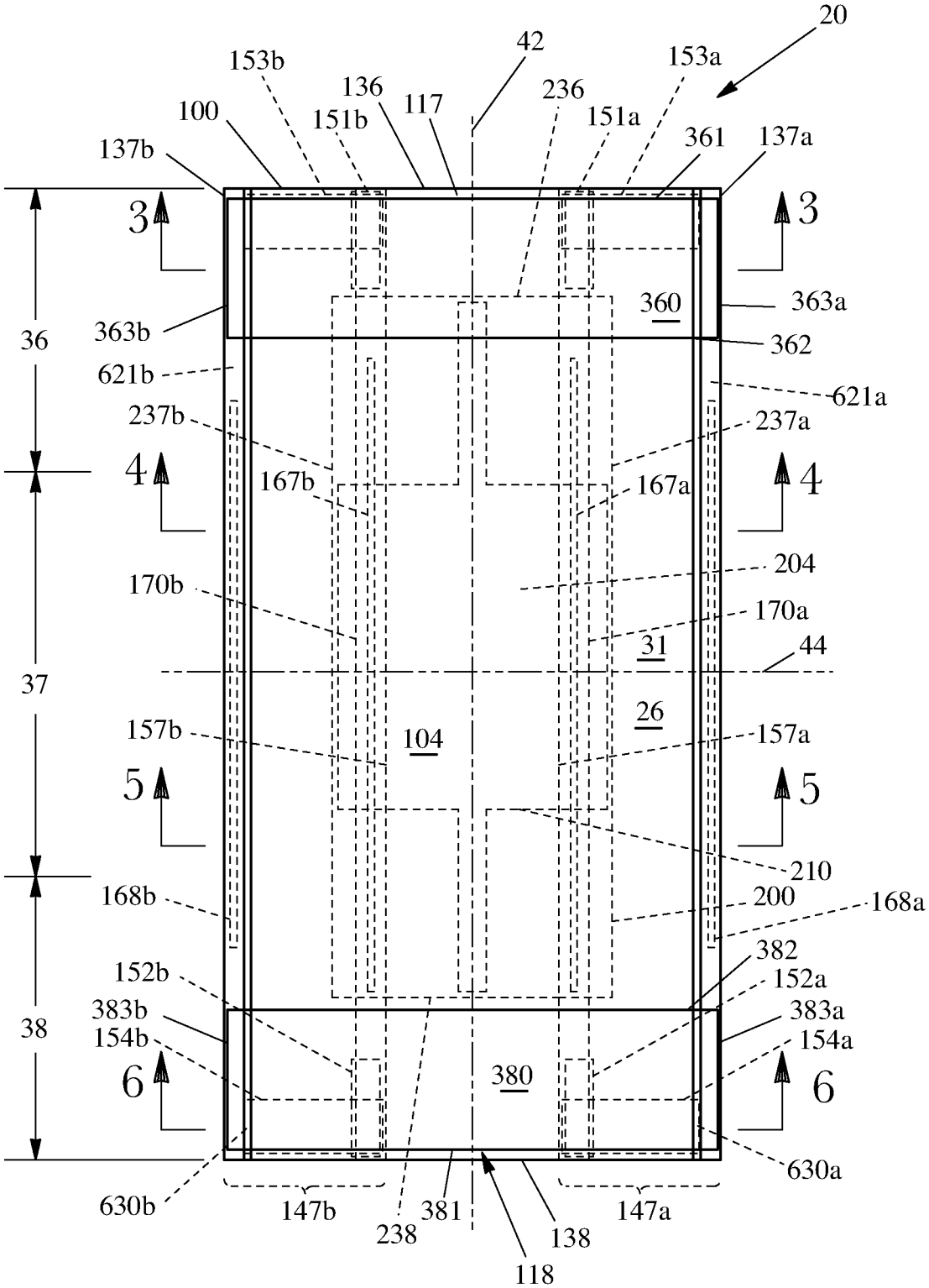
Fig. 1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237b
237a
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167a
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157b
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157a
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Fig. 2

