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(54) Title: DISPOSABLE ABSORBENT ARTICLE COMPRISING BELT EARS

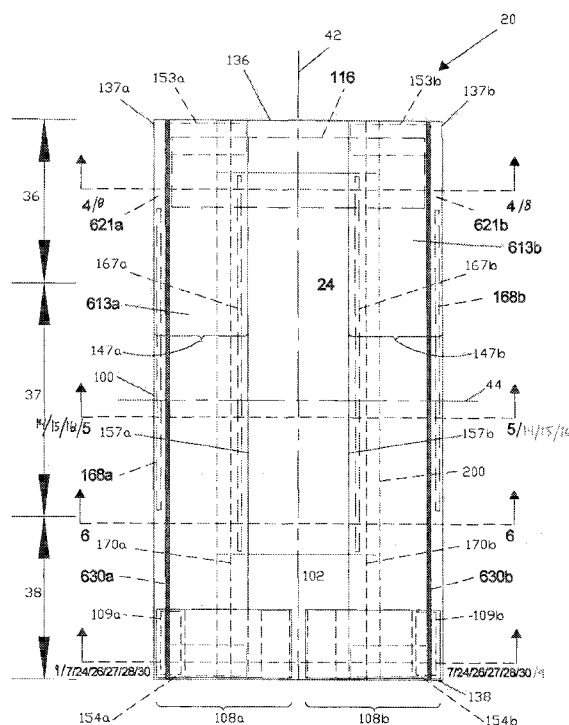


FIG. 1

(57) Abstract: A disposable absorbent article may comprise a web that may be folded over at a first fold line forming a first hem, folded over at a second fold line forming a second hem, and folded over at a third fold line and attached in the front and back waist regions to form a first side flap. The web may be folded over at a fourth fold line and attached in the front and back waist regions to form a second side flap. The absorbent article may also comprise a second elastic gathering member attached at or adjacent the side edge of the absorbent article. Also, the absorbent article may comprise laterally opposing deployable belt ears attached to the web in at least one of the waist regions. Each belt ear may be disposed laterally inward until being deployed laterally outward so as to project laterally outward beyond the respective distal edges of the side flaps.



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DISPOSABLE ABSORBENT ARTICLE COMPRISING BELT EARS

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.

In order to deliver a low cost solution, the absorbent article must be material efficient and the process to make it must be as low cost as possible. In order to deliver a low cost solution, the articles of the present invention utilize a web comprising a continuous layer. The web is then manipulated by folding to deliver a "one piece" integrated chassis. This construction is significantly cheaper and simpler than introducing multiple webs of material and then combining those webs together by adhesives and other means. The single continuous web utilized in the absorbent articles of the present invention described herein form the chassis comprising hems for the inner elastics, the hems for the outer elastics, the side flaps (each comprising the cuff flap and side barrier) and the backsheet in one unitary structure. The low cost solution leverages not only simplicity of design and material efficiency but includes activation to deliver customizeable fit. The activation of the chassis web renders portions of a simple low cost plastic film extensible and somewhat elastic. This extensibility allows for increased flexibility with regard to fit and sizing, as well as delivers significant wearer comfort.

SUMMARY OF THE INVENTION

A disposable absorbent article may comprise a front waist region, a back waist region, a crotch region between the waist regions, a front waist end edge, and a back waist end edge. Further, a longitudinal axis may extend from a midpoint of the front waist end edge through the

crotch region to a midpoint of the longitudinally opposed back waist end edge. The absorbent article may also comprise a web comprising an interior surface and an exterior surface. The article may further comprise an absorbent assembly comprising an interior surface and an exterior surface

The web may be folded over at a first fold line forming a first hem, folded over at a second fold line forming a second hem, and folded over at a third fold line and attached in the front and back waist regions to form a first side flap. The third fold line may form a first side edge of the absorbent article. The web may be folded over at a fourth fold line and attached in the front and back waist regions to form a second side flap. The fourth fold line may form a second side edge of the absorbent article.

The first side flap may comprise the first hem and the second side flap may comprise the second hem. Each of the first and second hems may comprise a longitudinally extending gathering member. The first fold line may form a proximal edge of the first side flap and the second fold line may form a proximal edge of the second side flap. The first and second proximal edges may be disposed laterally inward of the first and second side edges.

The first and second proximal edges of the first and second side flaps may be disposed between the longitudinal centerline and the first and second side edges, respectively.

The absorbent article may also comprise a second elastic gathering member attached at or adjacent the side edge of the absorbent article. Also, the absorbent article may comprise laterally opposing deployable belt ears attached to the web in at least one of the waist regions. Each belt ear may be disposed laterally inward until being deployed laterally outward so as to project laterally outward beyond the respective distal edges of the side flaps.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawing figures, like reference numerals identify structurally corresponding 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**.

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 this figure, the interior portion of the diaper **20** that faces inwardly toward the wearer and contacts the wearer is shown facing the viewer.

Figure 2 is a plan view of the diaper **20** of **Figure 1** with the laterally opposing belt ears **108** extending laterally outward. In this figure, the interior portion of the diaper **20** is shown facing the viewer.

Figure 3 is a plan view of the diaper **20** of **Figure 1** with the exterior portion of the diaper **20** shown facing the viewer.

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 section view of the diaper **20** of **Figure 1** taken at the section line 7-7.

Figure 8 is a section view of an alternative embodiment of the diaper **20** of **Figure 1** taken at the section line 8-8.

Figure 9 is a section view of an alternative embodiment of the diaper **20** of **Figures 1** taken at the section line 9-9.

Figure 10 is a section view of an alternative embodiment of the diaper **20** of **Figures 2** taken at the section line 10-10 illustrating attached side flaps **147**

Figure 11 is a section view of the diaper **20** of **Figures 2** taken at the section line 11-11.

Figure 12 is a section view of the diaper **20** of **Figure 2** taken at a section line similar to 12-12.

Figure 13 is a perspective view of the diaper **20** of **Figure 1**.

Figure 14 is a section view of an alternative embodiment of the side flaps **147** of **Figure 1** taken at the section line 14-14.

Figure 15 is a section view of an alternative embodiment of the side flaps **147** of **Figure 1** taken at the section line 15-15.

Figure 16 is a section view of an alternative embodiment of the side flaps **147** of **Figure 1** taken at the section line 16-16.

Figure 17 is a plan view of an alternative embodiment of the belt ears **108** of **Figure 1**.

Figure 18 is a section view of the diaper **20** of **Figure 17** taken at the section line 18-18.

Figure 19 is the section view of the diaper **20** of **Figure 18** wherein the belt ears **108** are deployed laterally outward.

Figure 20 is a section view of an alternative embodiment of the belt ears **108** of **Figure 17** taken at the section line **20-20**.

Figure 21 is a section view of an alternative embodiment of the belt ears **108** of **Figure 17** taken at the section line **21-21**.

Figure 22 is a plan view of exemplary belt ears **108** created from a single web via a nested cut line **92**.

Figure 23 is a plan view of an alternative embodiment of the belt ears **108** of **Figure 2** comprising nested belt ears **108**.

Figure 24 is a section view of an alternative embodiment of the belt ears **108** of **Figure 1** taken at the section line **24-24**.

Figure 25 is the section view of **Figure 24** wherein the belt ears **108** are deployed laterally outward.

Figure 26 is a section view of an alternative embodiment of the belt ears **108** of **Figure 1** taken at the section line **26-26**.

Figure 27 is a section view of an alternative embodiment of the belt ears **108** of **Figure 1** taken at the section line **27-27**.

Figure 28 is a section view of an alternative embodiment of the belt ears **108** of **Figure 1** taken at the section line **28-28**.

Figure 29 is the section view of the diaper **20** of **Figure 28** wherein the belt ears **108** are deployed laterally outward.

Figure 30 is a section view of an alternative embodiment of the belt ears **108** of **Figure 1** taken at the section line **30-30**.

Figure 31 is the section view of the diaper **20** of **Figure 30** wherein the belt ears **108** are deployed laterally outward.

Figure 32 is a partial section view of an alternative embodiment of the belt ear **108** of **Figure 26** illustrating a peel bond, wherein the belt ear is multi-layered.

Figure 33 is a partial section view of an alternative embodiment of the belt ear **108** of **Figure 27** illustrating a shear bond, wherein the belt ear is multi-layered.

Figure 34 is a plan view of an alternative embodiment of exemplary backsheet **26**, 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 34**, the exterior of the diaper is shown facing the viewer.

Figure 35 is a cross section view of the diaper **20** of **Figure 34**.

Figure 36 is a plan view of an alternative embodiment of the backsheet **26** of **Figure 34**.

Figure 37 is a cross section view of the backsheet **26** of **Figure 36**.

Figure 38 is a plan view of an alternative embodiment of the backsheet **26** of **Figure 34**.

Figure 39 is a cross section view of the backsheet **26** of **Figure 38**.

Figure 40 is a plan view of an exemplary absorbent assembly **200** with the interior portion of the absorbent assembly **200** shown facing the viewer.

Figure 41 is a section view of the absorbent assembly of **Figure 40** taken at the section line **41-41**.

Figure 42 is a view of the absorbent assembly of **Figure 40** taken at the section line **42-42**.

Figure 43 is a section view of an alternative embodiment of the absorbent assembly **200** of **Figure 40**.

Figure 44 is a section view of an exemplary storage component **272**.

Figure 45 is a section view of an alternative embodiment of the storage component **272** of **Figure 16**.

Figure 46 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 a 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 so as to encircle the waist and the legs of the wearer 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 may be pre-closed to form 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 “deploy” in all its forms refers to the manipulation of any disclosed deployable structural element from its initial configuration to a configuration in which it can be used for its intended purpose in the article on which it is provided.

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 “diagonal” refers to an orientation of a line extending obliquely relative to the longitudinal and lateral directions, i.e., neither perpendicular nor parallel to either of the longitudinal or lateral directions.

The term “circumferential” refers to a direction generally encircling the waist of the wearer parallel to the lateral direction. This term is used particularly when describing the elements that extend around and form the margin of the waist opening.

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 fastening, adhering, bonding, *etc.* by any method suitable for the elements being attached together and their constituent materials. Many suitable methods for attaching elements together are well-known, including adhesives, pressure bonding, thermal bonding, mechanical bonding, mechanical fastening, *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.

The term “laminated” refers to elements being attached together in a layered arrangement.

The term “cohesive” refers to the property of a material that, once set, sticks to itself but does not to any significant degree stick to other materials.

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 comprise man-made synthetics.

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

As shown in **Figures 1, 2 and 3**, 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**, and an intermediate portion may be configured as a crotch region **37**.

The basic structure of the diaper **20** includes a chassis **100**, which has a laterally extending front waist edge **136**, a longitudinally opposing back waist edge **138**, laterally opposing side edges **137**, an interior surface **102**, and an exterior surface **104**. A longitudinal axis **42** extends through the midpoints of the front waist edge **136** and the back waist edge **138** and a lateral axis **44** extends through the midpoints of the side edges **137**. The exemplary chassis **100** shown in **Figure 1** additionally has longitudinally extending and laterally opposing side flaps **147** as well as laterally opposing belt ears **108**, which 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.

The basic structure of the diaper **20** also includes an absorbent assembly **200** that may be attached to the interior surface of the chassis **100**. The absorbent assembly **200** absorbs and retains liquid bodily waste materials. The absorbent assembly **200** has a laterally extending front edge **236**, a longitudinally opposing back edge **238**, laterally opposing side edges **237**, an interior surface **202**, and an exterior surface **204**. The absorbent assembly **200** may be disposed either symmetrically or 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 offset toward the front waist region **36** with respect to the lateral axis **44**.

The edges of the absorbent assembly **200** may lie inward of the respective edges of the chassis **100**, as in the exemplary diaper **20** shown in **Figure 1**. Such a configuration in which one or more of the edges of the absorbent assembly **200** lies inward of the corresponding edges of the chassis **100** may be desirable, for example, in order to allow the relatively more flexible layer or layers adjacent to the edges of the chassis to conform to the body of the wearer and thereby form effective gasket-like seals against the skin of the wearer without being constrained by a relatively thicker and relatively less flexible absorbent assembly. Alternatively, one or more of the edges of the absorbent assembly **200** may coincide with the corresponding edge or edges of the chassis **100**, e.g. the front edge **236** of the absorbent assembly may correspond to the front waist edge **136** of the chassis **100** and/or the back edge **238** of the absorbent assembly may correspond to the back waist edge **138** of the chassis. In certain embodiments, as few as one layer of the absorbent assembly, e.g. the upper covering sheet **24**, may extend to and correspond with one or both of the front waist edge **136** or back waist edge **138** of the chassis.

In embodiments in which one or more of the layers of the absorbent assembly forming front edge **236** and/or back edge **238** of the absorbent assembly coincide with the respective front waist edge **136** or back waist edge **138** of the chassis 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 some embodiments, particularly those with a full length upper covering sheet **24**, a portion of the absorbent assembly **200** disposed in one or both of the waist regions **36** and **38** may be laterally extensible to a greater extent than a portion of the absorbent assembly **200** in the crotch region **37**. A portion of the absorbent assembly **200** may be rendered laterally extensible, for example, as described herein prior to being combined with the chassis **100** or in combination with the chassis **100** (as a whole diaper **20**). Alternatively, for example, the chassis **100** and absorbent assembly **200** may be activated in one or both of the waist regions **36** and **38**.