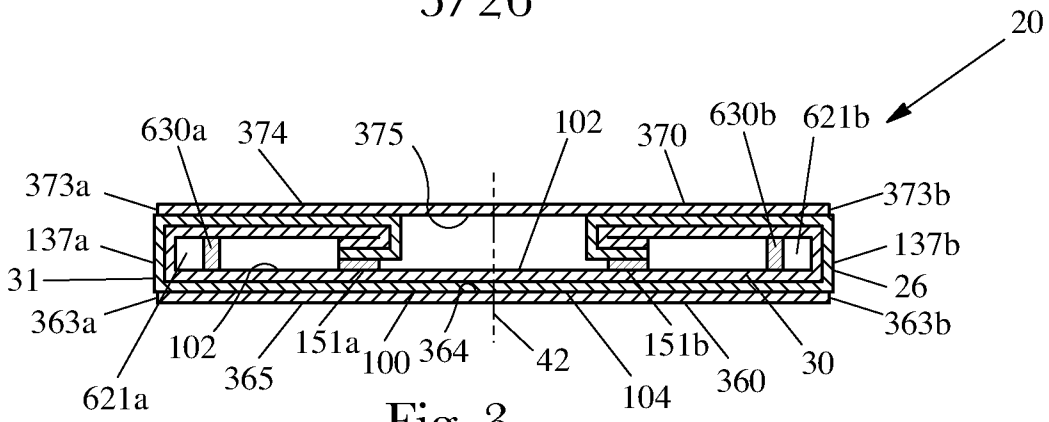


Fig. 3

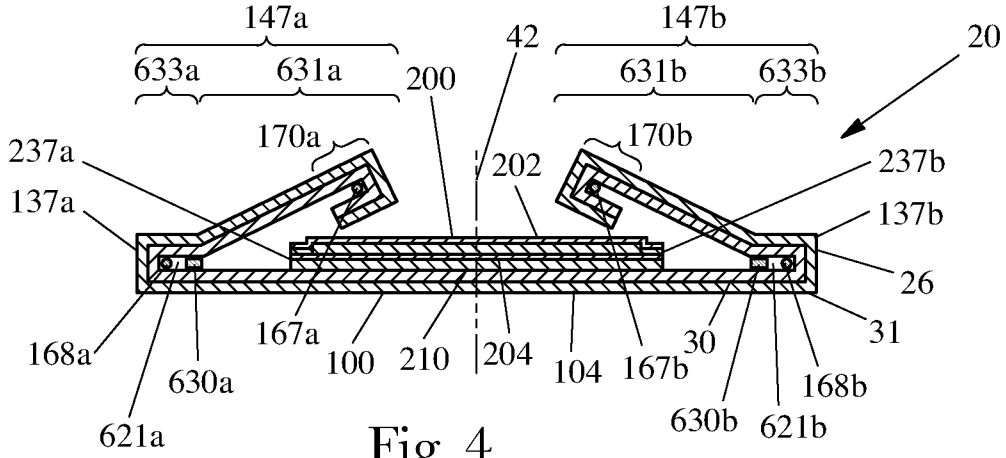


Fig. 4

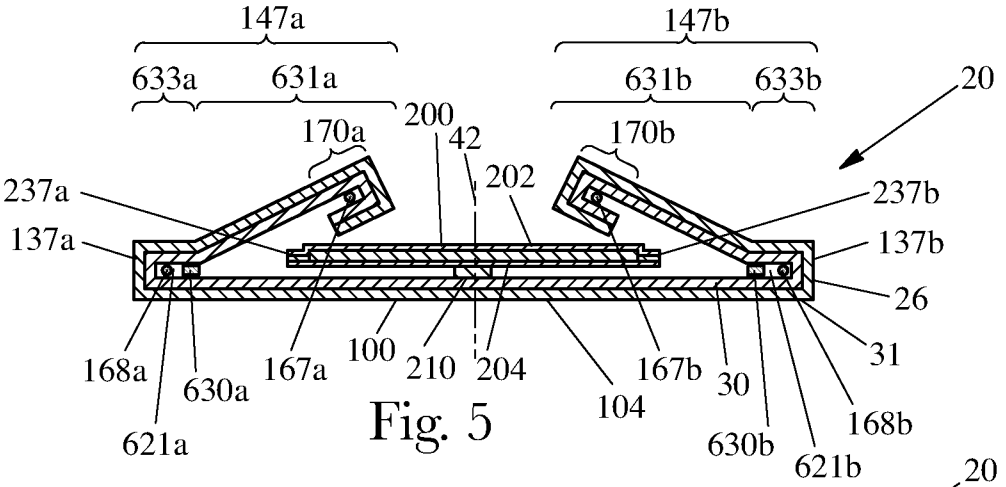


Fig. 5

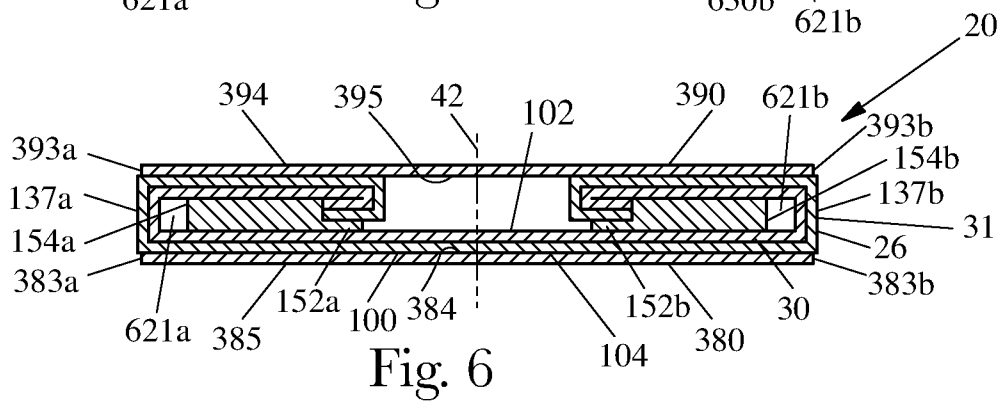


Fig. 6

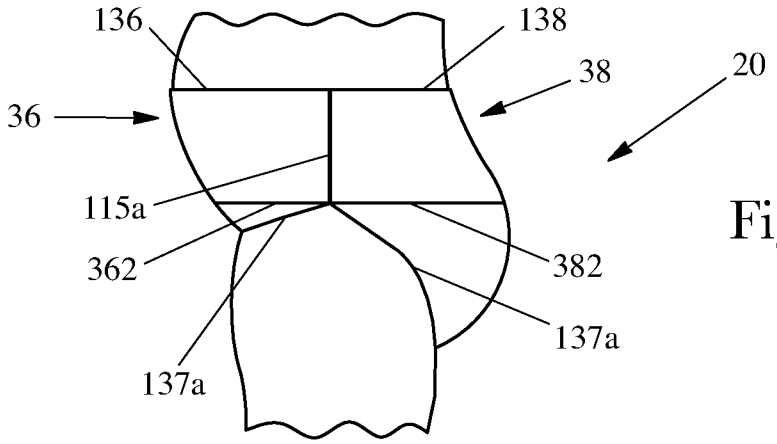


Fig. 7

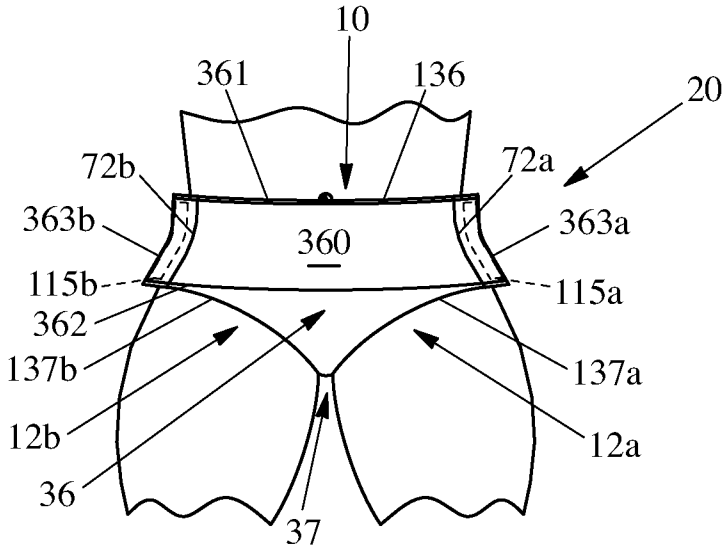


Fig. 8

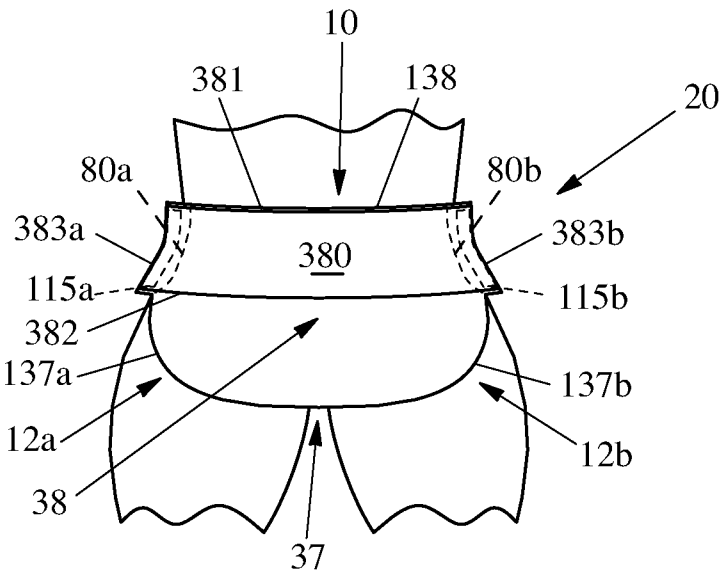


Fig. 9

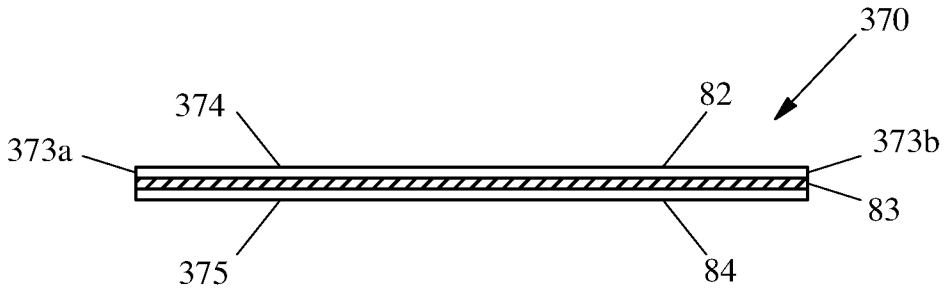
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Fig. 10

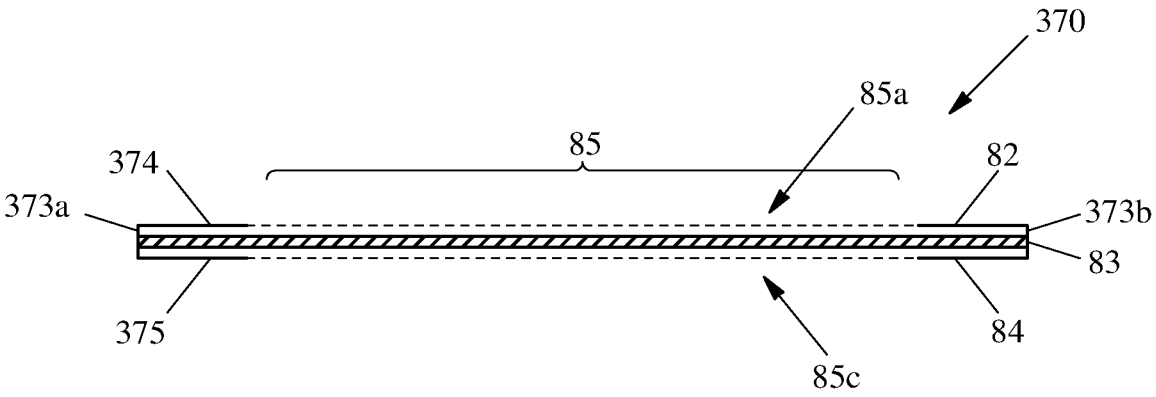
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Fig. 11