When the diaper **20** is worn on the lower torso of a wearer, the front waist edge **136**, the laterally opposing belt ears **108** and the back waist edge **138** encircle the waist of the wearer, while at the same time the chassis side edges **137** encircle the legs of the wearer at least partially, the crotch region **37** is generally 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**.

The chassis **100** includes 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. For example, the backsheet **26** may comprise a water vapor impermeable material or a water vapor permeable material. Exemplary materials suitable for use in the backsheet **26** include polyolefinic films, microporous or other breathable formed films, breathable monolithic films, and hydrophobic nonwovens. 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 **Figures 4, 5, 6 and 7**, 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 nonwovens **31** disposed both exteriorly and interiorly such that the film is sandwiched. In embodiments in which the chassis **100** comprises a multi-layer backsheet **26**, 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 backsheet **26**, alternatively the nonwoven **31** may have a lateral extent that is less than that of the backsheet **26** or the nonwoven **31** may have a lateral extent that is greater than that of the backsheet **26**.

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 multi-layered 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. In such an embodiment, the side flap **147** may comprise a single layer nonwoven **31** or may be folded to form a dual-layer nonwoven **31** side flap **147** that may be breathable.

As illustrated in **Figures 8 and 9**, the chassis **100** may, but need not, additionally include an inner liner **22** attached to the backsheet **26**. Such an inner liner **22** may be formed of a soft material that will not irritate the skin of the wearer. 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, polyethylene, or polyester. An inner liner **22** may form a portion of the interior surface **102** of the chassis **100** such as in the respective front and back laterally central portions **117** and **118** between the edges **236** and **238** of the absorbent assembly **200** and the waist edges **136** and **138** of the chassis **100** and thereby 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 film could be uncomfortable.

As shown in the figures, 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 illustrated in **Figure 10**, 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**. In embodiments in which the side flaps are formed by attaching an additional layer or layers to the chassis **100**, each of the additional layer or layers may be attached in a distal edge attachment zone **149** at or adjacent to its laterally distal edge **158**.

In the exemplary diaper **20** shown in **Figure 1**, the side flaps **147** overlap the absorbent assembly **200**, *i.e.*, their 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 side flap **147** may be attached to the interior surface **102** of the chassis **100** in a side flap attachment zone **153** adjacent to the front waist edge **136** and in a longitudinally opposing side flap attachment zone **154** adjacent to the back waist edge **138**, as shown in the figures.

Between the side flap attachment zones **153** and **154**, the proximal edge **157** of the side flap **147** remains free, *i.e.*, 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 5, 6, 10, and 14-16**, 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 side edge **137a** and **b** of the chassis **100** where it may be folded to form the side flap **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 may be 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 strand **168a** or **b**, particularly in each of the opposing waist regions **36** and **38**, such that the second elastic strand **168a** and **b** floats in the hollow of the channel **621a** and **b** to enable the second elastic strand **168a** and **b** to snap back to its glued-in length once the diaper **20** is cut to length during manufacture.

The side flap **147** may be formed into a cuff flap **631** and a side barrier **633**. Particularly, side barrier attachment zone **630** may be oriented between the first and second elastic strands **167a** and **b** and **168a** and **b**. The placement of side barrier attachment zones **630a** and **b** relative to the longitudinal axis **42** has a direct and coupled effect on the depth of cuff flaps **631a** and **b** and the size of the side barriers **633a** and **b**. For example, as illustrated by **Figure 15**, when the side barrier attachment zone **630** is moved laterally inward, the depth of the cuff flaps **631** decreases and the size of the side barrier **633** increases. Conversely, when the side barrier attachment zone **630** is 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, 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 **12** 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 of the side flaps **147** to the proximal edge of the side barrier attachment zones **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 flaps **147**, as measured from the proximal edge of the side flap **147** to the side edge of the chassis **137** 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 16**, a second pair of side barrier attachment zones **630** may be used such that one can adjust the height of the cuff flaps **631** portion of the side flaps **147** without impacting the height of the barrier cuffs **633**. A channel **634a** and **b** may be formed between side barrier attachment zones **630a** and **c** and/or **630b** and **d** and may comprise an elastic strand **635a** and **b** disposed therein.

For embodiments wherein the side flaps **147** are formed by attaching additional layers 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., layers forming the backsheet **26** and side flap **147**) as illustrated in **Figure 10**. The layers may also form a channel (e.g., **621a** and **b**) and provide the functionality associated with it as described above.

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.

Additional lateral extensibility in the chassis **100** or portions of the absorbent assembly **200** may be provided in a variety of ways as describe hereinafter. 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 includes 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 includes 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 46**. This formed web material **305** includes 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** also includes 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.

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. In one embodiment, 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 region specific activation (e.g. activation 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 absorbent article may be activated in a specific region, e.g. front and/or back waist region, to a greater extent than an adjacent region. For example, one or both of the waist regions of the chassis 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.

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 **153** and **154** where the side flaps **147** are attached. 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 **153** and **154**. 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 **153** and **154** 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 must 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 **153** and **154** to render the laterally central portions more easily or less easily extensible than the respective portions in the side flap attachment zones **153** and **154**.

In the finished diaper, the chassis may be non-rectangular, but instead have an overall shape in plan view of a “T” or of an “I”. Such a non-rectangular configuration may impart a tailored appearance to the diaper **20** when it is worn and may also impart an impression that the diaper **20** will fit comfortably between the legs of a wearer.

An exemplary non-rectangular configuration of the chassis is shown in **Figure 2**, **Figure 3**, and **Figure 13**. As shown in these figures, laterally opposing belt ears **108** in the back waist region **38** extend laterally outward while the adjacent side flaps **147** remain folded laterally inward. The laterally outwardly extending belt ears **108** impart a “T” shape to the diaper. Alternatively, laterally opposing belt ears disposed in the front waist region **36** may similarly extend laterally outward to impart a “T” shape to the diaper. In some embodiments, both front belt ears and back belt ears may extend laterally outward while the adjacent side flaps **147** remain folded laterally inward, in which configuration an “I” shape is imparted to the diaper **20**.

Each belt ear may be attached to chassis at or adjacent the side edges **137** in an ear attachment zone **109**. The belt ears may be attached interiorly to the respective side flap **147** in ear attachment zone **109**, as shown in **Figure 1**, **Figure 2**, **Figure 3**, **Figure 7**, **Figure 9**, **Figure 11**, and **Figure 12**. Alternatively, the belt ears may be attached exteriorly to the backsheet **26** at or adjacent the side edges **137**. For ease of manufacturing and packaging, the belt ears **108** may remain disposed laterally inward until a user desires to deploy them for use when applying the diaper **20** onto the body of a wearer. For this purpose, as shown in **Figure 17** and **Figure 18**, one edge of each belt ear **108** may be defined by a frangible line of attachment **91** along which the belt ear can be detached from the laterally opposing belt ear for deployment laterally outward in preparation for use as illustrated in **Figure 19**. Such a frangible line of attachment **91** 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 may be suitable for the materials involved.

Alternatively, as shown in **Figure 20** and **Figure 21**, one edge of each belt ear **108** may be defined by a cut line **92** at which the belt ear is severed from the laterally opposing belt ear during manufacture. Because the formation of this cut line **92** would allow the belt ear **108** to deploy prematurely, the belt ear **108** may be held laterally inwardly disposed by a releasable attachment member until being released and deployed laterally outward so as to project laterally outward beyond the adjacent side flap. As shown in **Figure 21**, a fastening element **120** may serve to releasably attach the belt ear **108** to the interior surface **102** until it is deployed for use. Such a releasable attachment may also be used in combination with a belt ear **108** that is defined by a frangible line of attachment **91** if additional assurance is desired that the belt ear **108** will not inadvertently be deployed prematurely, for example by handling that might rupture the frangible line of attachment. Alternatively, as shown in **Figures 24** and **25**, the fastening element **120** may be releasably attached to an attachment surface **680**. The attachment surface **680** may be a release tape, mating loops, a lacquered portion of the interior surface **102** of the chassis **100** (as shown in **Figures 24** and **25**), etc. Further, as shown in **Figures 30** and **31**, the fastening element **120** may be releasably attached to the attachment surface **680** on the belt ear **108**. In such an embodiment, the belt ear **108** may be folded over itself and positioned over the side flap **147**.

The belt ears **108** may be created from a single web via a nested cut line **92**. The following constraints should be maintained in forming the nested configuration of the belt ear **108** as illustrated in **Figure 22**. The most important constraint may be the longitudinal distances of a tab portion **640** relative to a remainder **641** of the belt ear **108**. With further reference to **Figure 22**, the distance $b=a+c$ where a is the distance from the first edge **642** of the belt ear **108**, to a midpoint **643a** through the transition between first edge **642** of the belt ear **108** and a midpoint of the tab portion **640** of the belt ear **108**, the distance c is from the midpoint **643b** of the transition between the midpoint of the tab portion **640** and the second edge **644** of the belt ear **108**. The distance b is from the midway point **643a** to midpoint **643b**. When the fastening element **120** is applied to the belt ear prior to cutting the web, the nested pattern cut line **92** also cuts through and shapes the fastening element **120** to match the portion of the tab **640** underlying the fastening element **120**.

In an embodiment of the invention (not shown), a single width web of belt ear material such as

a nonwoven material may be fed from a roll into a die cutter to provide one main web cut line **92** having the desired pattern of the final belt ear. In another embodiment, the two now separate webs are phased and aligned, with the tab portions (e.g., **640**) positioned in a partially overlapping configuration. The combined web may then be cut to length and the pairs of belt ears are placed onto the chassis (e.g., **100**) and attached as described herein.

In a further embodiment (not shown), the two separate webs are in the same plane. In another embodiment, after the tab portions (e.g., **640**) of the webs are aligned and placed in a “gap” format, i.e., the webs are not touching, the webs are cut into belt ear pieces and placed onto the chassis (e.g., **100**) and attached as described herein. The belt ears may be held in a closed configuration by fasteners or other means also described further herein.

Portions of the diaper **20** can be fastened together to encircle the waist and the legs of the wearer in many well-known ways. For example, separate fastening devices such as safety pins, separate tapes, a separate tie strap or straps, and/or a separate belt can be used for this purpose. Alternatively or in addition, fastening elements can be incorporated into the diaper **20** to enable a user to apply the diaper to the body of the wearer without, or in conjunction with, any separate fastening devices. Many suitable types of such incorporated fastening elements are well-known, including, for example, tapes, adhesives, adhesive tape tabs, ties, buttons, hooks, loops, snap fasteners, other forms of mechanical fasteners, cohesive patches, *etc.* When configured for use, portions of these incorporated fastening elements may project laterally or longitudinally outward or they may lie entirely inside the edges of the diaper **20** (consistent with the disclosure herein, the edges of the diaper **20** encompass the belt ears).

For example, laterally opposing fastening elements **120** may be attached to the belt ears. These fastening elements **120** may be disposed on the back belt ears **108**, as shown in **Figure 1**, **Figure 2**, **Figure 3**, **Figure 7**, **Figure 9**, **Figure 11**, **Figure 12** and **Figure 13**. [is this list right?] Such fastening elements **120** may be used to fasten the back belt ears **108** to the front waist region **36** or to fasten the back belt ears **108** to front belt ears if present. Fastening elements may similarly be disposed on front belt ears and may be used to fasten the front belt ears to the back waist region **38** or to fasten the front belt ears to back belt ears **108**, if present. In some embodiments in which both front belt ears and back belt ears are present, fastening elements may be attached to one but not the other. In other embodiments in which both front belt ears and back belt ears are present, complementary fastening elements may be attached to the respective belt ears such that the front belt ears may be fastened to their corresponding back belt ears. Fastening elements may be disposed on a waist region not having belt ears extending from it and may be used to attach that waist region to belt ears extending from the opposing waist region.

Fastening elements **120** may be disposed on both the back belt ears **108** and the front belt ears. Such fastening elements **120** may be used to fasten the respective left and right pairs of such ears together or to fasten the respective belt ears to the opposing waist regions.

Optionally, a fastening sheet **116** may be attached onto the exterior surface **104** of the chassis **100**, as described in U.S. Patent Application Publication No. 2005/0171499A1 to Nigam et al. When a fastening sheet **116** is provided, adhesive fastening elements **120** may be adhered to the fastening sheet **116** to fasten the back waist region **38** and the front waist region **36** together, or mechanical fastening elements **120** (e.g., hooks) may engage with the fastening sheet **116** (e.g., loops) for the same purpose. The incorporation of such a fastening sheet **116** may be desirable, for example, in order to make it possible to use a relatively inexpensive and relatively weak material for the backsheet **26**.

Several configurations of cohesive fastening patches are described in U.S. Patent Application Publication No. 2005/0171499A1 to Nigam et al. In the present invention, cohesive fastening patches may be disposed on the belt ears. For example, in **Figures 1, 2, 3, and 13**, the back fastening elements **120** may be formed by cohesive fastening patches and the complementary front fastening sheet **116** in the front waist region **36** may be formed of a compatible cohesive fastening material.

Alternatively, when a laminate backsheet is used and is oriented with the nonwoven disposed exteriorly, some forms of mechanical fasteners that typically require specific mating fastener elements, such as hooks that typically mate with loops, may be configured to engage with the nonwoven and thereby make the inclusion of the specific mating fastener element or fastening sheet unnecessary. For example, the fastening elements **120** may be formed by hook fastening patches configured to engage with the nonwoven layer **31** of the laminate backsheet **26**. A laminate 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 nonwovens **31** disposed both exteriorly and interiorly. In addition, the nonwoven **31** and film **30** layers of the multi-layer laminate backsheet **26** may have different widths, for example the film **30** may be wider than the nonwoven **31**.

In the exemplary embodiments shown in cross section in **Figure 20**, and **Figure 21**, each belt ear **108** lies flat while laterally inwardly disposed and may be folded adjacent to ear attachment zone **109** where it may be attached to the respective side flap **147** in order to be deployed laterally outward for use. In this configuration, the ear attachment zone **109** is predominately subjected to a peel force when the belt ear **108** is subjected to a tensile force as during normal wear of the diaper **20**. Therefore, it may be desirable to attach the belt ear **108** by

a through-bonding method, i.e., a bonding method that fuses the layers of material together, such as pressure bonding or thermal bonding, in order to maximize the peel strength.

Another exemplary attachment configuration is shown in **Figures 1, 7, 9, 18 and 24**, in which each belt ear is folded adjacent to its ear attachment zone **109** where it is attached to the respective side flap **147** while laterally inwardly disposed and is unfolded, i.e., made to lie flat, in order to be deployed laterally outward for use. In this configuration, the ear attachment zone **109** is predominately subjected to a shear force when the belt ear is subjected to a tensile force. Because the shear strength of an adhesive bond is often greater than its peel strength, an adhesive bond may be used to form the ear attachment zone **109** in this configuration, so long as suitable materials are used.

The ear attachment zones **109** are disposed at or adjacent the side edges **137** in one or both of the waist regions **36** and **38** of the chassis **100**. The ear attachment zone **109** may be disposed completely in the area between the side edges **137** and the side barrier attachment zone **630** as illustrated in **Figures 18, 19, 20, 21, 24 and 25**. In such an embodiment the strength of the attachment can be impacted by the individual layers (e.g., film **30** and nonwoven **31** layers (when present)) forming the channels **621** since the individual layers may strain and tear independently when the belt ear **108** is subjected to a tensile force as during normal wear of the diaper **20**. In order to improve the strength of the attachment between the belt ears **108** and the chassis **100** it has been determined that if the ear attachment zones **109** extend laterally inward to or beyond the side barrier attachment zone **630** as illustrated in **Figures 1, 2, 7, 9, 11 and 12**, the layer (e.g., film **30**) forming the side flap **147** and the layer or layers (e.g., film **30** and nonwoven **31** layers) forming the outer surface **104** of the chassis **100** act together in concert to provide a more robust base structure for attachment of the belt ear **108**.

In the exemplary embodiments shown in cross section in **Figure 7, Figure 9, Figure 18, Figure 20, Figure 21 and Figure 24**, the belt ears **108** do not overlap each other while laterally inwardly disposed. Other exemplary configurations are shown in **Figure 26 and Figure 27**, in which the belt ears **108** overlap while in this disposition. As previously mentioned, for ease of manufacturing and packaging, the belt ears **108** may remain disposed laterally inward until a user desires to deploy them for use when applying the diaper **20** onto the body of a wearer. Therefore, overlapped belt ears may be releasably attached to each other where they overlap. For example, in each of **Figure 26 and Figure 27**, a fastening element **120** serves this purpose.

The belt ears **108** may be folded such that they form a double layer belt ear **108** while disposed laterally inward prior to deployment as illustrated in **Figures 28, 29, 30 and 31**. The fastening element **120** may be designed to engage with the surface of the belt ear **108** to

maintain the belt ear **108** in folded configuration. The folded belt ears **108** can be held laterally inward until deployed for use by suitable means, for example, releasable adhesives, hook/loop attachments, frangible bonds, etc. This assists with the manufacturing of the diaper **20**, keeping the belt ears **108** from deploying prematurely.

The interior surface of each belt ear 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.

A belt ear **108** may have a laminate structure. In particular, a belt ear **108** 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, such as a nonwoven exhibiting substantial elastic properties, may be used for any of the layers. For example, belt ears **108** having laminate structures are shown in **Figure 32** and **Figure 33**. Each of these belt ears may include an interior skin-contacting layer **82** and an elastic layer **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. Each belt ear **108** 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** may be sandwiched between the interior layer **82** and the exterior cover layer **84**.

The layers of each belt ear 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 skin-contacting layer **82** (and a relaxed exterior cover layer **84** if present) and then allowed to relax. The resultant contraction of the elastic layer **83** may gather the skin-contacting 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 skin-contacting layer **82** (and 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 skin-contacting layer **82** (and 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 skin-contacting layer **82** (and 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 skin-contacting layer **82** (and the exterior cover layer **84** if present) relaxed. All or a portion of the resultant laminate belt ear may subsequently be “activated” by subjecting it to elongation to create localized areas of deformation or ruptures in a portion **85a** of the skin-contacting layer **82** (and a portion **85c** of the exterior cover layer **84** if present). In **Figure 16** and **Figure 17**, belt ears having activation portions **85** are shown, with the deformed or ruptured portion **85a** of the interior layer **82** and the deformed or ruptured portion **85c** of the exterior cover layer **84** shown in dashed lines representing exemplary breaks in and/or separation of the fibers in nonwoven materials. The deformed or ruptured portion **85a** of the interior layer **82** (and the deformed or ruptured 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 the exterior cover layer **84** if present), the deformed or ruptured portion(s) typically include(s) breaks in and/or separation of the fibers that render the ruptured portion(s) substantially incapable of transmitting tensile forces in the plane of the nonwoven. Alternatively, when an extensible nonwoven is used for the interior layer **82** (and the exterior cover layer **84** if present), the deformed portion(s) typically include(s) areas of fiber deformation that render the deformed portion(s) substantially incapable of transmitting tensile forces in the plane of the extensible nonwoven until a substantial level of extension is achieved. 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.

As illustrated in **Figures 34, 35, 36, 37, 38** and **39**, one or more of the layers (e.g., the film **30** and nonwoven **31**) of the backsheet **26** may comprise one or more design fields **615** and **618**. A first design field **615** may be in contrast to other design fields (e.g., a second design field **618**) or to other portions of backsheet **26** or other portions of the viewable surfaces of the diaper **20**. The design fields **615** and **618** may comprise one or a combination of individual graphic elements, patterns of graphic elements, and solid or interrupted colored fields. For example, the design fields **615** and **618** may be comprised of a continuously repeating pattern formed in a longitudinally extending direction. Alternatively, the design fields **615** and **618** 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.

In certain embodiments of the present invention, particularly those embodiments where a portion of the backsheet **26** is folded to form longitudinally extending laterally opposing side flaps **147a** and **b**, the design fields **615** may extend to cover (or be viewable over) the entirety of the exterior surface **104** of the unfolded portion of the backsheet **26**, as well as cover (or be viewable on) the upper surfaces **613a** and **b** of the side flaps **147a** and **b**. To be clear, the design field **615** 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 **619** 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 design field **618**. In certain embodiments, the design fields **615** and **618** may provide not only a pleasing aesthetic visual appearance to the exterior of the product, but it may also distinguish the side flaps **147a** and **b** from the unfolded portion of the backsheet **26**, or portions of the side flaps **147a** and **b** from itself 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 **34** and **35**, for example, the backsheet **26** has a first design field **615** undulating along a left fold line **608a** of the backsheet **26** and terminating at a right fold line **608b** of the backsheet **26**. The fold lines **608a** and **b** are the lines that the backsheet **26** is folded along to form 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 **36**, **37**, **38**, and **39**, 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** and the second design field **618**, when present, can make the side flaps **147a** and **b** 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. As illustrated in Figures **38** and **39**, it should be understood that 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 a second design field **618**, having only the color and texture of the backsheet **26** making it up.

Absorbent Assembly

As shown in **Figure 40**, **Figure 41**, **Figure 42**, **Figure 43** and **Figure 44**, the absorbent assembly **200** includes an absorbent core **250**. The absorbent core **250** has a laterally extending front edge **256**, a longitudinally opposing back edge **258**, a left side edge **257a**, and a laterally opposing right side edge **257b**. Any or all of the edges of the absorbent core **250** may lie inward of, or may coincide with, the respective edges of the absorbent assembly **200**. For example, in the exemplary absorbent assembly **200** shown in **Figure 40**, the side edges **257** of the absorbent core **250** are located laterally inward of the side edges **237** of the absorbent assembly **200**, while the front edge **256** and back edge **258** of the absorbent core **250** coincide with the respective front edge **236** and back edge **238** of the absorbent assembly **200**.

The absorbent assembly **200** may be attached to 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 cruciform attachment pattern, *i.e.*, in an attachment pattern that forms or is arranged in a cross or “+” shape. The cruciform attachment pattern may be contiguous, *i.e.*, all of its portions may be touching or connected throughout the pattern in an unbroken sequence. Alternatively, the cruciform attachment pattern may include detached portions and thereby lack contiguity but still be arranged such that the shape of the overall pattern is a cruciform. For example, a discontinuous cruciform attachment pattern may include a longitudinally extending portion disposed along the longitudinal axis and separate left and right laterally distal portions disposed along or adjacent to the lateral axis and thereby form a cruciform as the shape of the overall pattern.

An exemplary contiguous cruciform attachment pattern **210** is shown in **Figure 40**. The portions **190** of the chassis **100** that lie outside such a cruciform attachment pattern are not restrained by attachment to the absorbent assembly **200** and therefore remain extensible. In particular, a relatively narrow longitudinally extending portion **212** of a cruciform attachment pattern **210** like that shown in **Figure 40** leaves the majority of the width of the chassis **100** in

the front waist region **36** and in the back waist region **38** freely extensible and thereby allows extension of the chassis **100** in the lateral direction in these regions. A relatively wide laterally extending portion **214** of a cruciform attachment pattern **210** prevents the portion of the chassis **100** in the crotch region **37** to which the absorbent assembly **200** may be attached from shifting relative to the absorbent assembly **200** in that region. A relatively wide laterally extending portion **214** of a cruciform attachment pattern **210** may also contribute to the effectiveness of the side flaps **147** when the elastic strands **167** lift the proximal edges **157** into contact with the body of the wearer. Because the relatively wide laterally extending portion **214** of the cruciform attachment pattern **210** restrains the chassis **100** over a relatively wide portion of the width of the crotch region **37**, the side flaps **147** are better supported at their bases while being lifted by the elastic strands **167**.

Within the extent of the cruciform attachment pattern **210**, the absorbent assembly **200** may be attached to the chassis **100** continuously or intermittently. For example, a film of an adhesive material may be applied continuously over the entire area of the cruciform attachment pattern and then used to continuously attach the absorbent assembly to the chassis. As an alternative example, an adhesive material may be applied discontinuously at and inside the boundaries of the cruciform attachment pattern, such as in the form of dots, stripes, beads, spirals, *etc.*, and then used to attach the absorbent assembly to the chassis.

Cruciform attachment pattern **210** may be disposed either 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 cruciform attachment pattern **210** may be disposed symmetrically or asymmetrically with respect to either or both of the side edges **237** and the front edge **236** and the back edge **238** of the absorbent assembly **200**.

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

The absorbent core **250** may be disposed between a lower covering sheet that may be disposed on the exterior face of the absorbent core **250** in a face-to-face arrangement with the interior surface **102** of the chassis and an upper covering sheet that may be 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 the figures, 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 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** of the absorbent assembly **200**, *e.g.*, at or adjacent to the end edges **236** and **238**, or at or adjacent to both the end edges **236** and **238** and the side edges **237**.

The upper covering sheet **24** may be water-permeable and allows 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, the lower covering sheet **25** may be water-permeable.

In the exemplary absorbent assembly **200** shown in **Figure 41**, **Figure 42**, and **Figure 43**, 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 upper covering sheet **24** may also comprise graphics. The graphics on the upper covering sheet **24** may be random and form a longitudinally extending continuously repeating pattern (not shown). Alternatively, the graphics may be designed for a specific size absorbent article or to provide specific design language associated with a specific region of the absorbent article. Such graphics are often referred to as pitched graphics, meaning the design is linked or associated with the pitch (*i.e.*, length of the absorbent article) and may provides a visual signal for the user allowing them to identify and ensure proper application and initial position of the absorbent assembly **200** on the wearer.

The upper covering sheet **24** may also comprise a lotion. The lotion may be in a pattern. The pattern may be laterally and/or longitudinally discontinuous. The lotion pattern may extend from the front waist edge **136** to the back waist edge **138**. Alternatively, the lotion pattern may extend from the front edge of the absorbent assembly **236** to the back edge **238** of the absorbent assembly **200**. Examples of suitable lotions include, but are not limited to, those described in U.S. Pat. Nos. 5,607,760 to Roe on; U.S. Pat. No. 5,609,587 to Roe; U.S. Pat. No. 5,635,191 to Roe et al.; U.S. Pat. No. 5,643,588 to Roe et al.; and U.S. Pat. No. 5,968,025 to Roe et al. The lotion may also be incorporated onto the cuff flaps.

The absorbent core may include one or more acquisition components 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. Preferred materials for the acquisition component include synthetic fiber materials, open celled polymeric foam materials, fibrous nonwoven materials, cellulosic nonwoven materials, and various combination synthetic/cellulosic nonwoven materials. Examples of such acquisition materials are more fully described in U.S. Patent No. 4,950,264 issued on August 21, 1990.

Such an acquisition component **290** overlying an absorbent core storage component **272** is shown in **Figure 43**. 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.