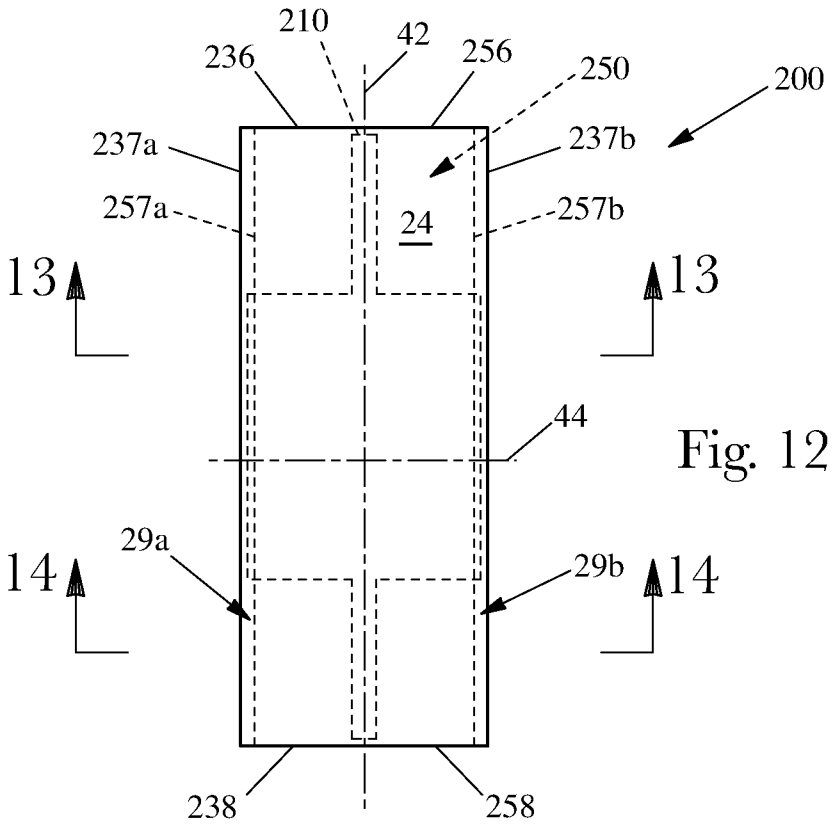



Fig. 12

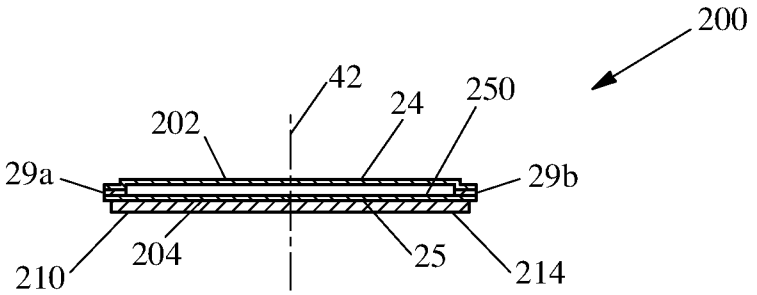



Fig. 13

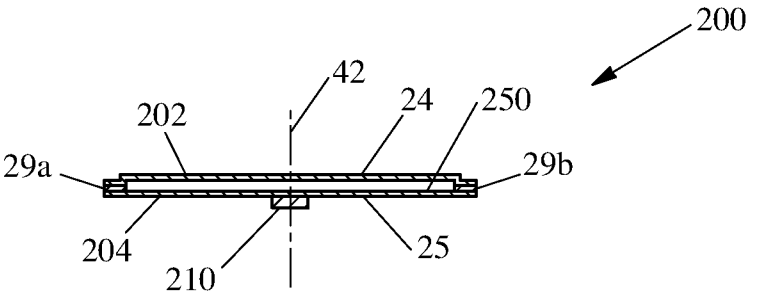



Fig. 14

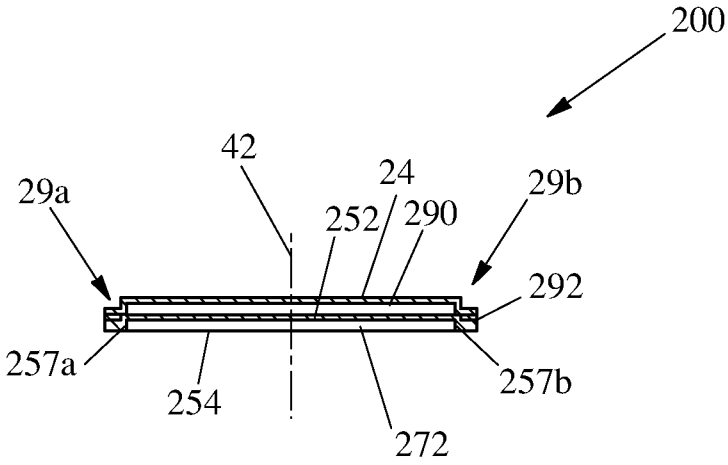



Fig. 15

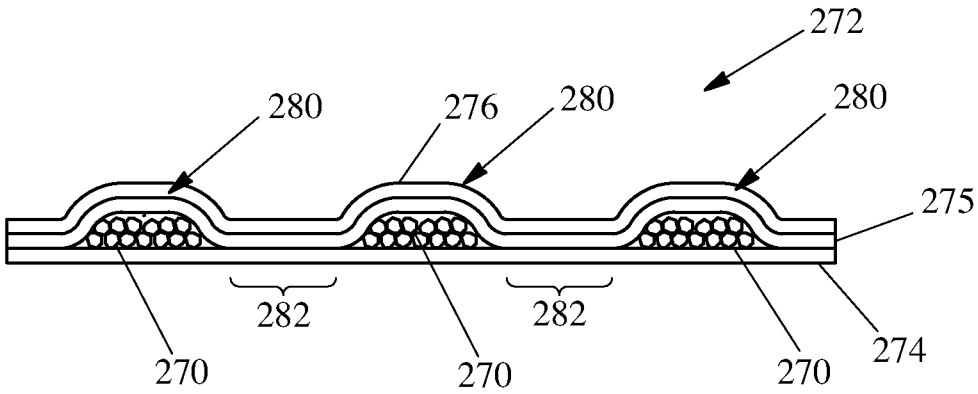



Fig. 16

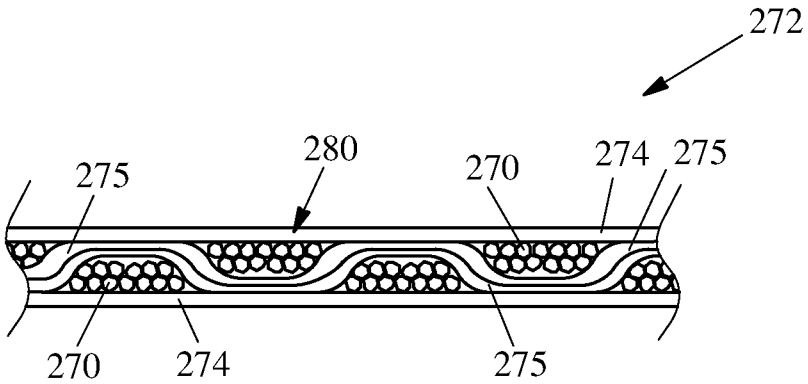



Fig. 17

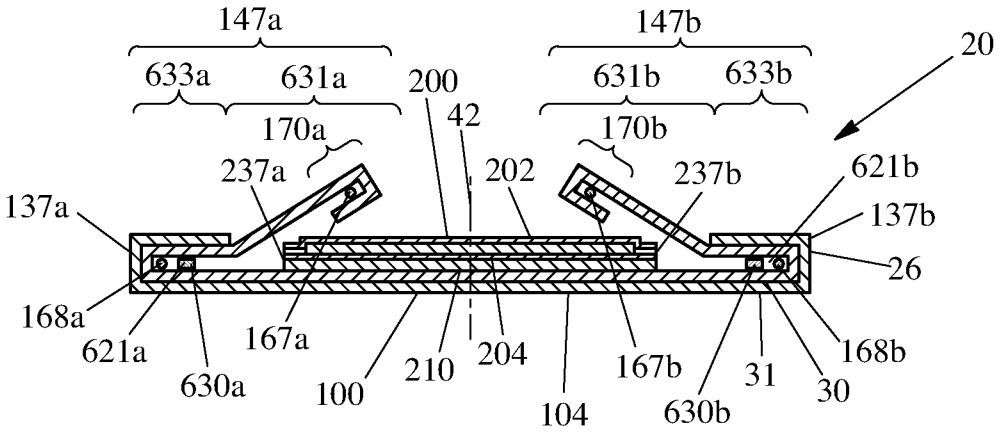
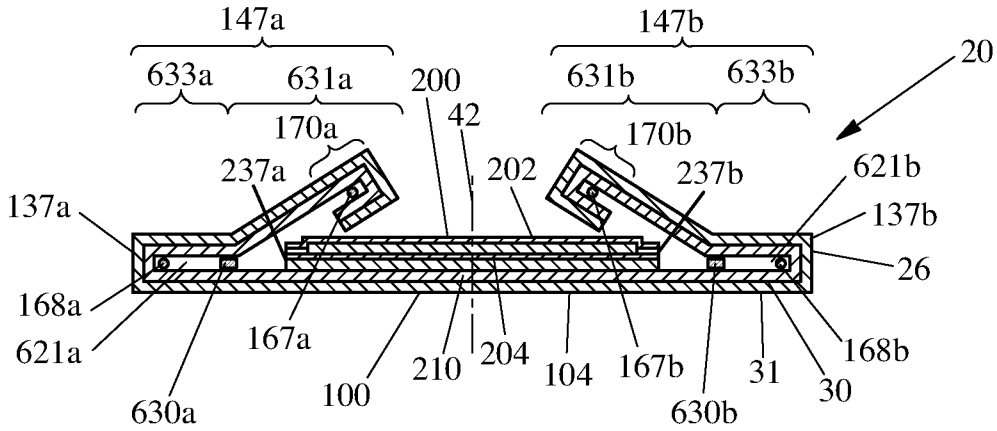



Fig. 18

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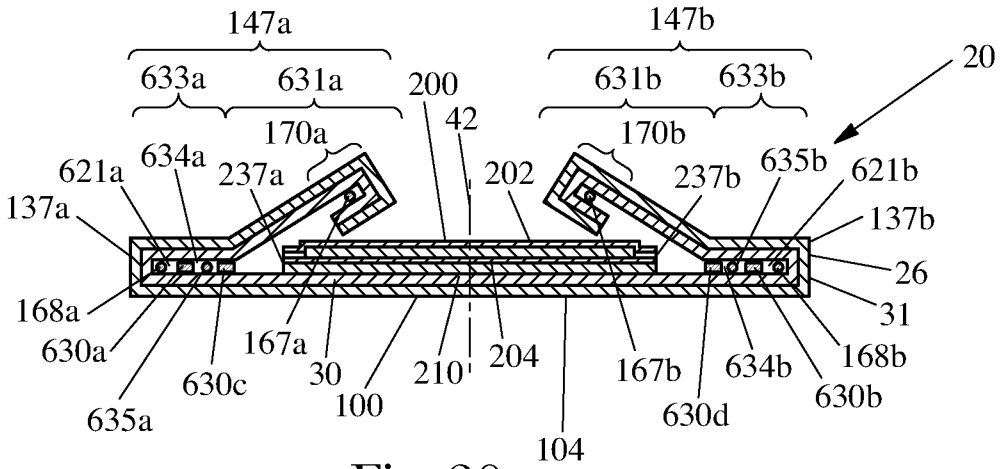


Fig. 20

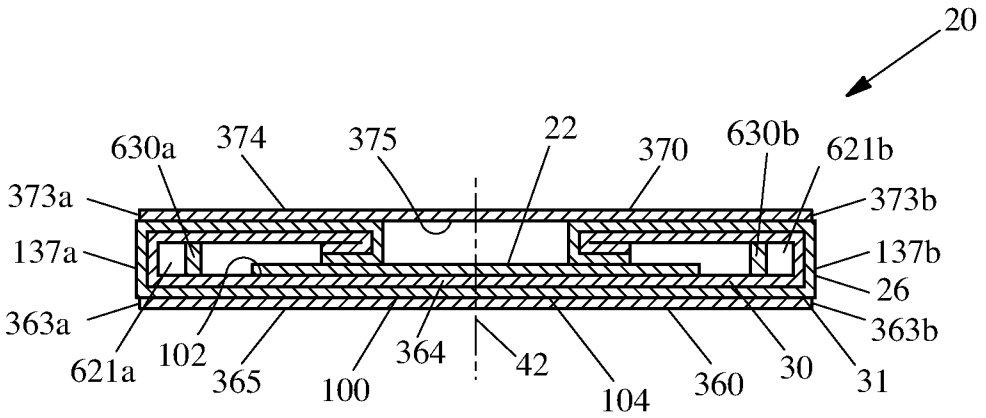
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Fig. 21

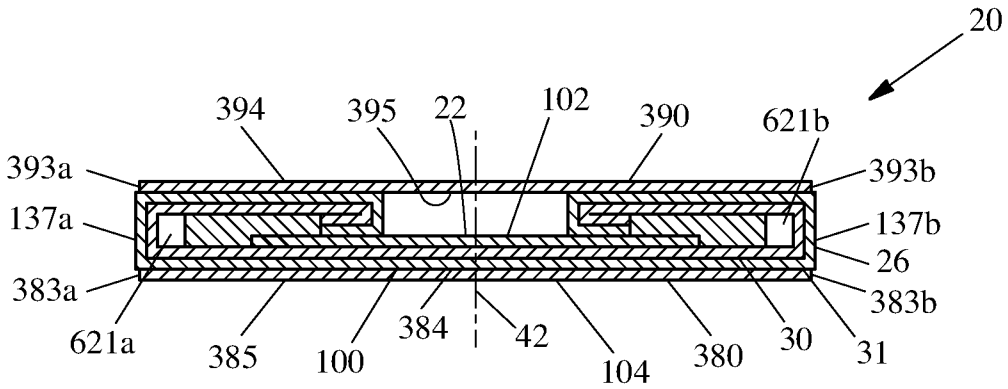
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Fig. 22

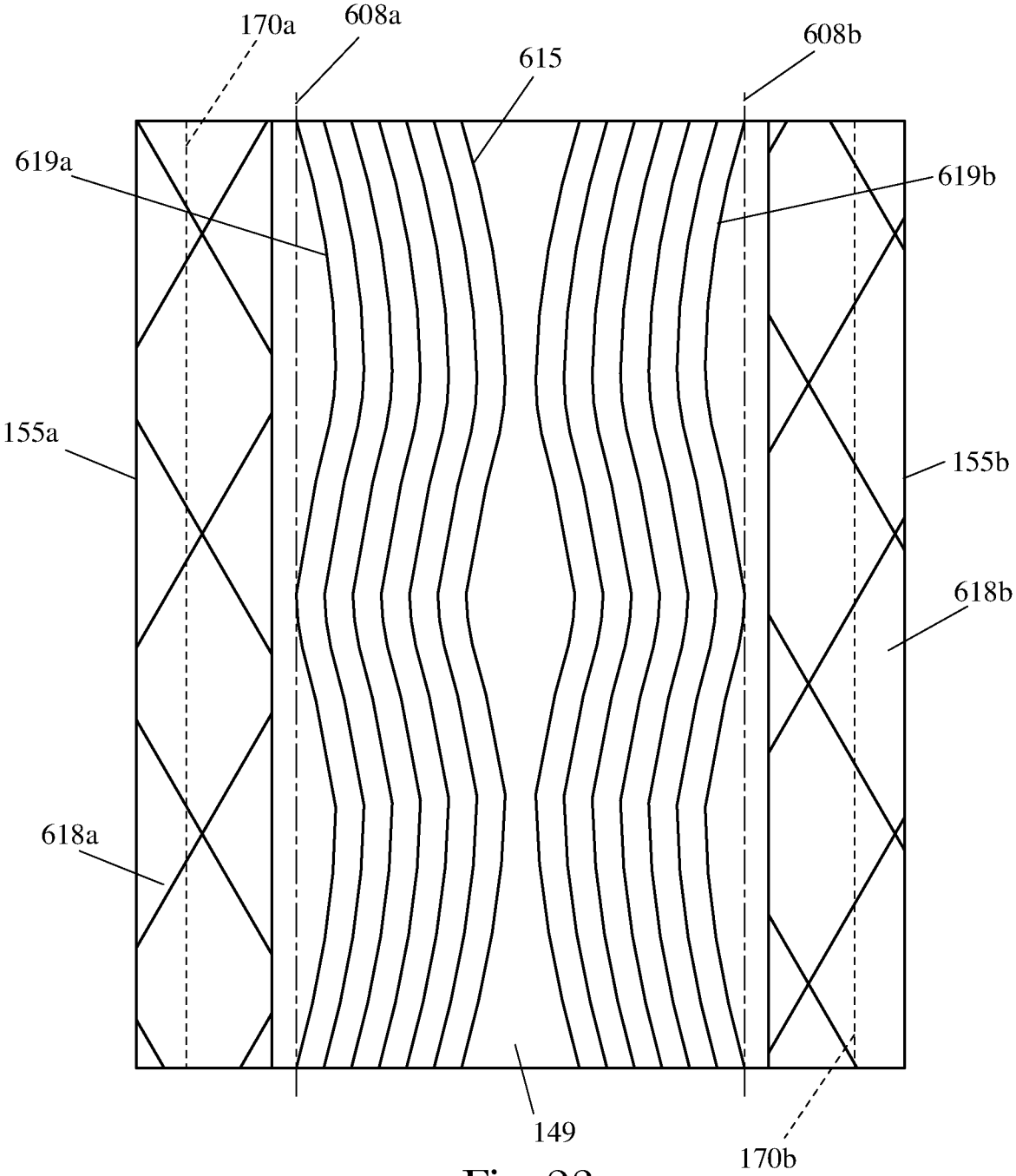
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Fig. 23

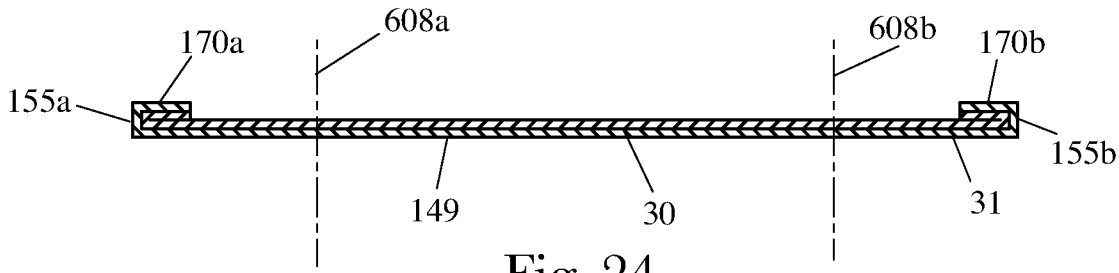
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Fig. 24