Suitable well-known absorbent materials for the absorbent core include cellulose fibers in the form of comminuted wood pulp, which is commonly known as “airfelt”, layers or sheets of natural or synthetic fibrous material, superabsorbent polymer, *etc.* These absorbent materials may be used separately or in combination and many may be used in a discrete form, *i.e.*, in the form of fibers, granules, particles, layers and the like.

The discrete form of an absorbent material may be immobilized in pockets formed by a layer of a thermoplastic material, such as a hot melt adhesive, that intermittently contacts and adheres to a substrate, such as a covering sheet, while diverging away from the substrate 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, 60/936,146, to Ashton, dated June 18, 2007, and 61/091,799 to Hundorf filed on 08/26/2008.

An exemplary absorbent assembly **200** having such a structure is shown in **Figure 44**. In this absorbent assembly **200**, the absorbent core **250** includes particles of superabsorbent polymer **270** that 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 of superabsorbent polymer **270** to be absorbed.

In **Figure 44**, a separate thermoplastic layer covering sheet **276** is shown overlying the layer **275** of the thermoplastic material. Alternatively, the separate thermoplastic layer covering sheet may be omitted.

As another alternative, as shown in **Figure 45**, 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 a combined absorbent assembly **200**, the distally opposing single substrate sheets **274** may serve respectively as the upper covering sheet **24** and the lower covering sheet **25**.

Alternatively, as disclosed in U.S. Serial No. 61/091,799 filed on August 26, 2008, the absorbent assembly may comprise superabsorbent polymer material deposited from a plurality of reservoirs in a printing roll onto a substrate disposed on a grid of a support which includes a plurality of cross bars extending substantially parallel to and spaced from one another so as to form channels extending between the plurality of cross bars. The superabsorbent polymer material may be arranged in an array comprising rows extending substantially parallel to and spaced from one another. A thermoplastic adhesive material may be deposited on the superabsorbent polymer material and the substrate to cover the superabsorbent polymer material on the substrate and form an absorbent layer.

Further, a wetness indicator composition, such as disclosed in U.S. Serial No. 61/168,756 filed on April 13, 2009, may be incorporated in the absorbent assembly, as well as other components of the absorbent article. The wetness indicator composition may comprise a stabilizer, a colorant, and a matrix. The absorbent core may comprise a nonwoven layer and a complex of absorbent polymer material and thermoplastic adhesive material. The wetness indicator composition may be in direct contact with an inner surface of the backsheet and an outer surface of the nonwoven layer. And, the complex of absorbent polymer material and thermoplastic adhesive material may be in direct contact with an inner surface of the nonwoven. Further, the absorbent core may be cellulose free.

Additionally, the absorbent article, and particularly including the absorbent assembly, may comprise an odor control system as disclosed in U.S. Serial Nos. 12/272,967 filed on November 18, 2008 and 61/116,490 filed on November 20, 2008. The odor control system may

comprise a bleach activator system. The bleach activator system may comprise a peroxygen bleaching compound and a bleach activator capable of reacting with the peroxygen bleaching compound to form a peracid. The peroxygen bleaching compound may be a source of hydrogen peroxide.

Statements of Incorporation by Reference and Intended Scope of Claims

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. An absorbent article comprising:

a front waist region, a back waist region, a crotch region between the waist regions, a front waist end edge, and a back waist end edge;

a longitudinal axis extending from a midpoint of the front waist end edge through the crotch region to a midpoint of the longitudinally opposed back waist end edge;

a web comprising an interior surface and an exterior surface;

an absorbent assembly comprising an interior surface and an exterior surface;

wherein the web is folded over at a first fold line forming a first hem;

wherein the web is folded over at a second fold line forming a second hem;

wherein the web is folded over at a third fold line and attached in the front and back waist regions forming a first side flap, the third fold line forming a first side edge of the absorbent article;

wherein the web is folded over at a fourth fold line and attached in the front and back waist regions forming a second side flap, the fourth fold line forming a second side edge of the absorbent article;

wherein the first side flap comprises the first hem and wherein the second side flap comprises the second hem;

wherein each of the first and second hems comprise a longitudinally extending gathering member;

wherein the first fold line forms a proximal edge of the first side flap and the second fold line forms a proximal edge of the second side flap; wherein the first and second proximal

edges are disposed laterally inward of the first and second side edges of the absorbent article;

wherein the first and second proximal edges of the first and second side flaps are disposed between the longitudinal centerline and the first and second side edges of the absorbent article, respectively;

the absorbent article also comprising a second elastic gathering member attached at or adjacent the side edge of the absorbent article; and

the absorbent article also comprising laterally opposing deployable belt ears attached to the web in at least one of the waist regions, each belt ear being disposed laterally inwardly until being deployed laterally outward so as to project laterally outward beyond the respective distal edges of the side flaps.

2. The disposable diaper according to Claim 1 wherein the chassis comprises longitudinally opposing belt ears.
3. The disposable diaper according to any of the preceding claims wherein the chassis includes fastening elements disposed on at least two of the belt ears and adapted for fastening the front waist region to the back waist region to encircle a waist and legs of a wearer.
4. The disposable diaper according to Claim 3 wherein the fastening elements comprise mechanical fastener.
5. The disposable diaper according to any of the preceding claims wherein the web comprises a first layer and a second layer.
6. The disposable diaper according to Claim 5, wherein at least one of the layers is folded to form the side flaps.
7. The disposable diaper according to Claim 5 wherein the first layer is a nonwoven and the second layer is a film and wherein at least a portion of the side flap is formed by one or both of the first and second layers.

8. The disposable diaper according to Claim 4, wherein the mechanical fastener is adapted to engage with the backsheet nonwoven.
9. The disposable diaper according to any of the preceding claims wherein the extensible portion of the chassis comprises a formed web material including at least two distinct laterally extending embossed regions each containing a pattern of generally longitudinally oriented alternating ridges and valleys created by an embossment and also containing an unembossed region located between the embossed regions, such that the extensible portion of the chassis can be laterally extended to a given extent with the application of relatively less force than that required to laterally extend the same portion of the chassis to the same given extent before the embossment.
10. The disposable diaper according to any of the preceding claims wherein the chassis comprises a first activation pattern disposed in at least one of the front waist region, back waist region, and crotch region; and wherein the chassis comprises a second activation pattern disposed in the front waist region and/or the back waist region.

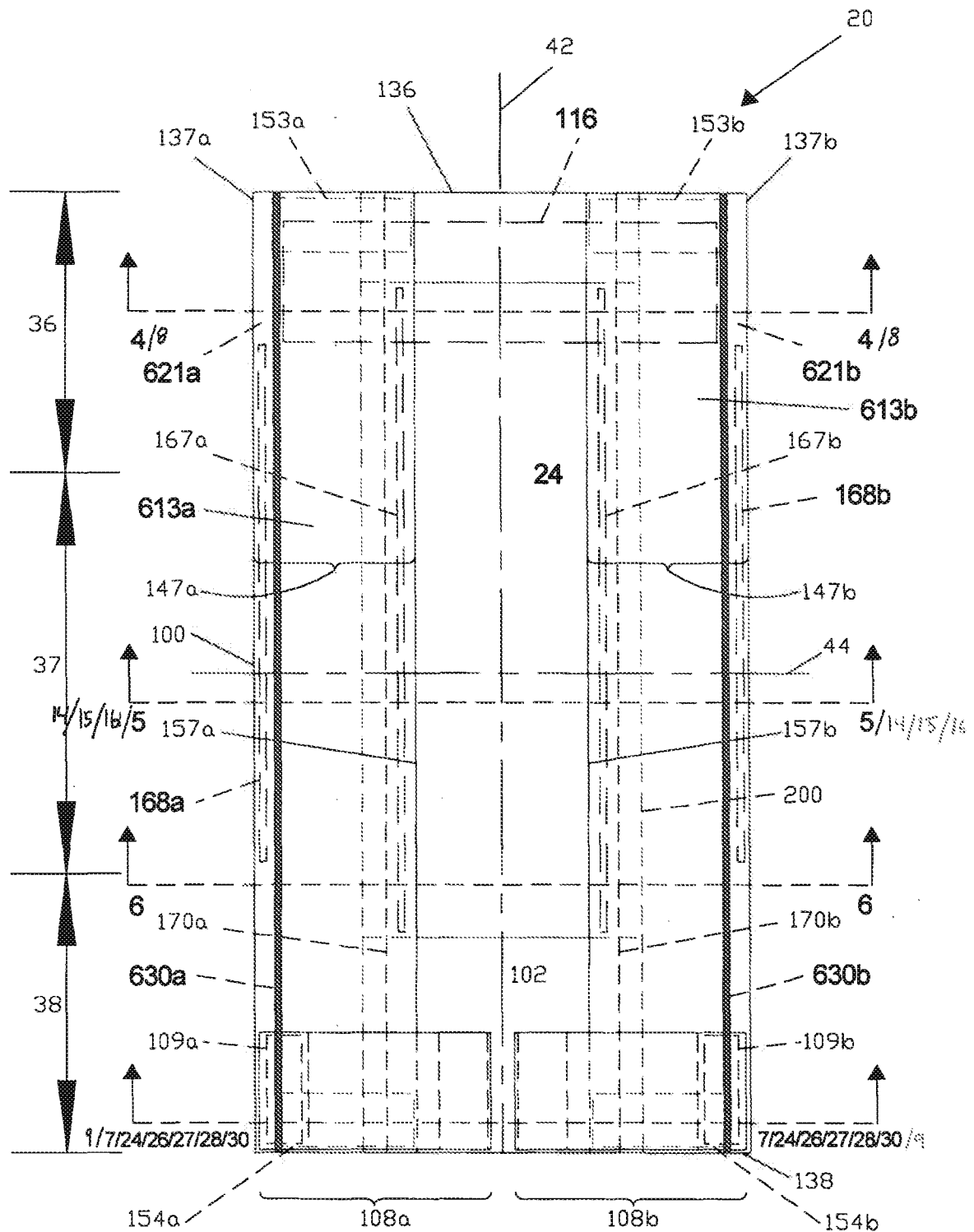
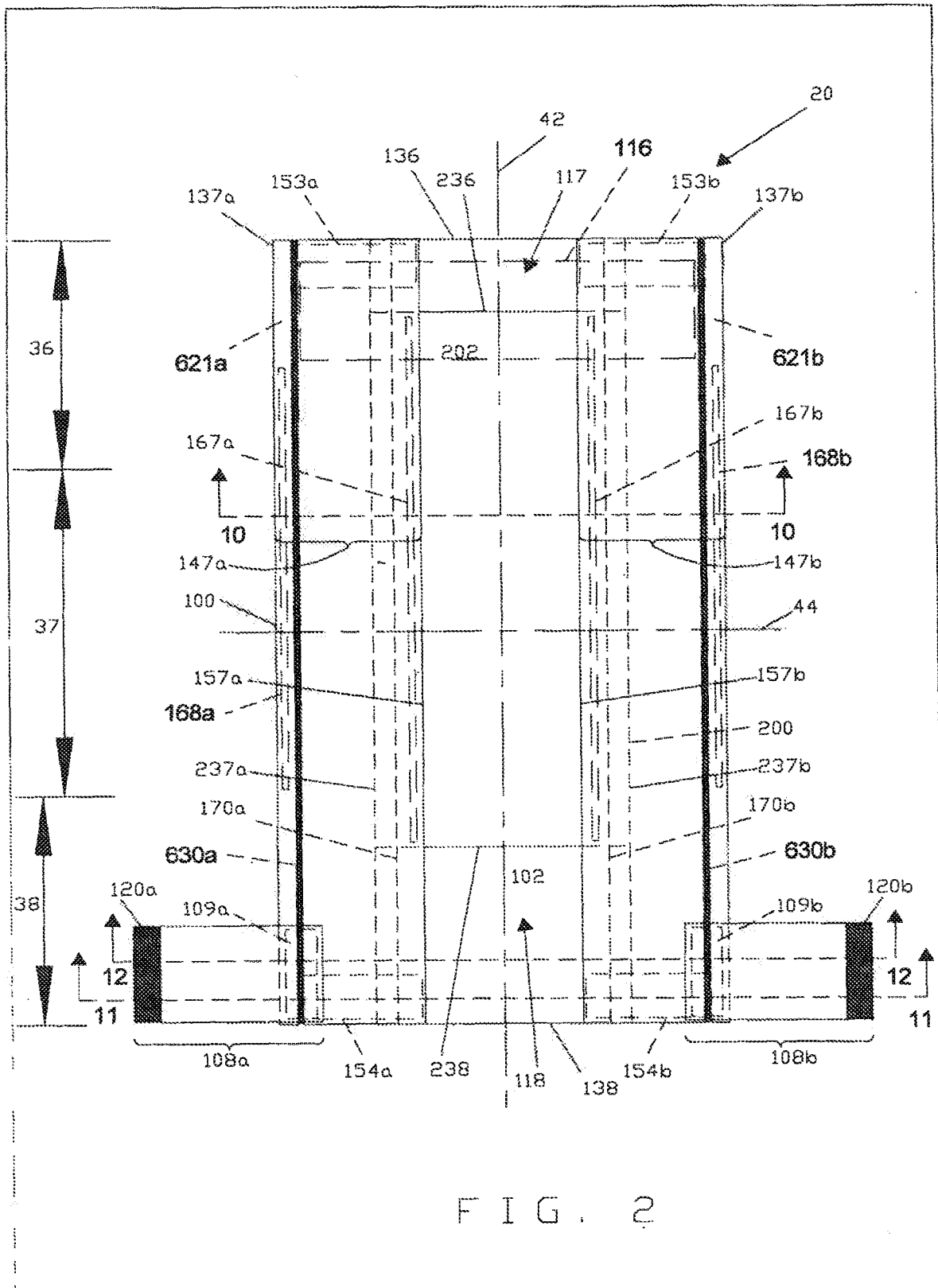
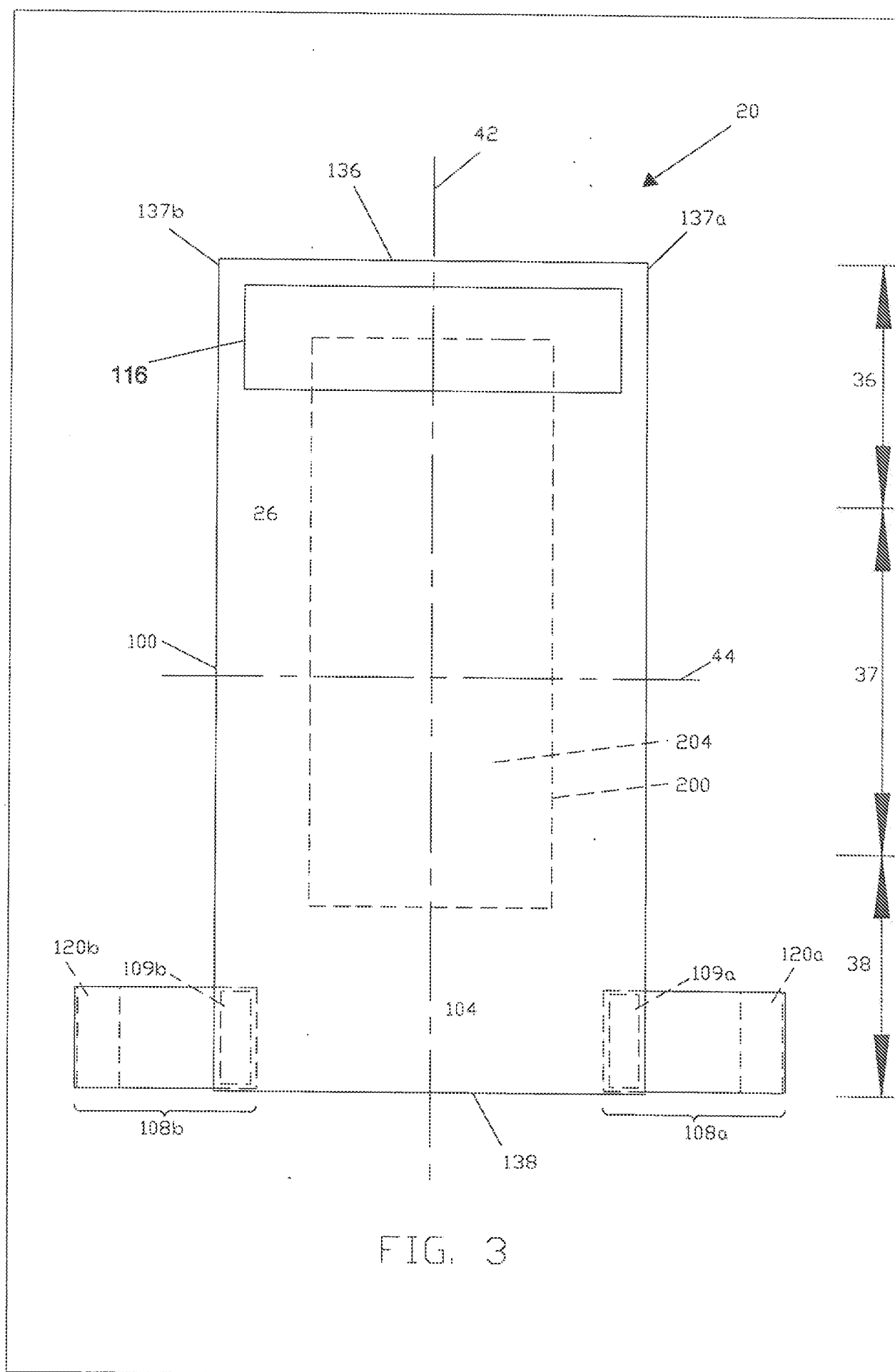


FIG. 1





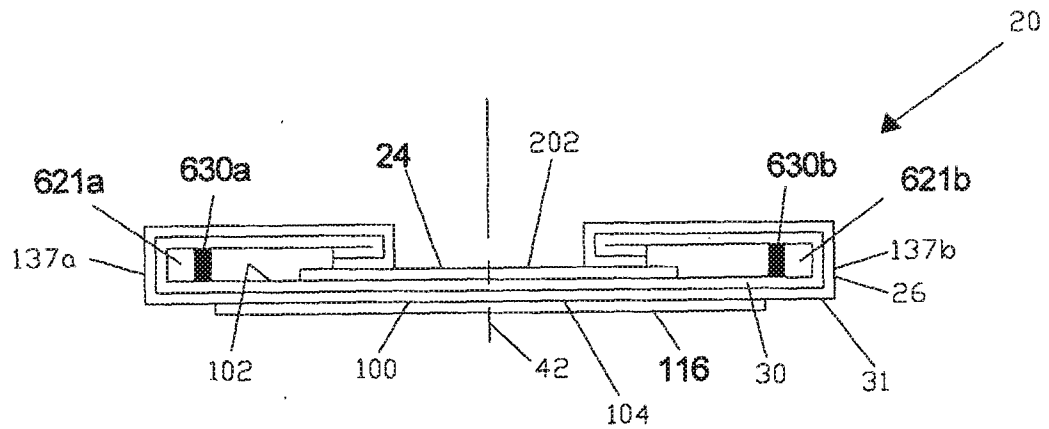


FIG. 4

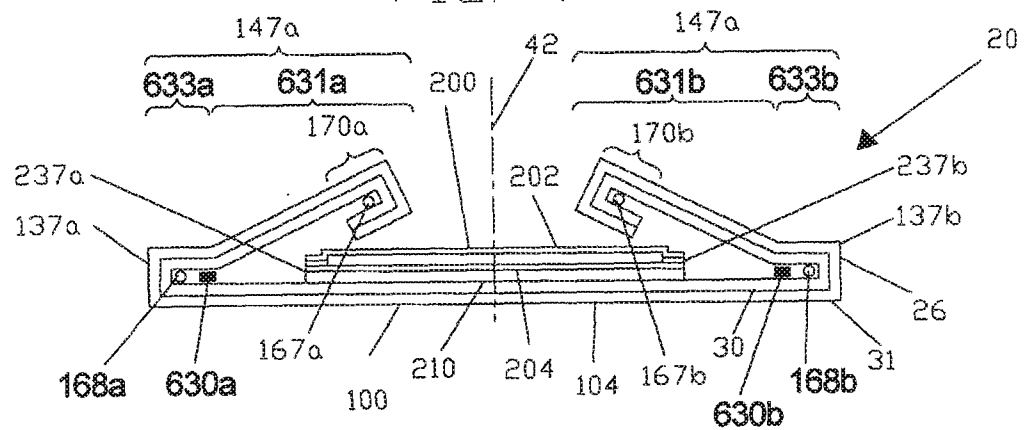


FIG. 5

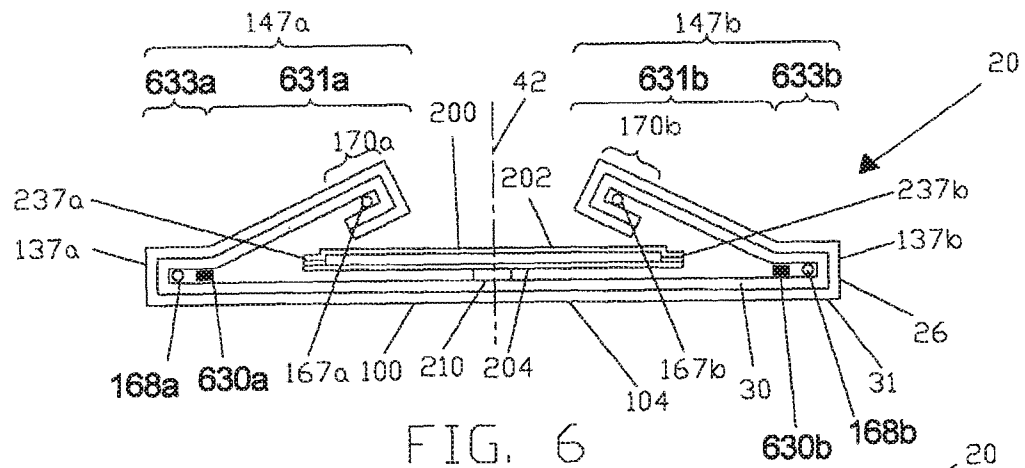


FIG. 6

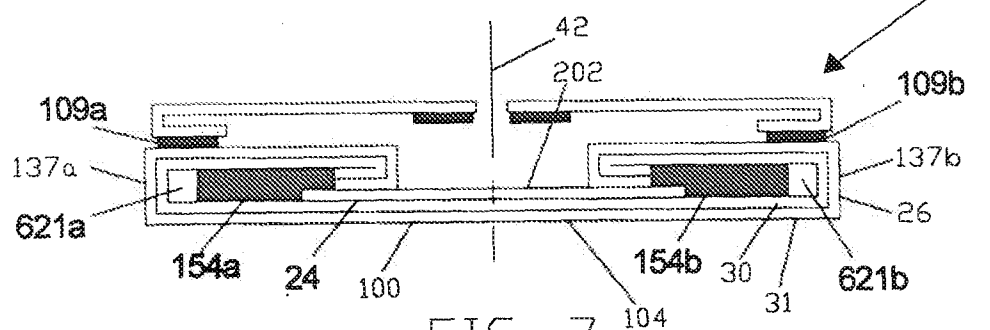


FIG. 7

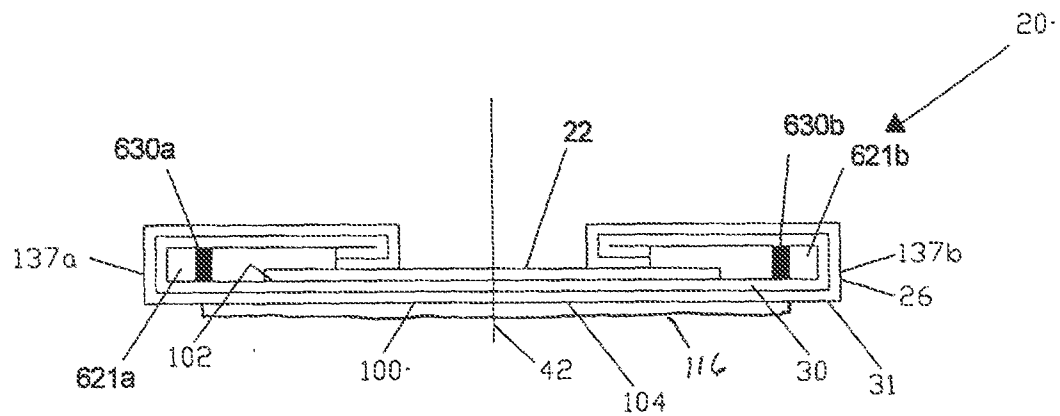


FIG. 8

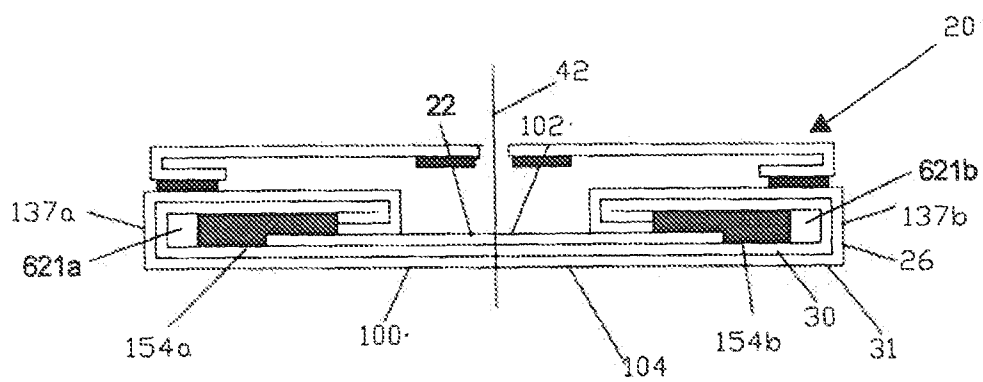


FIG. 9

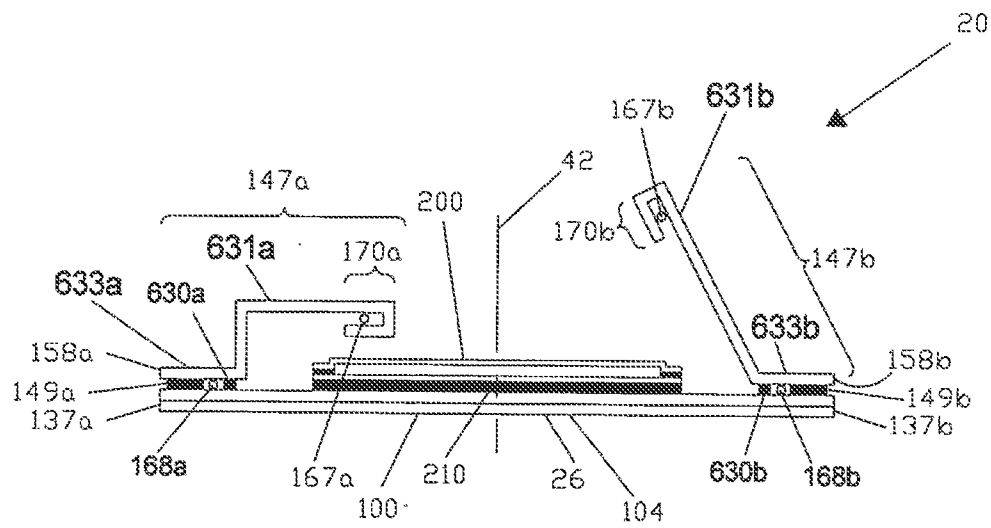


FIG. 10

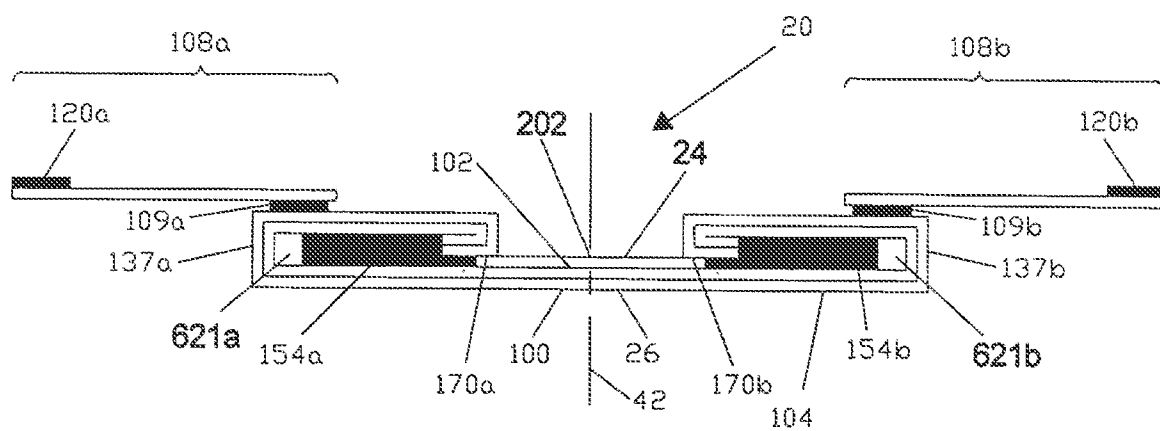


FIG. 11

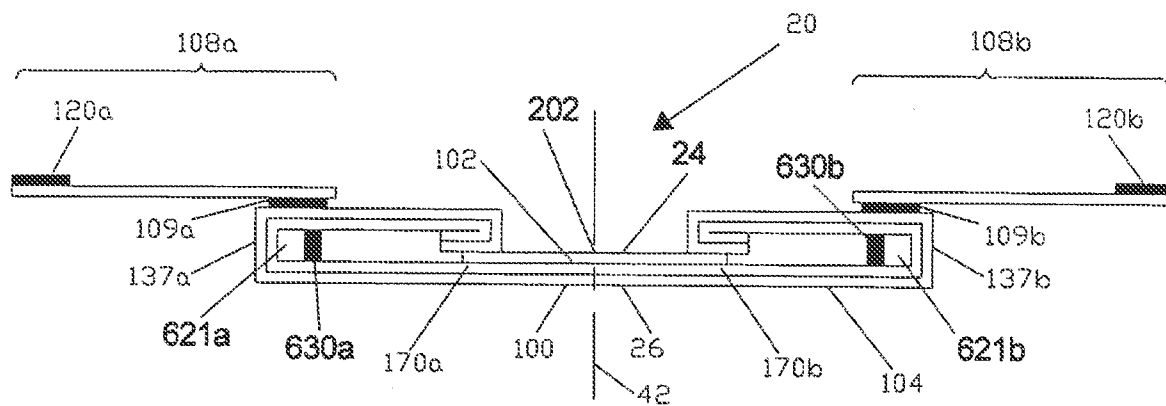
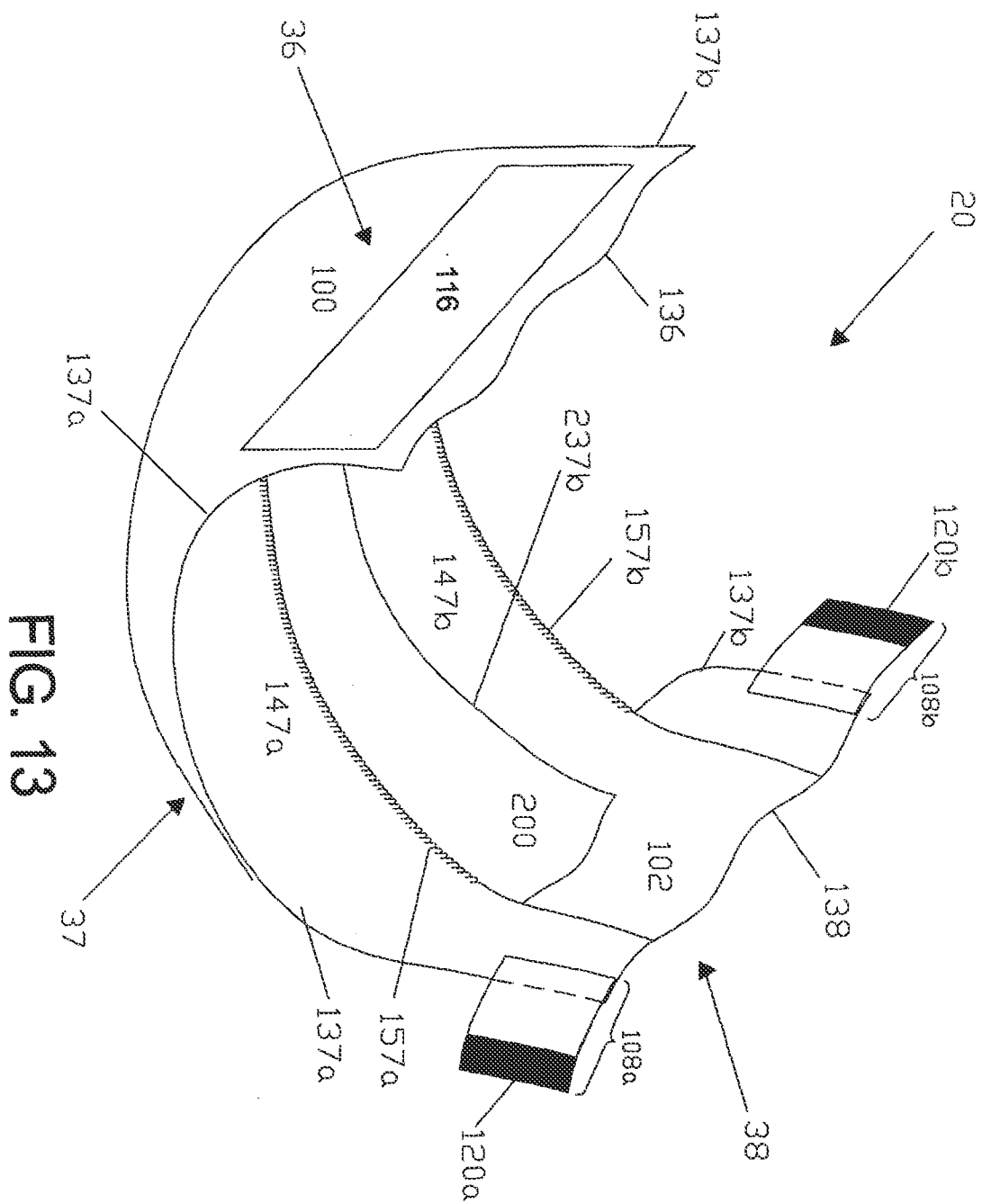