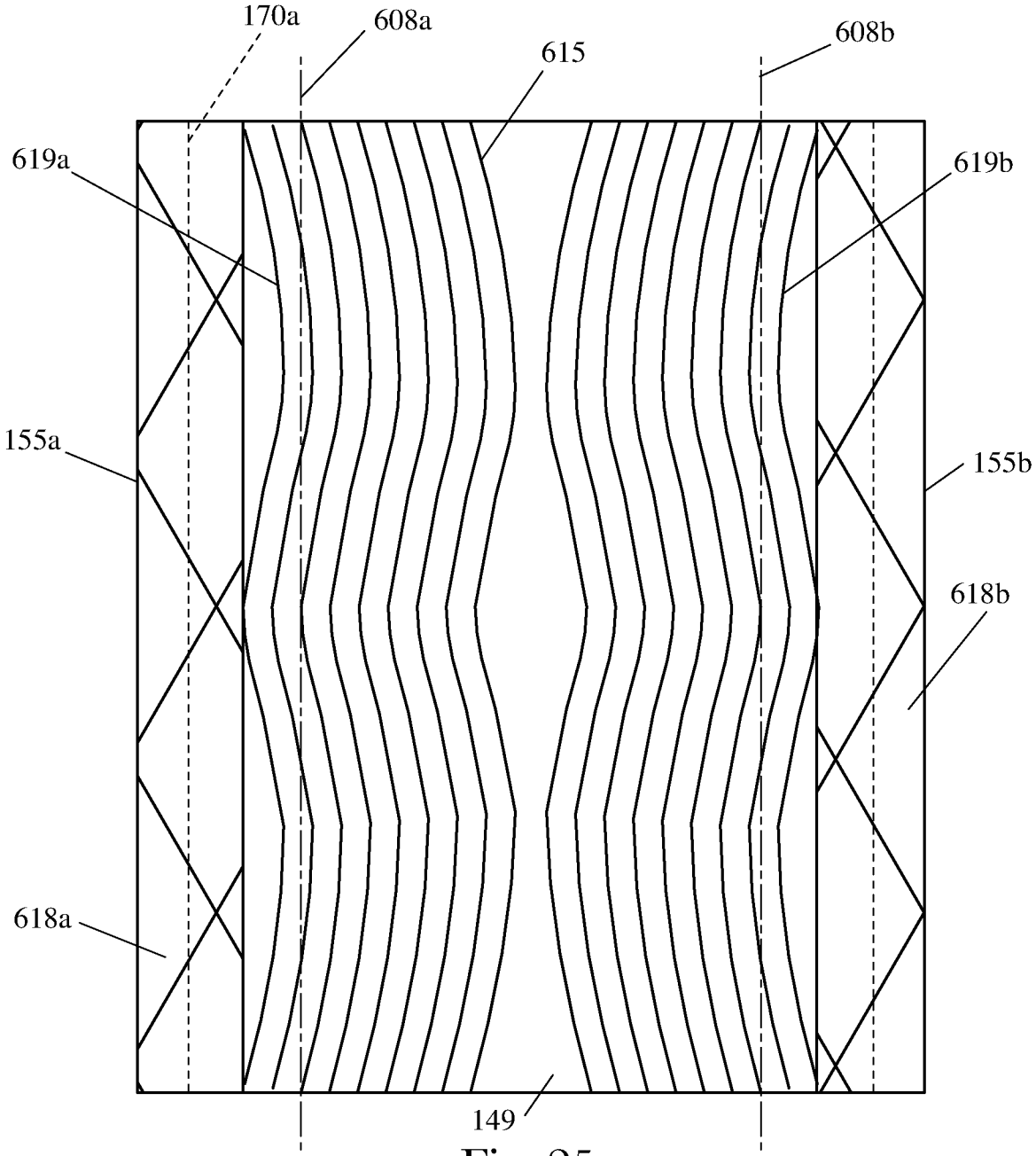
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Fig. 25

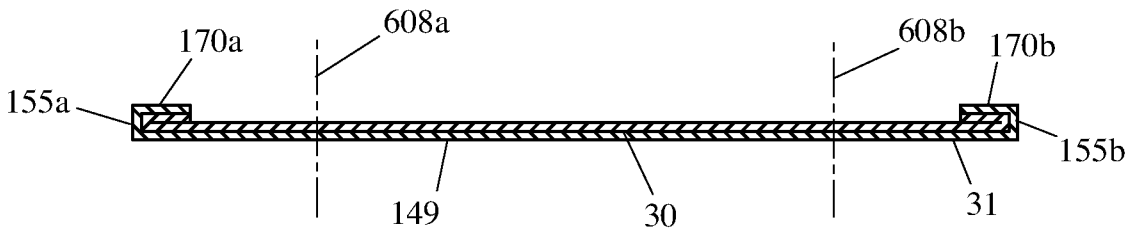
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Fig. 26

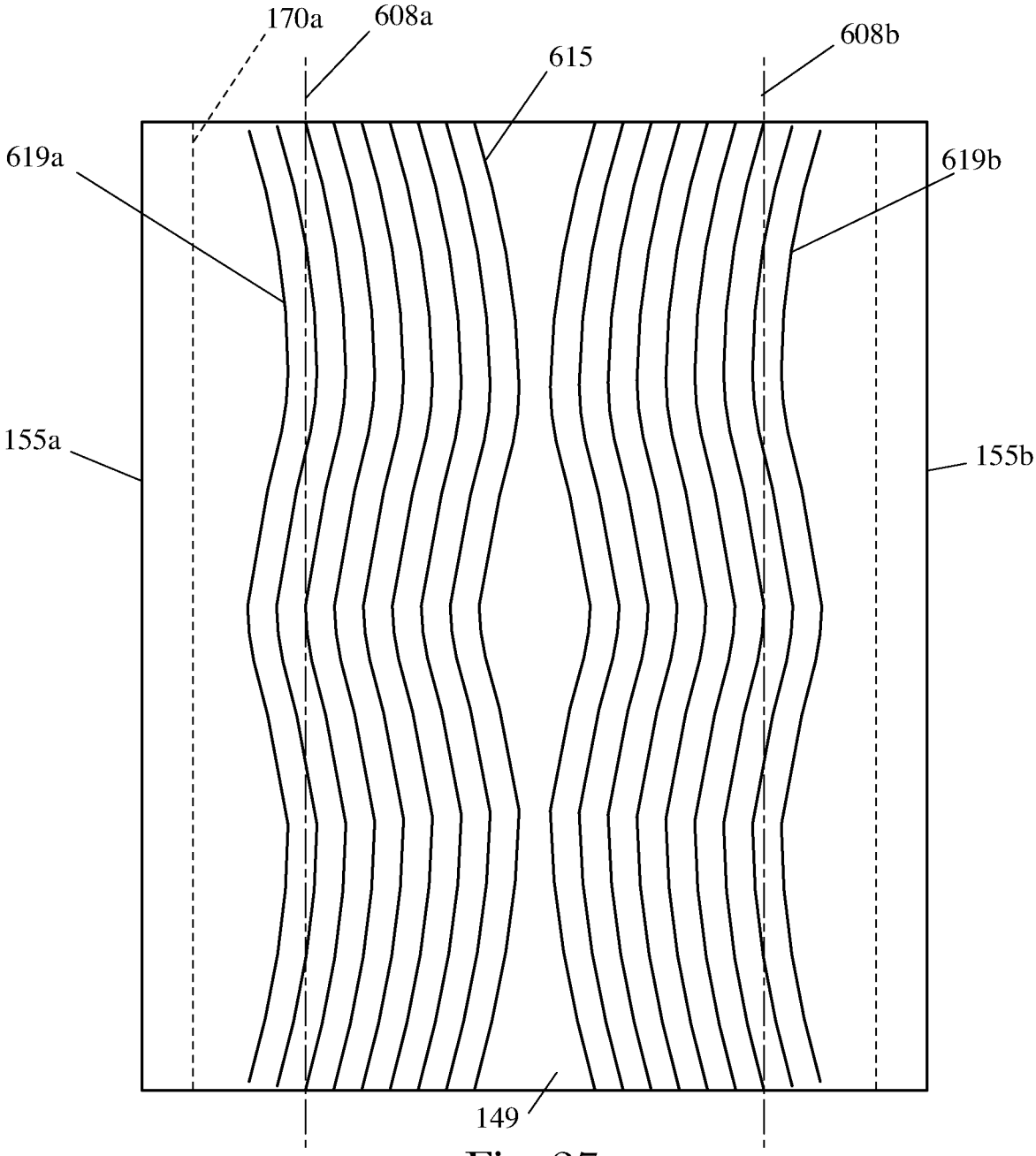
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Fig. 27

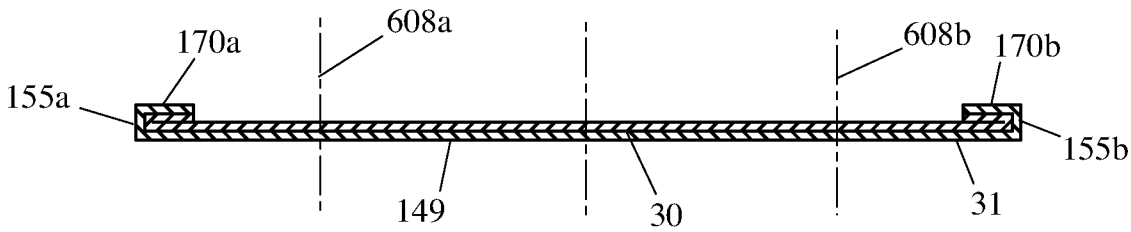
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Fig. 28

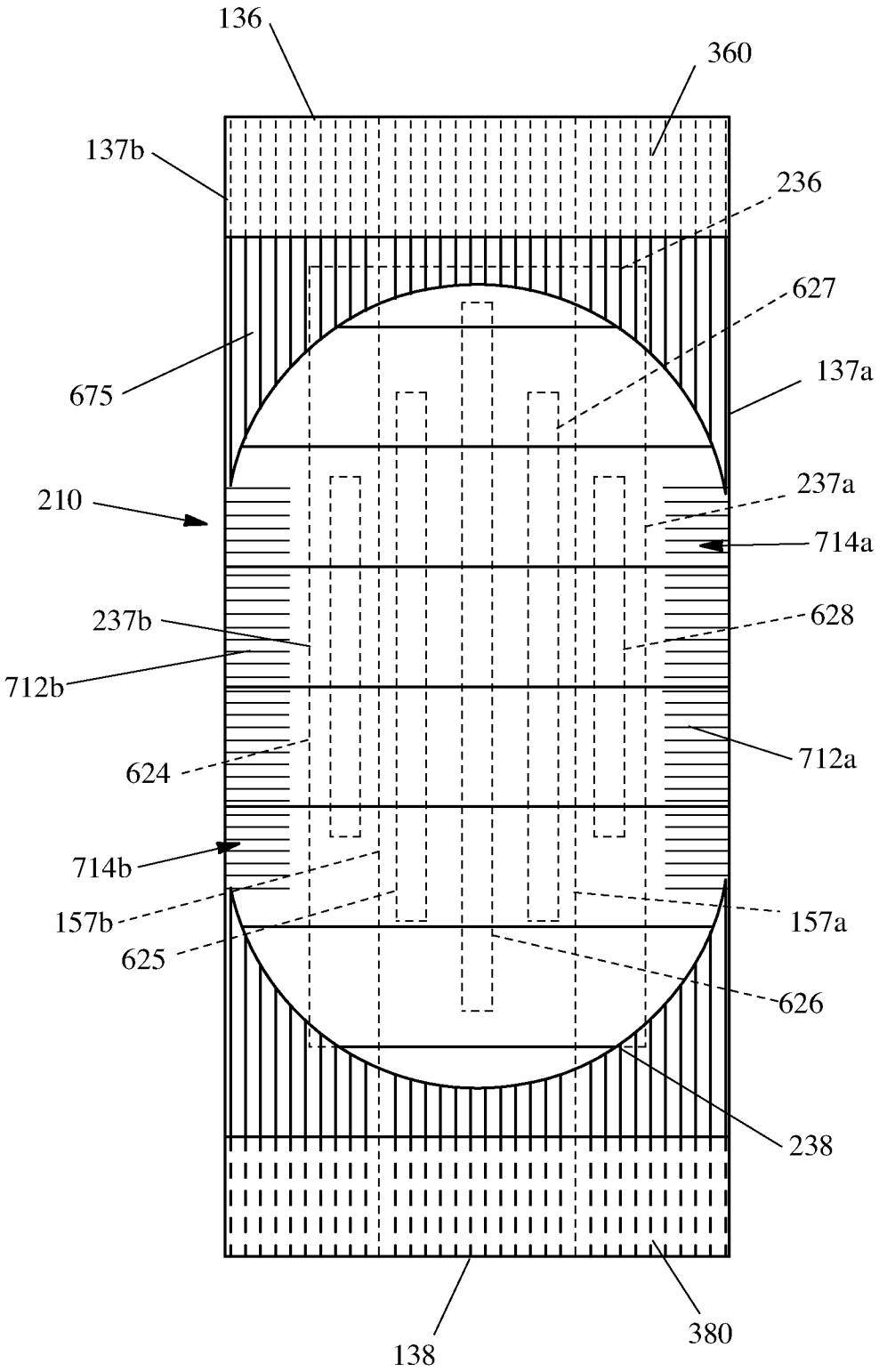
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Fig. 29