FIG. 12



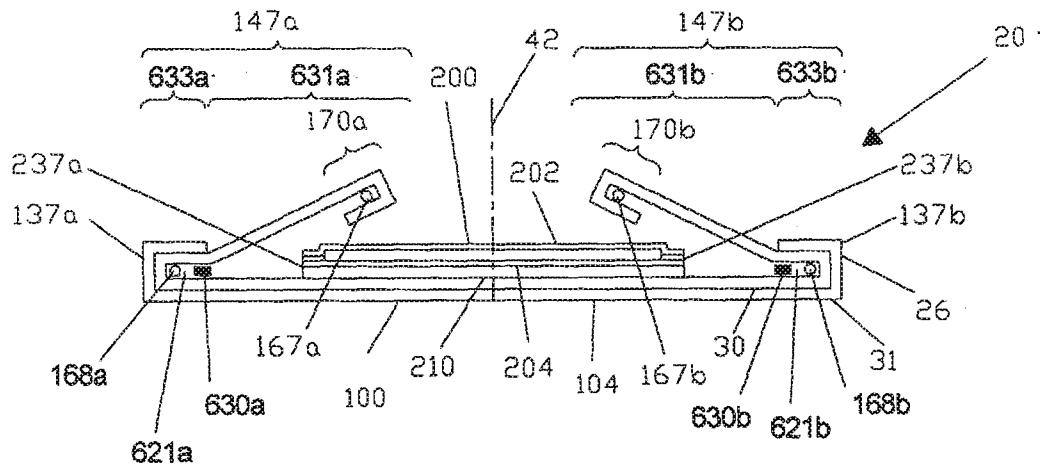


FIG. 14

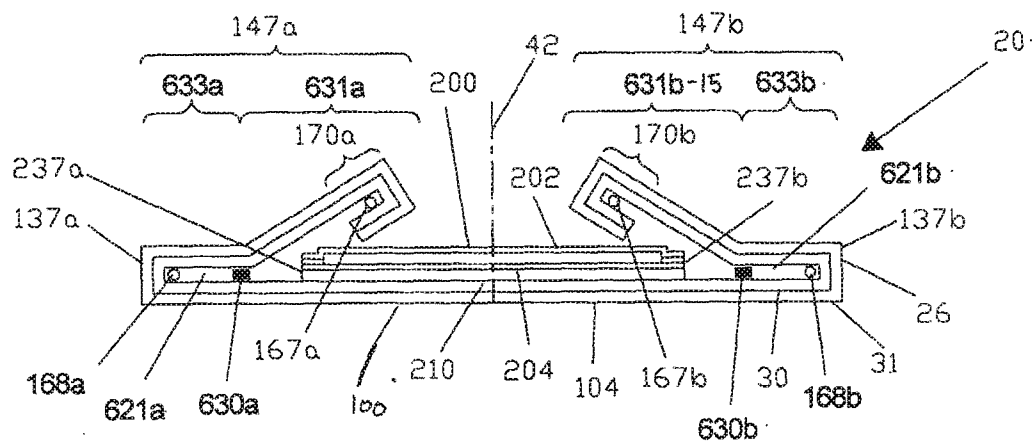


FIG. 15

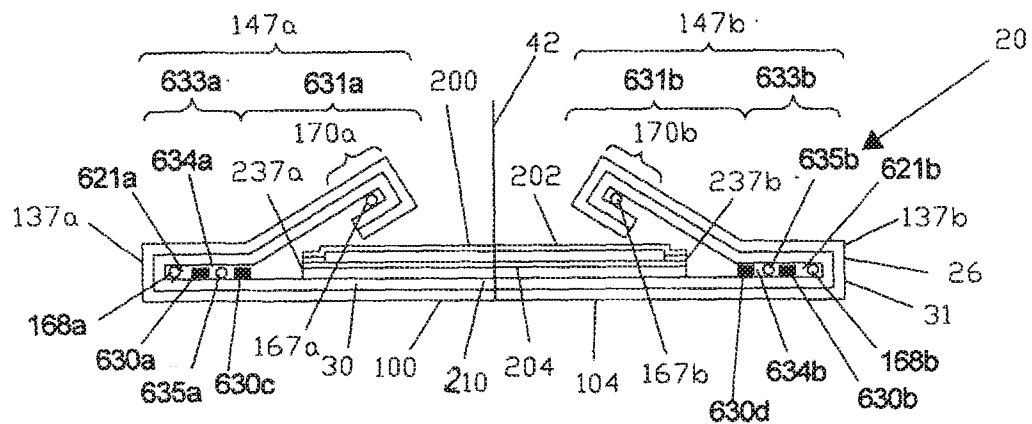


FIG. 16

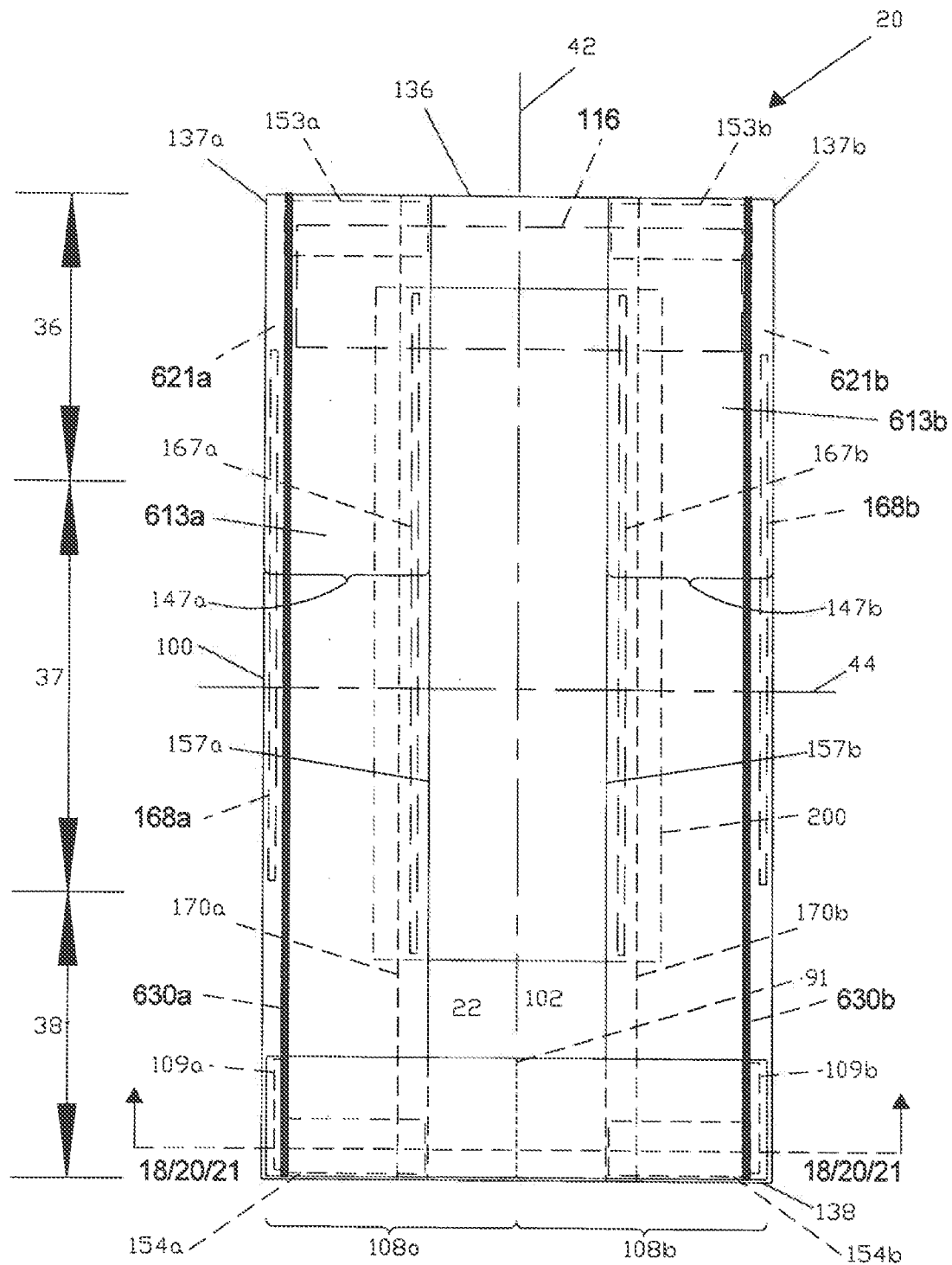


FIG. 17

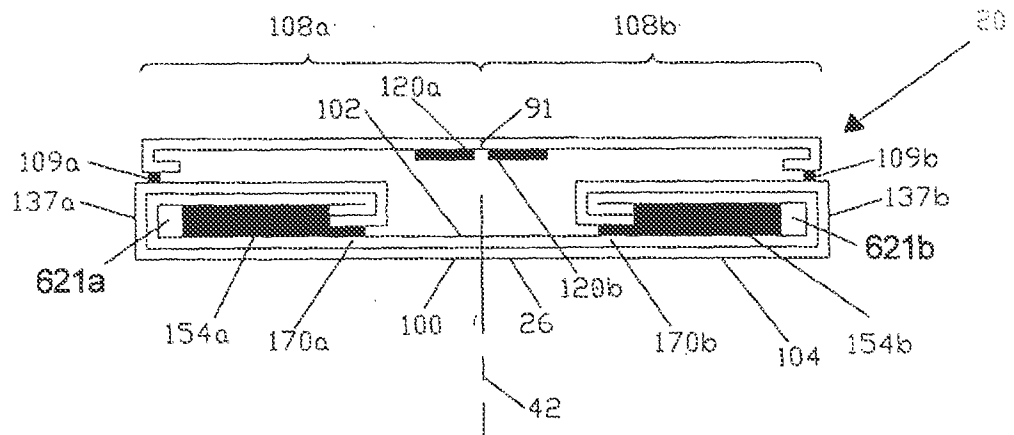


FIG. 18

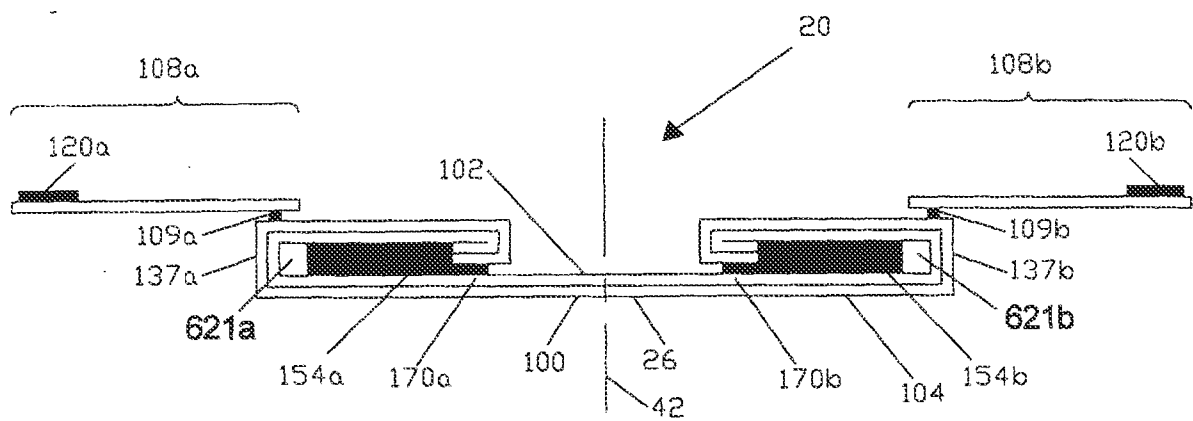