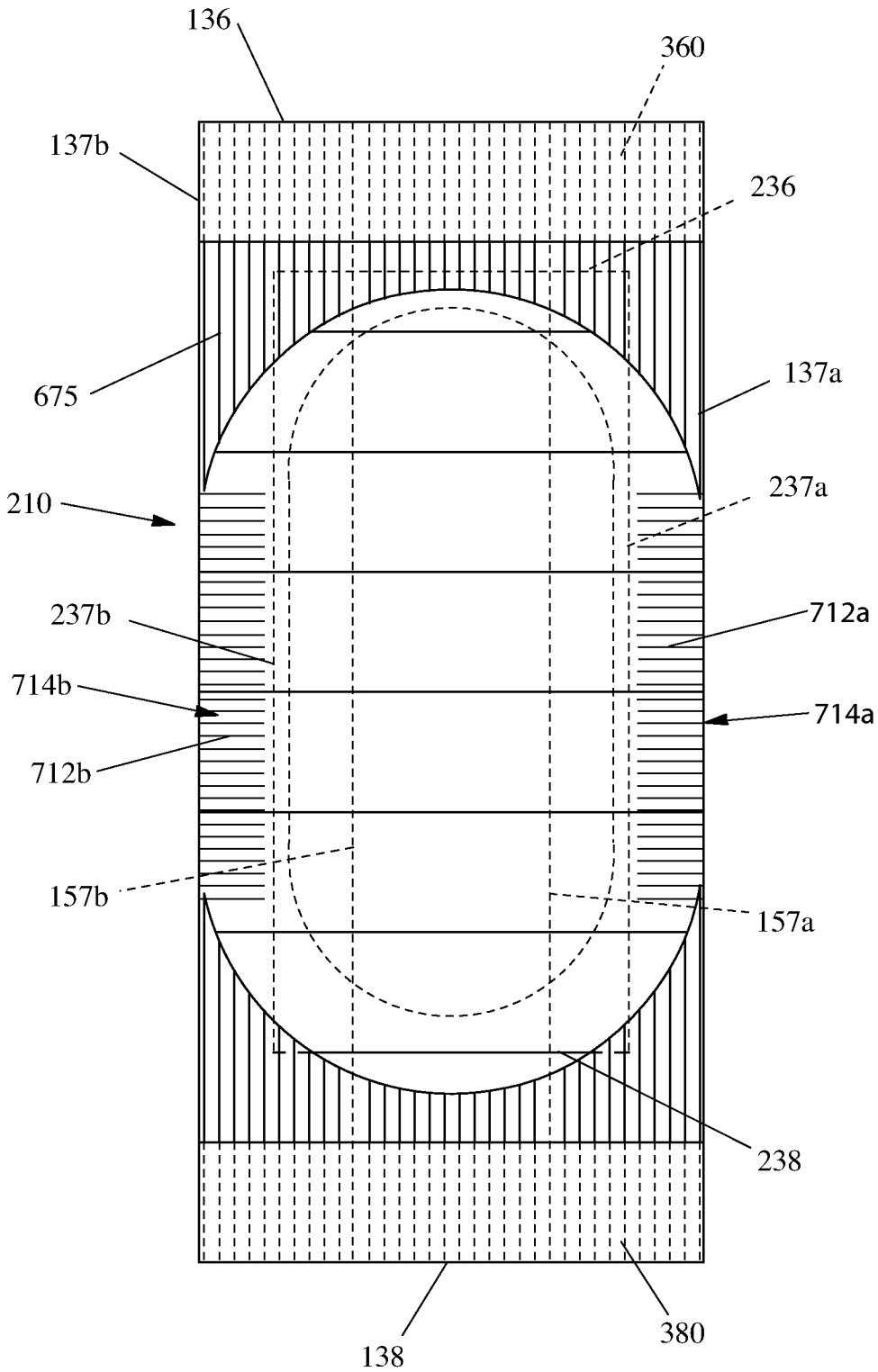
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Fig. 30

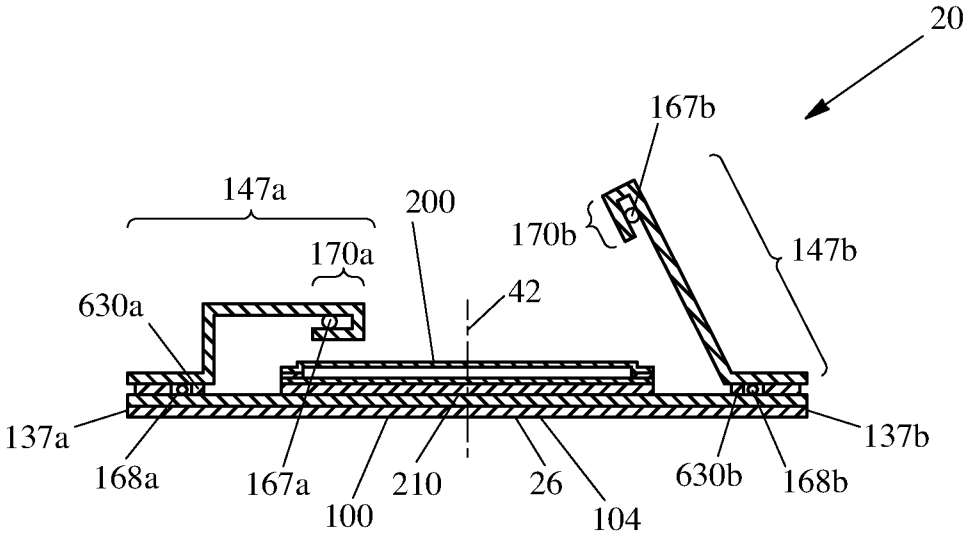
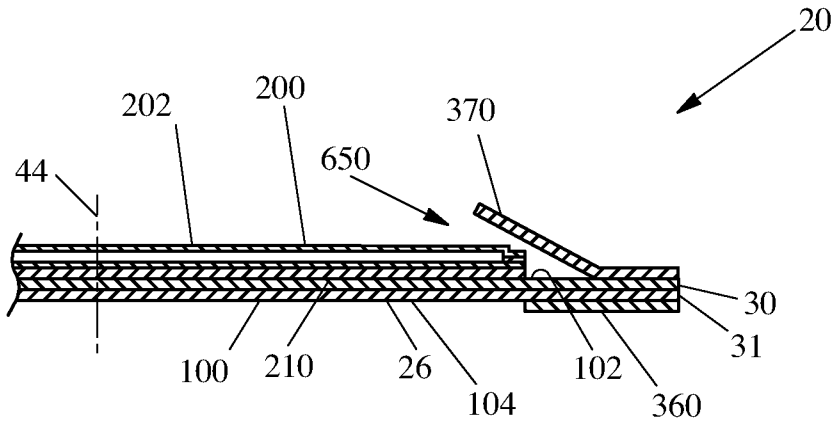



Fig. 31

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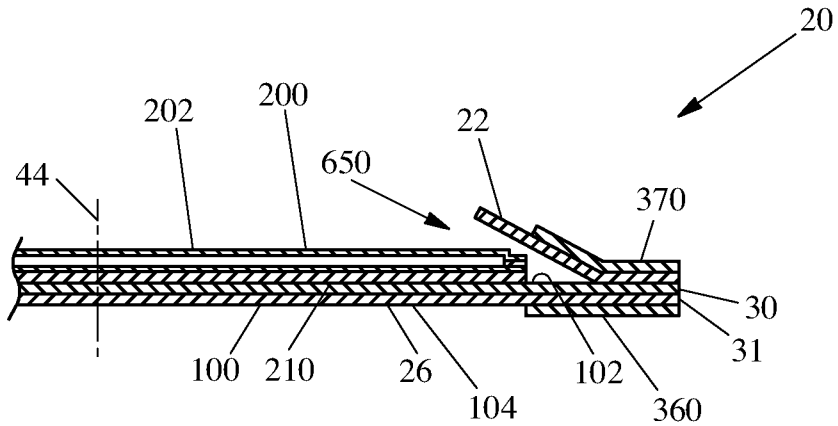


Fig. 33

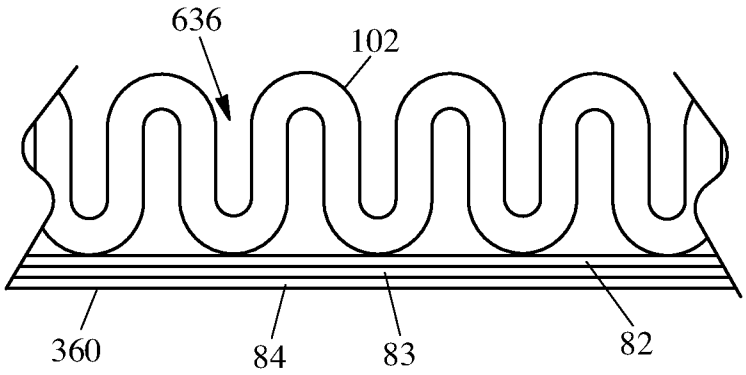


Fig. 34

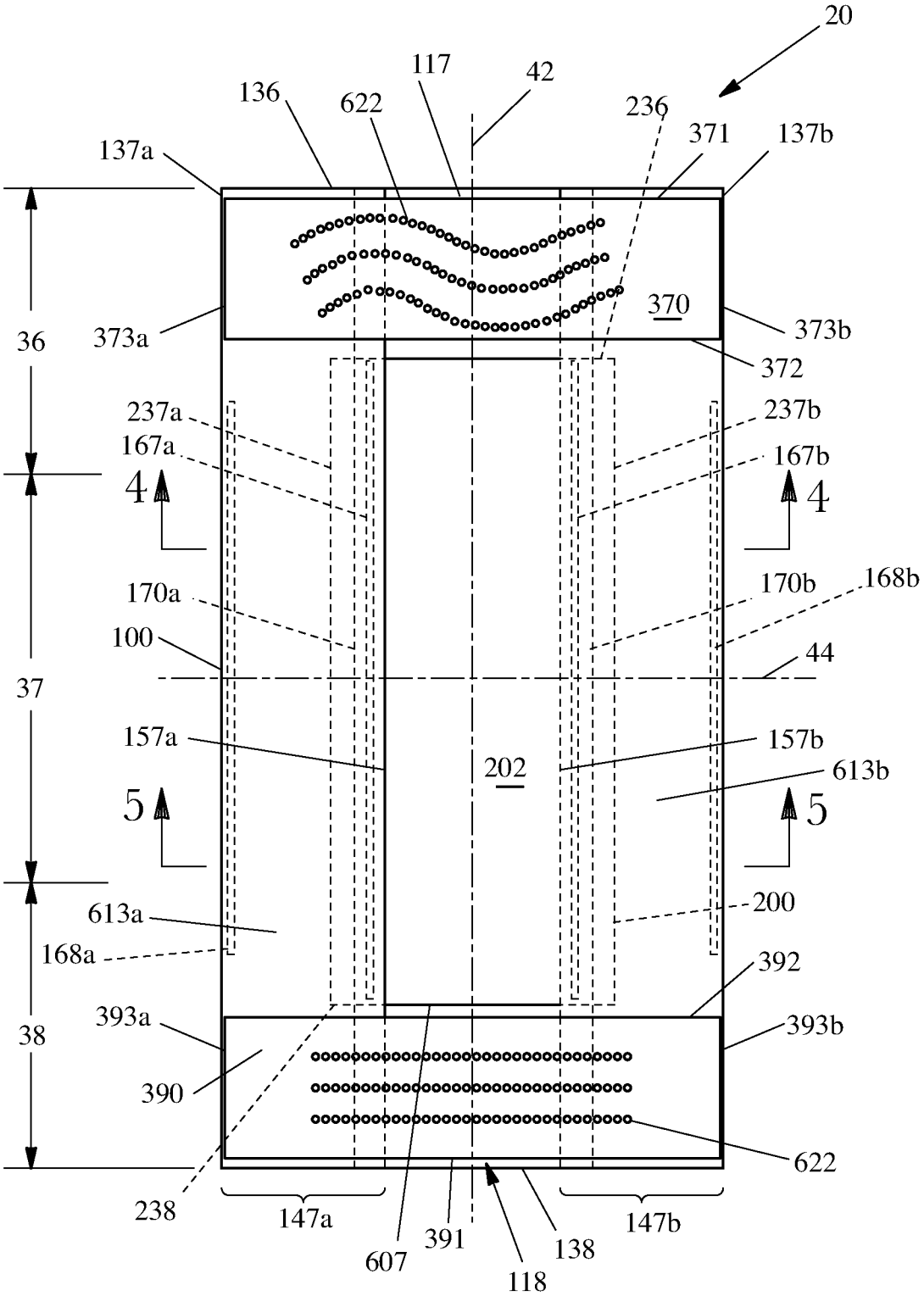
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Fig. 35

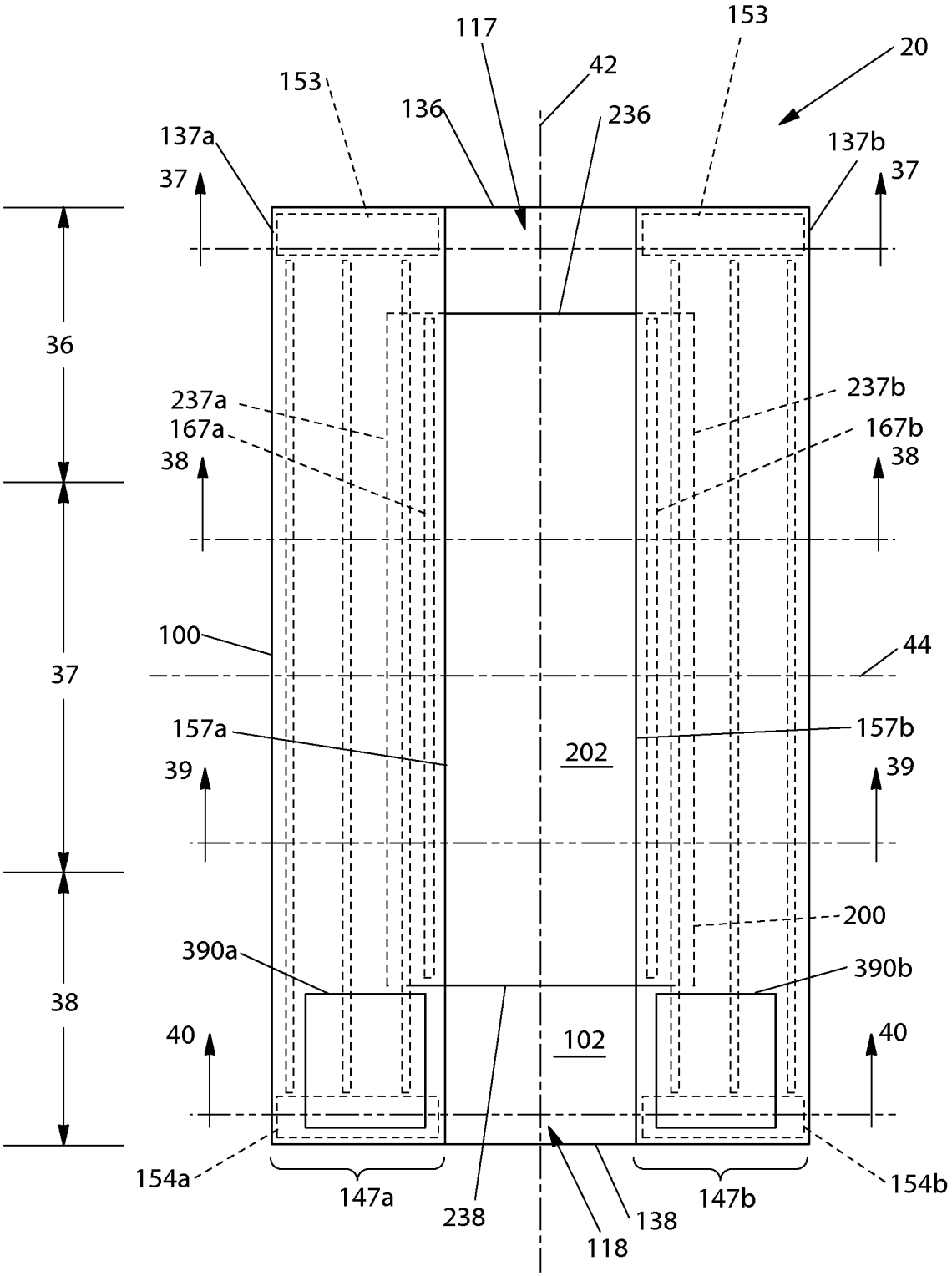
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Fig. 36