FIG 19

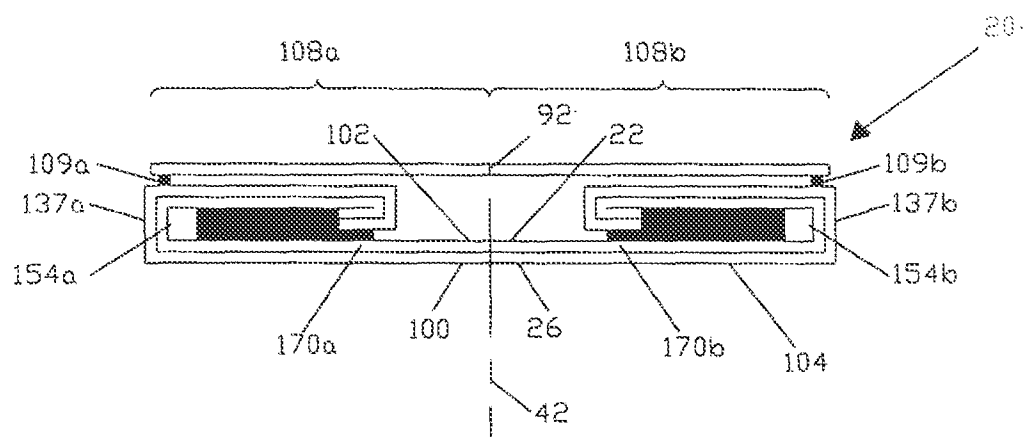


FIG. 20

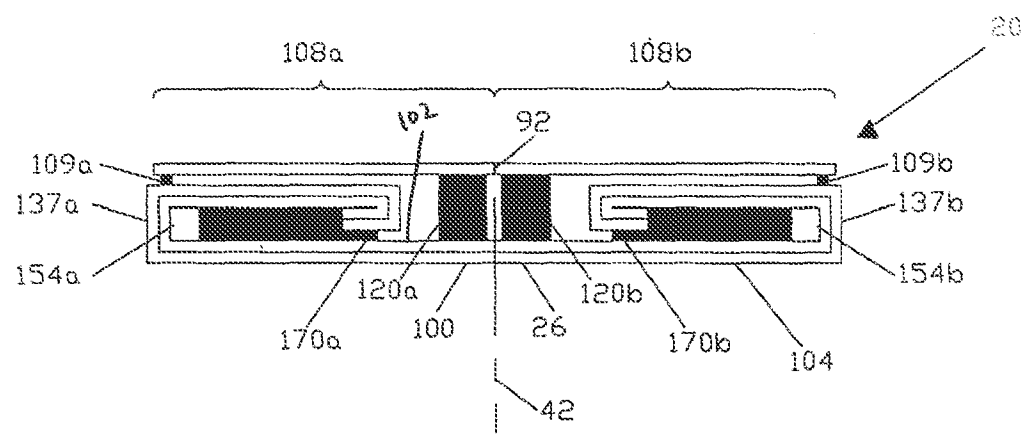


FIG. 21

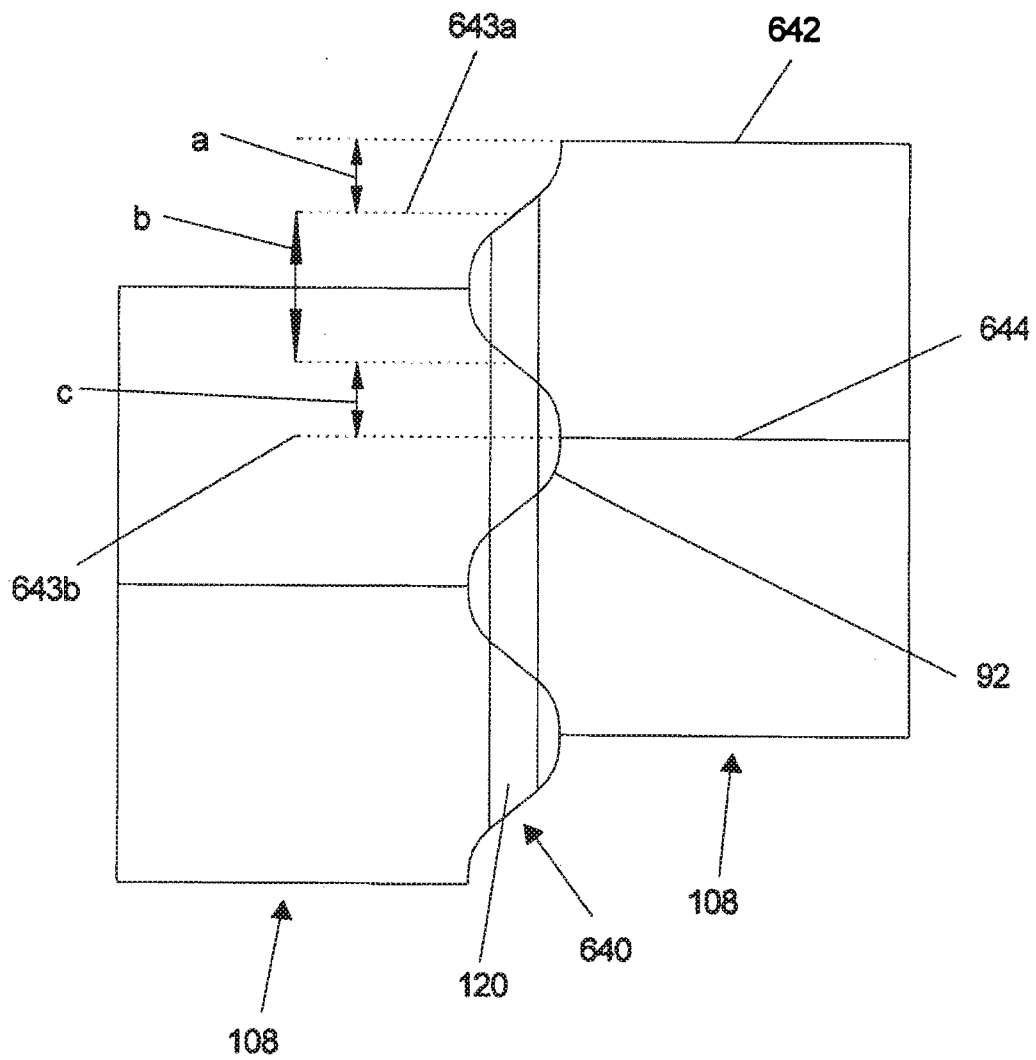


FIG. 22

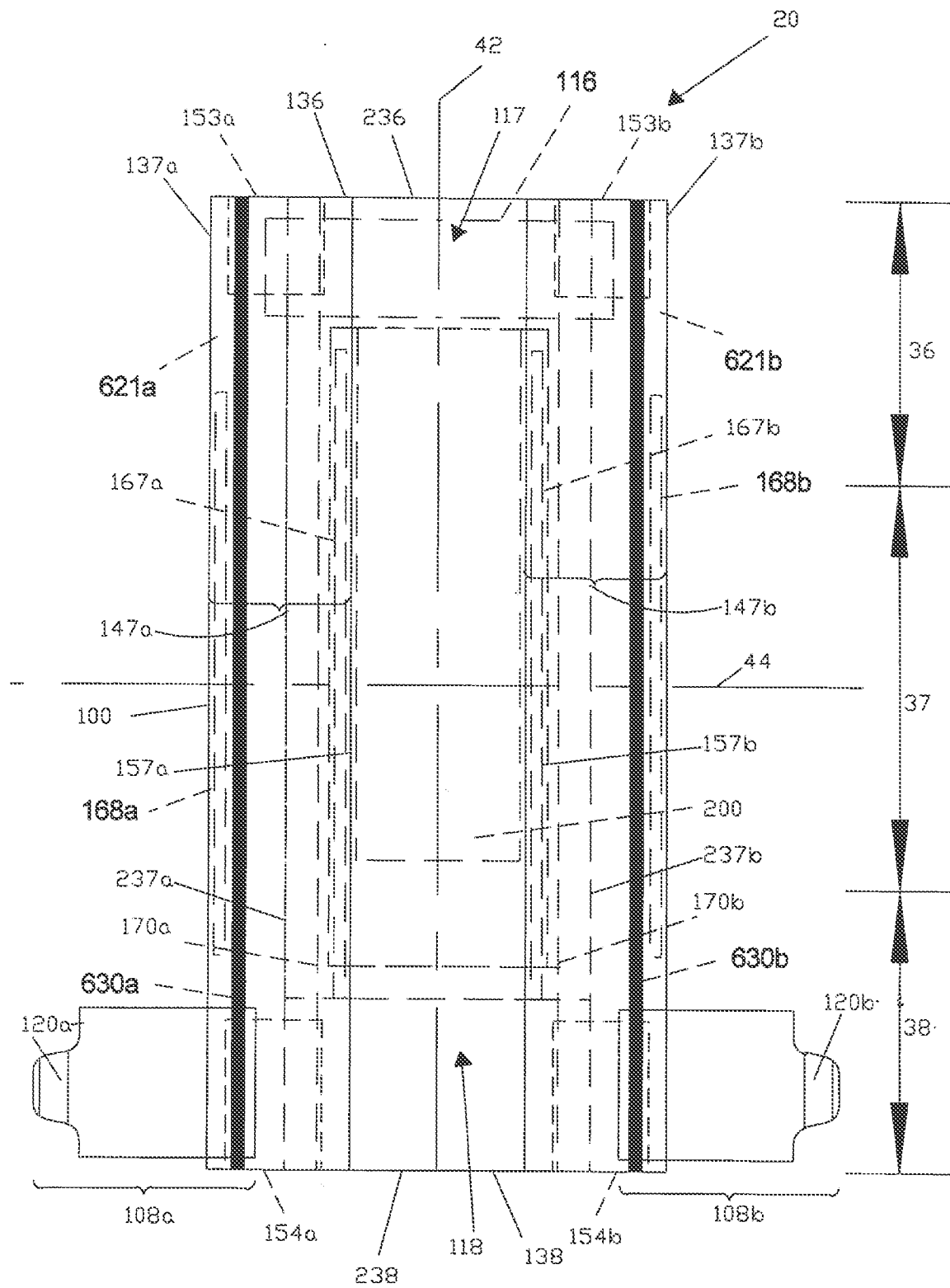


FIG. 23

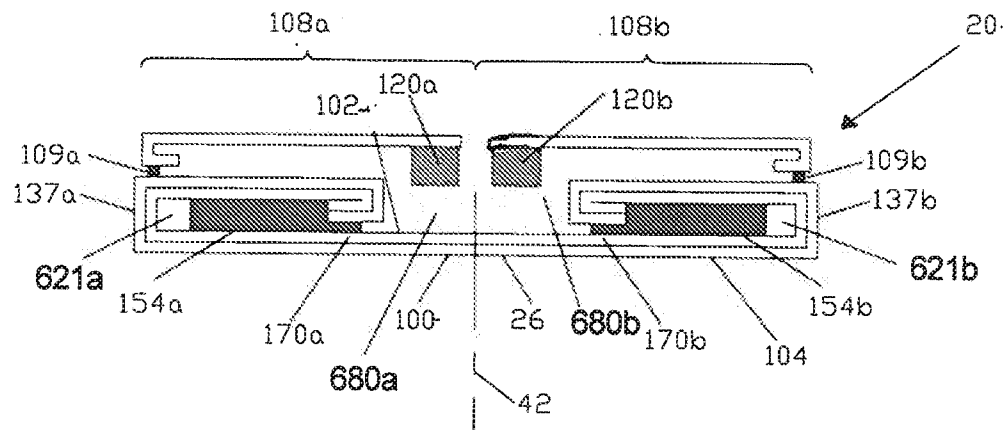


FIG. 24