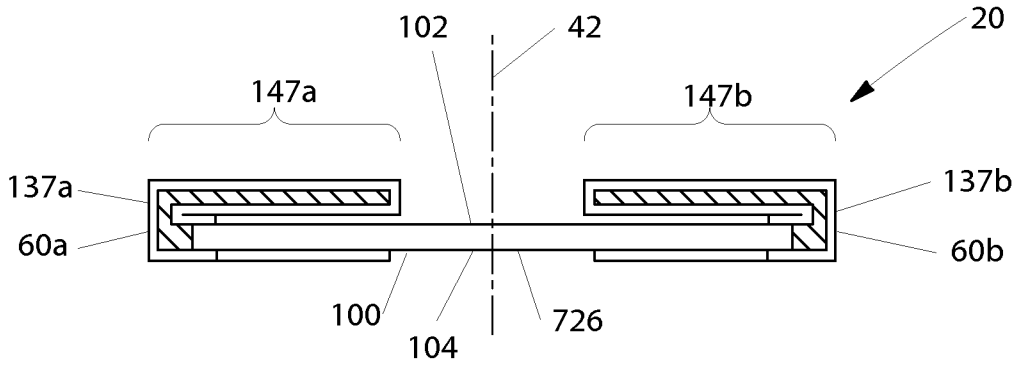


Fig. 37

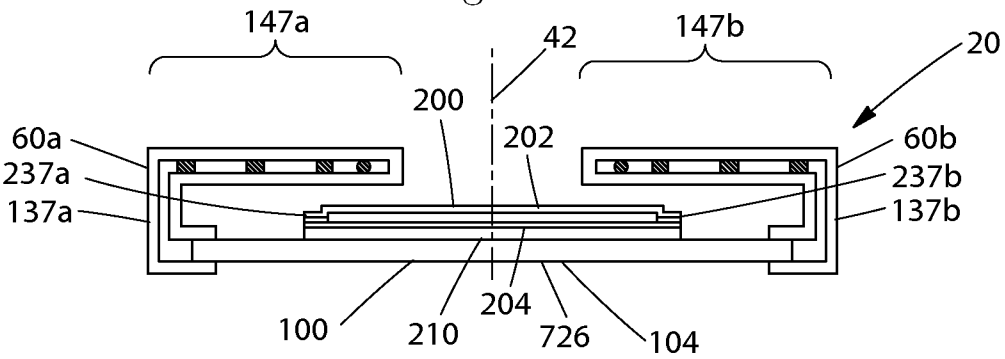


Fig. 38

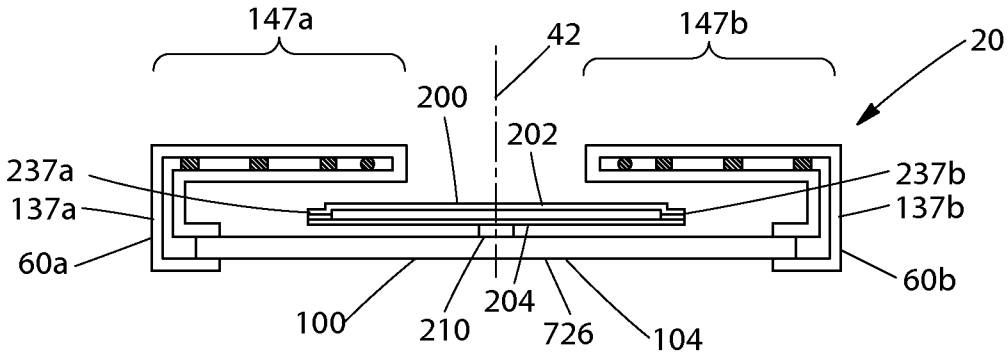


Fig. 39

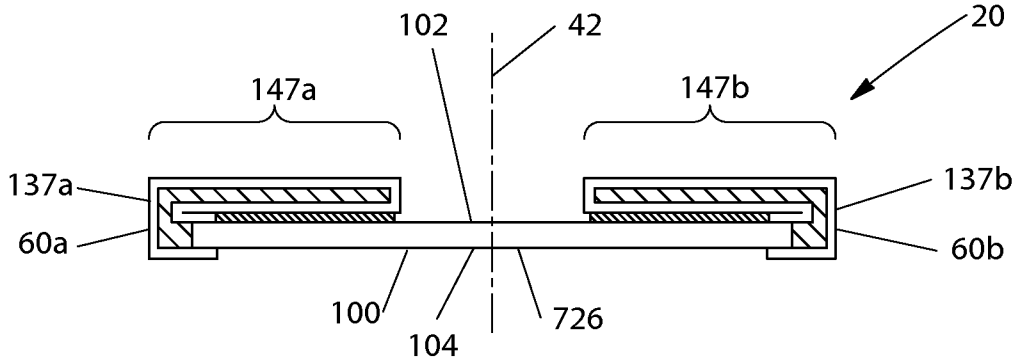


Fig. 40

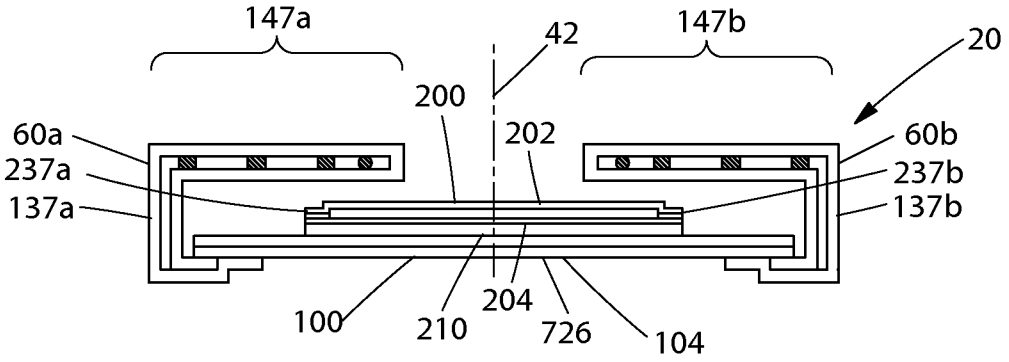


Fig. 41

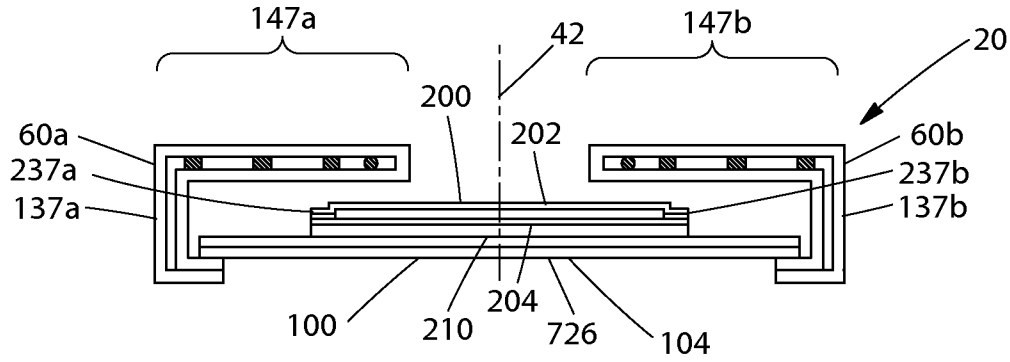


Fig. 42

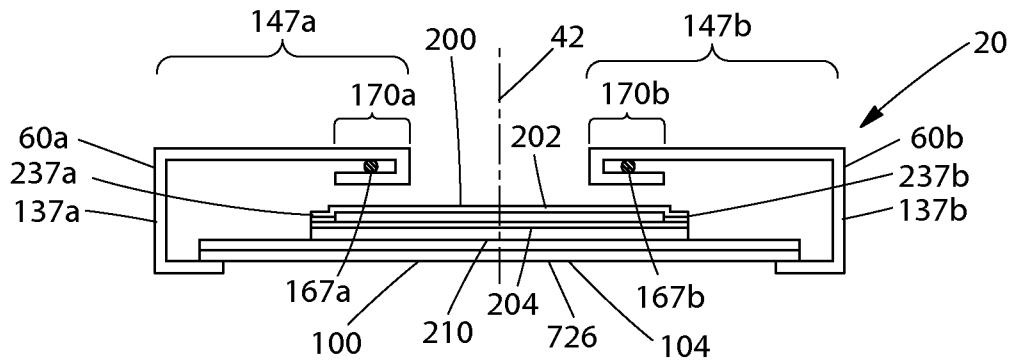


Fig. 43

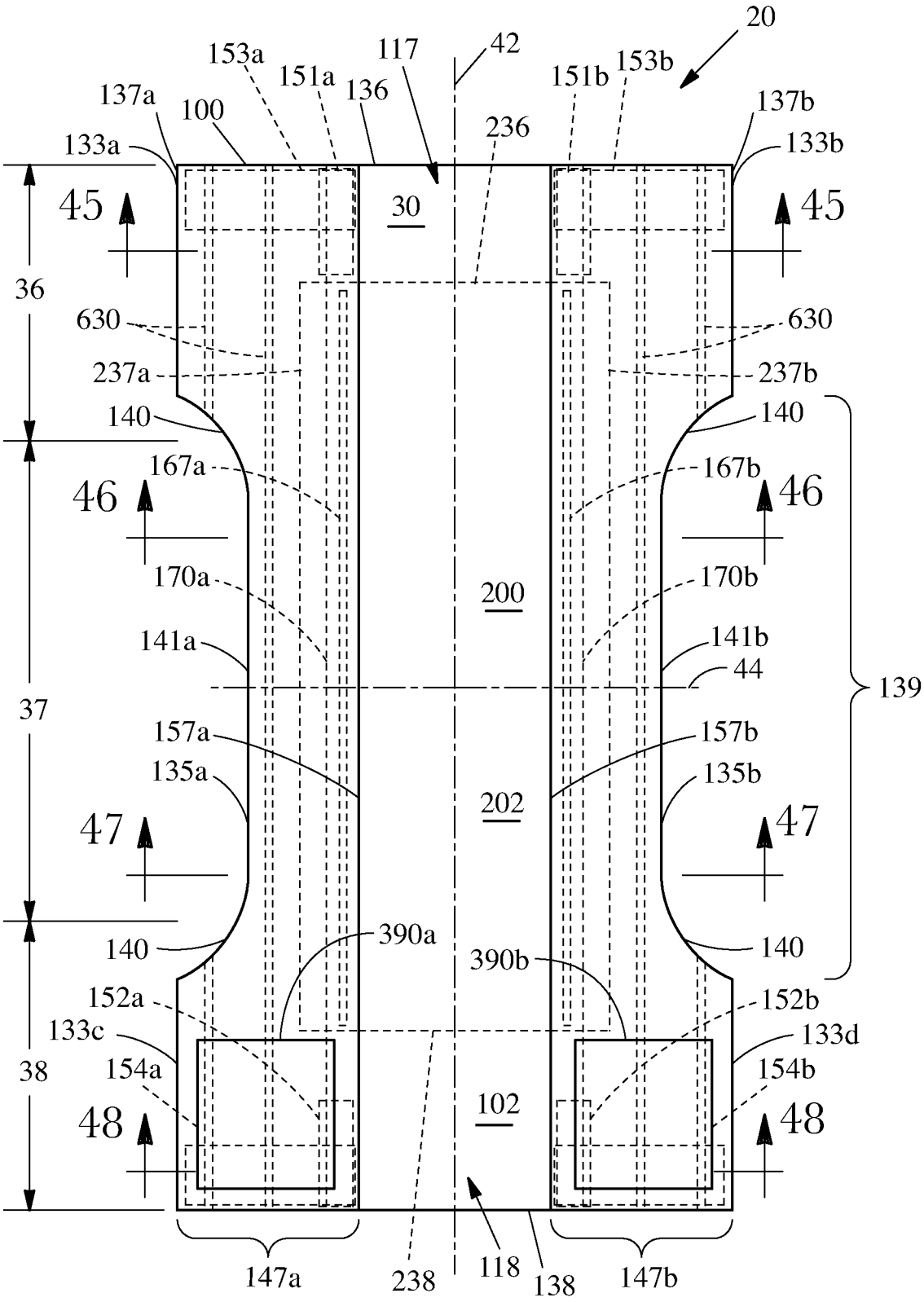
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Fig. 44

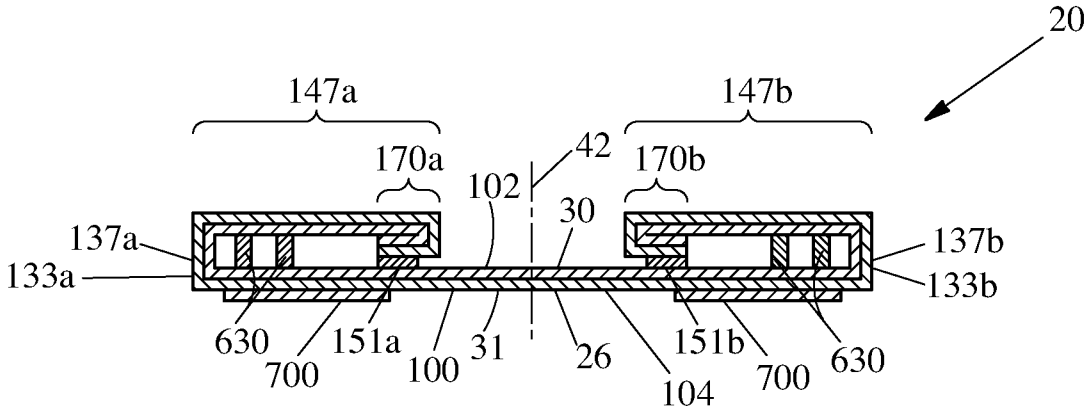


Fig. 45

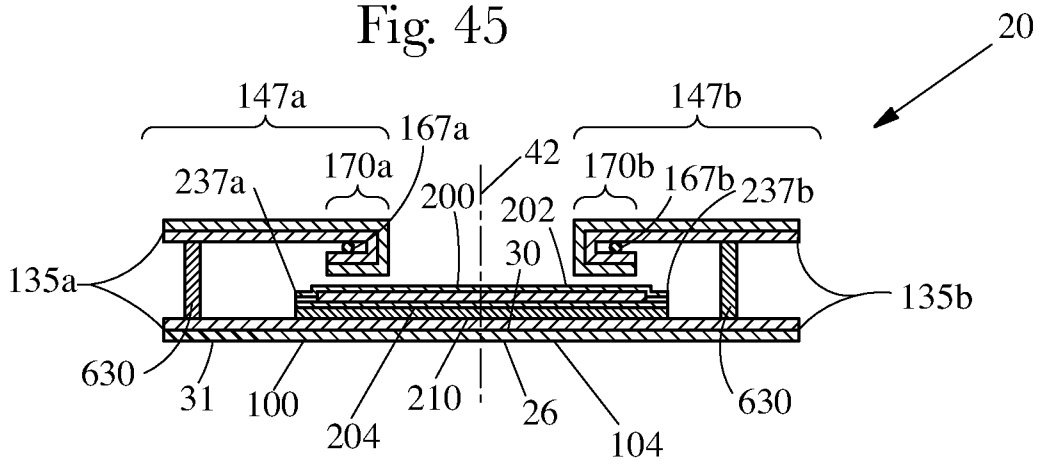


Fig. 46

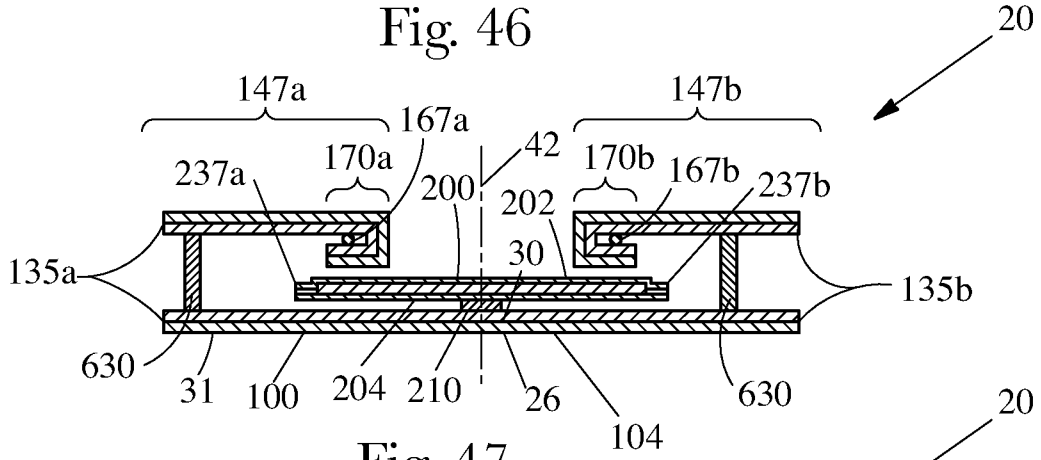


Fig. 47

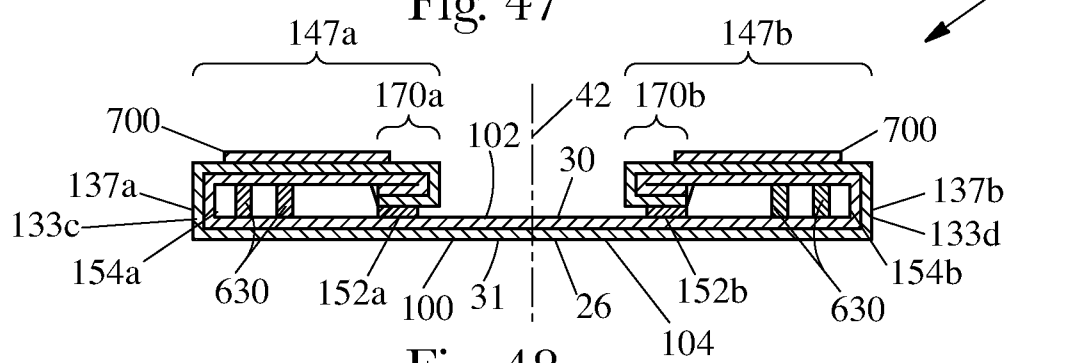


Fig. 48

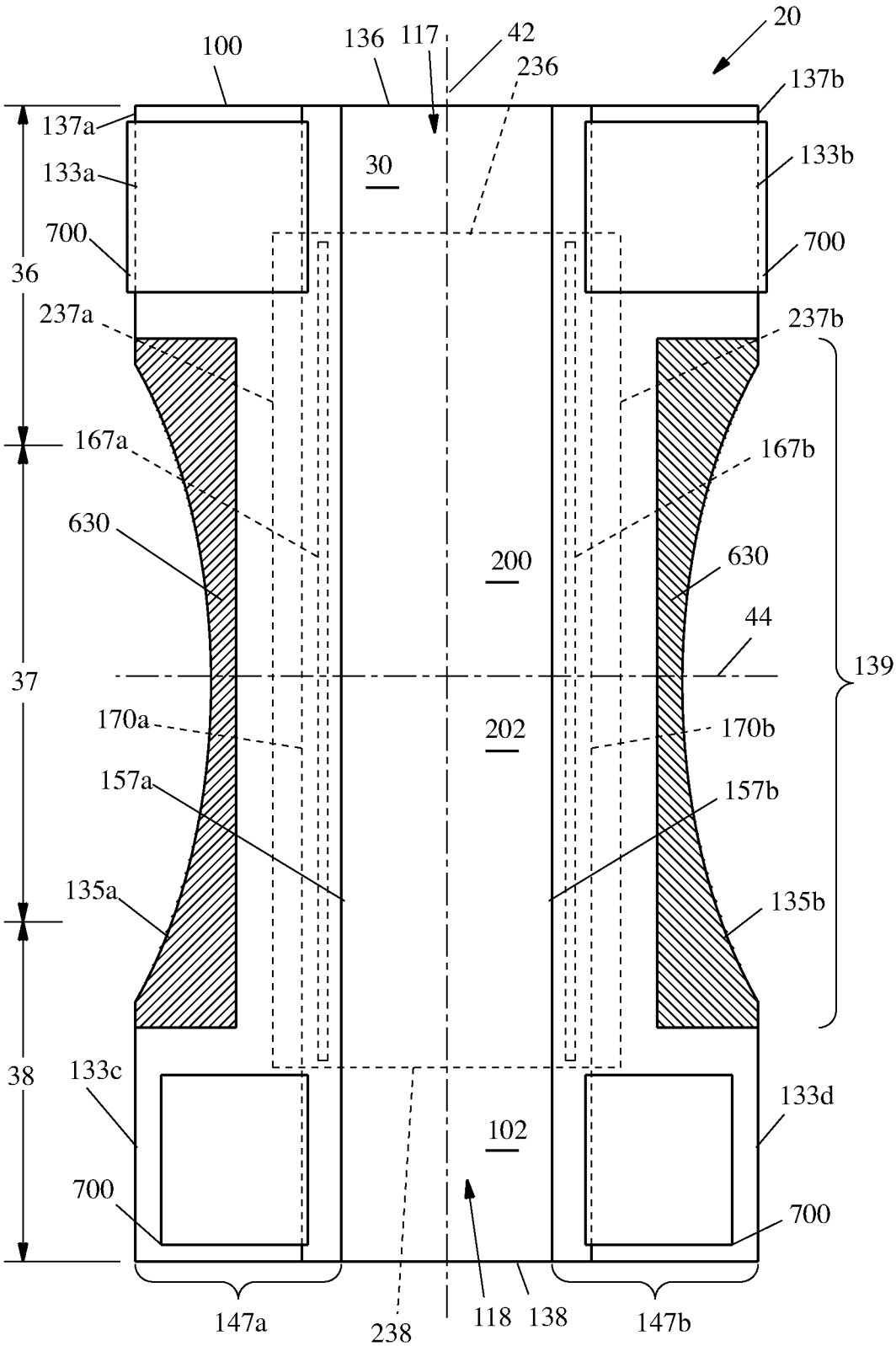
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Fig. 49

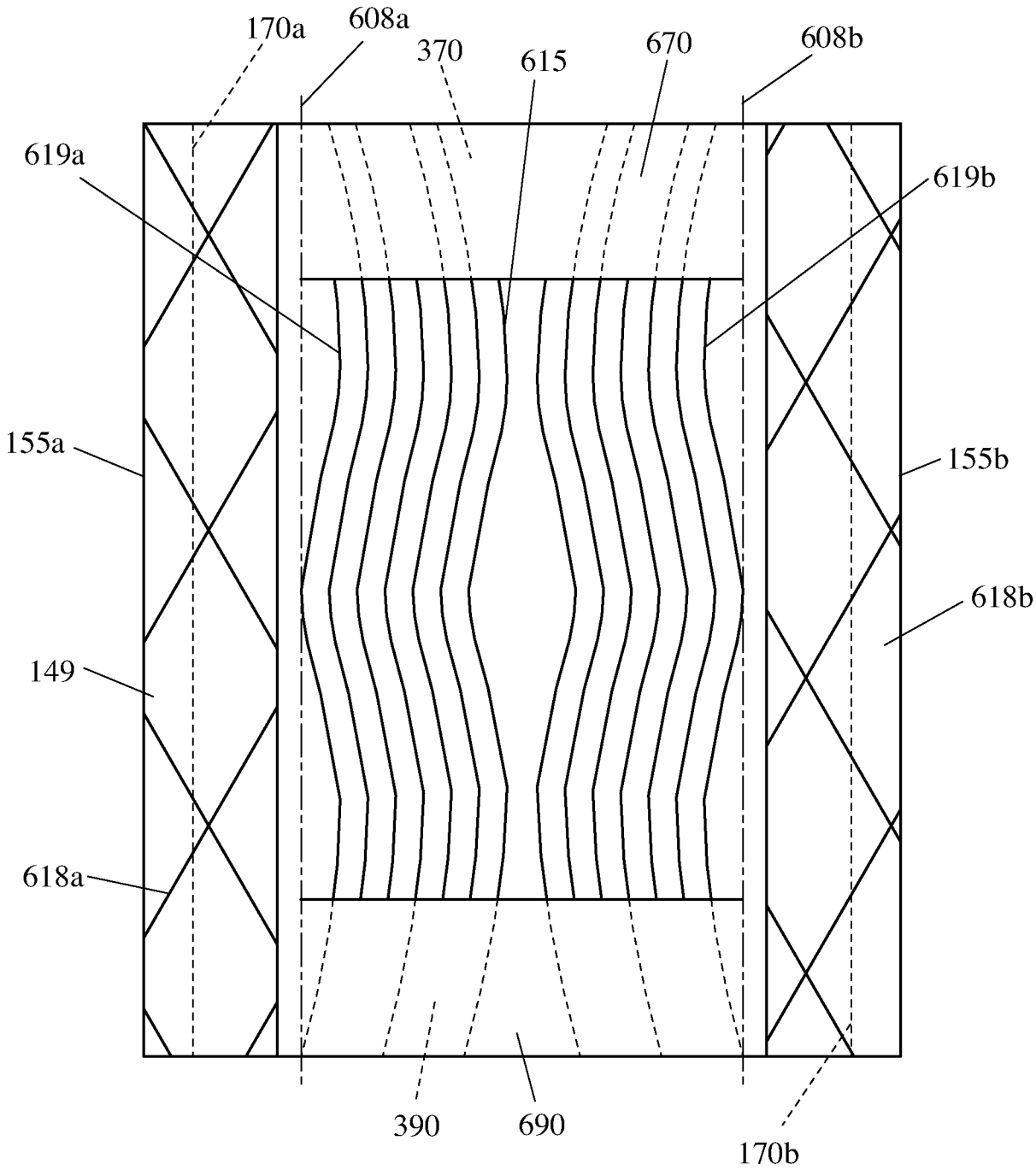
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Fig. 50

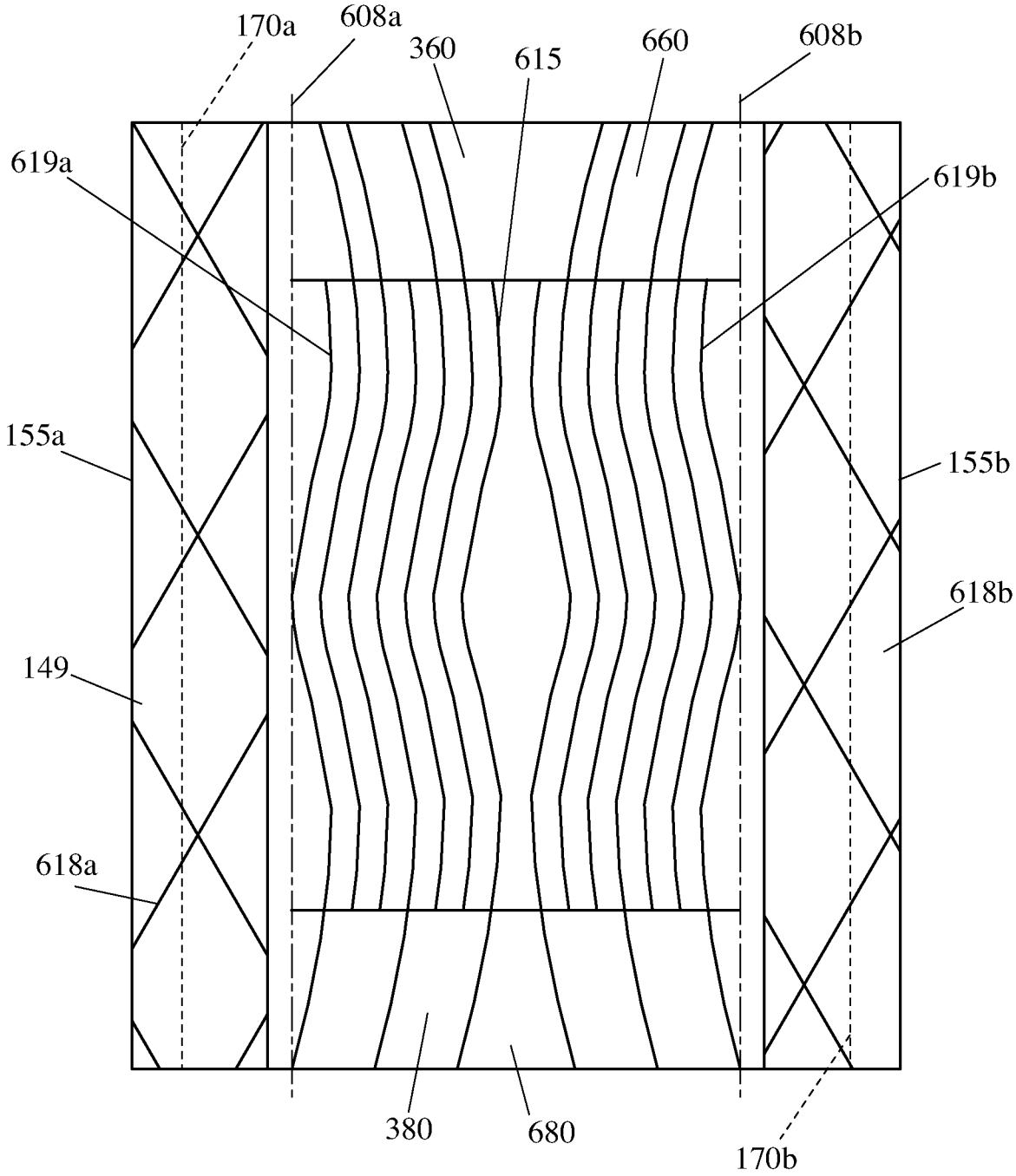
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Fig. 51

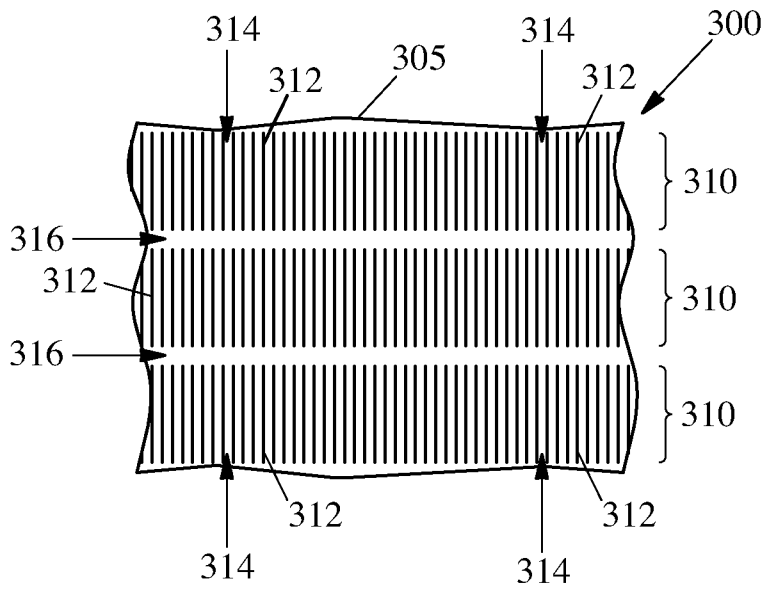


Fig. 52

# INTERNATIONAL SEARCH REPORT

International application No
PCT/US2010/032887

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61F13/15
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 practical, search terms used)
EPO-Internal

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[X] See patent family annex.

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|---|---|
| 5 July 2010 | 20/07/2010 |

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

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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| Y | US 5 545 158 A (JESSUP JAMES L [US])<br>13 August 1996 (1996-08-13)<br>claim 1; figure 2 | 1-10 |
| Y | US 2008/234649 A1 (HAMALL KENNETH MICHAEL [US] ET AL) 25 September 2008 (2008-09-25)<br>paragraph [0068]; figure 10 | 1-10 |

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International application No
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International application No
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