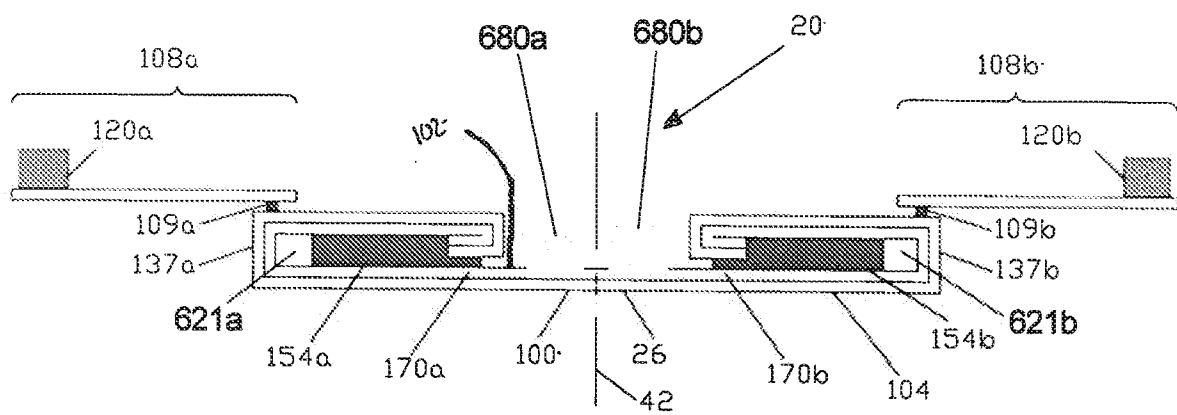


FIG. 25

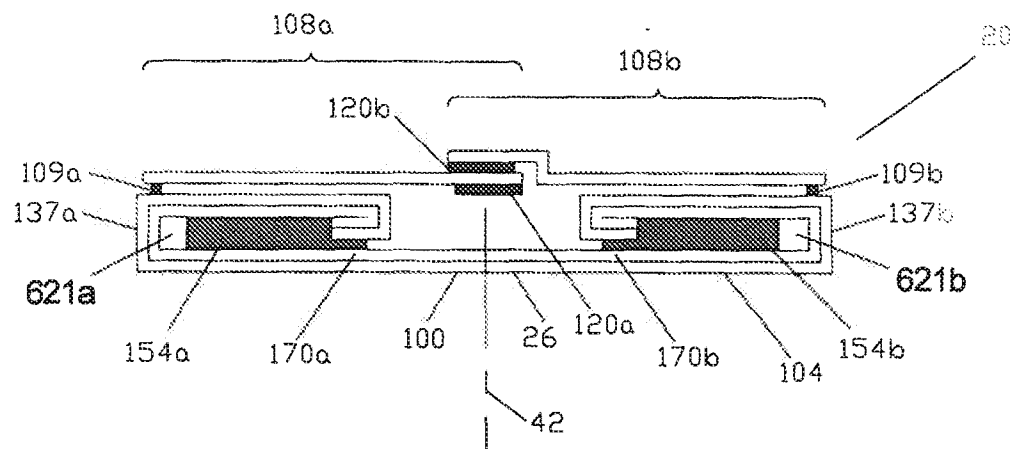


FIG. 26

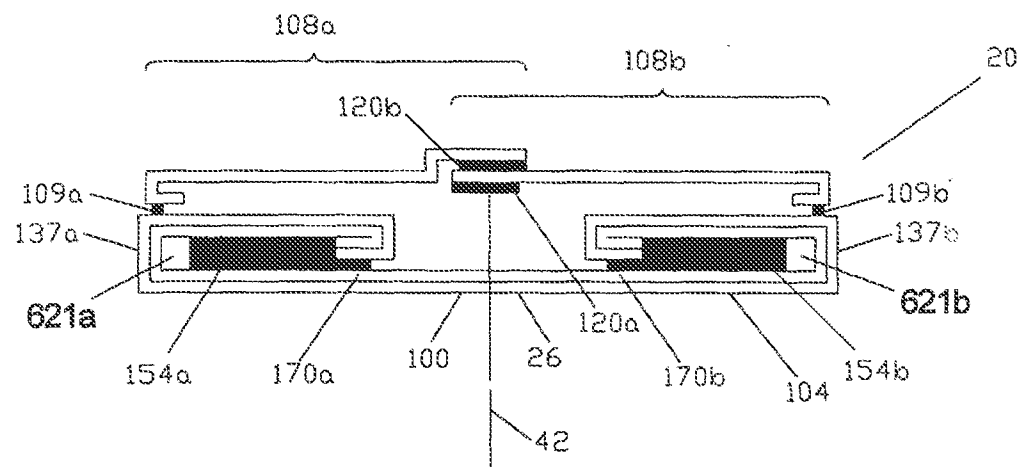


FIG. 27

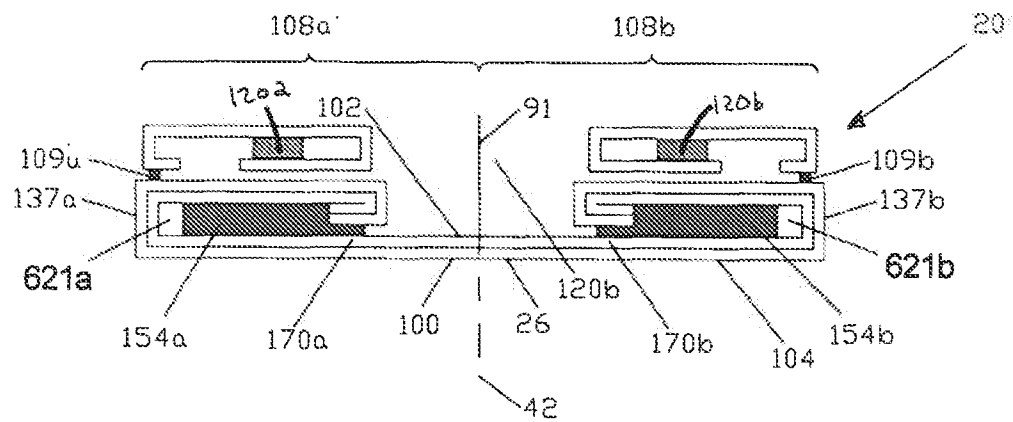


FIG. 28

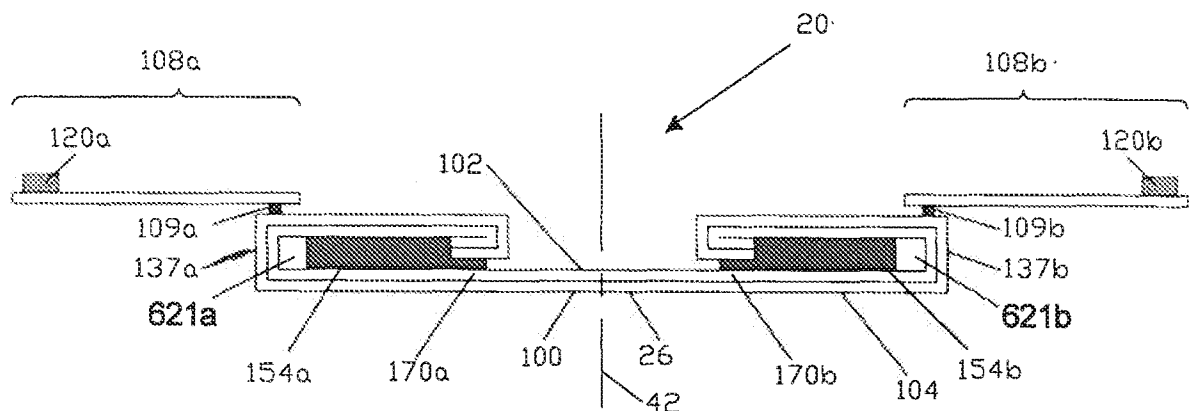


FIG. 29

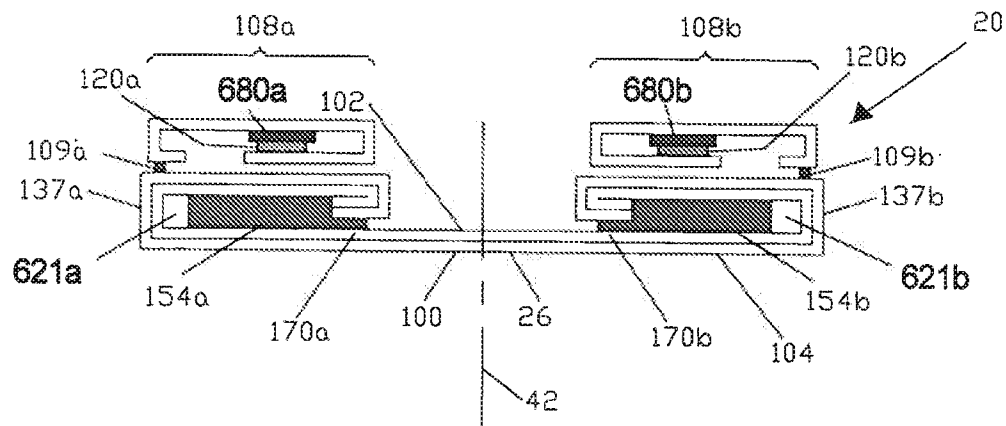


FIG. 30

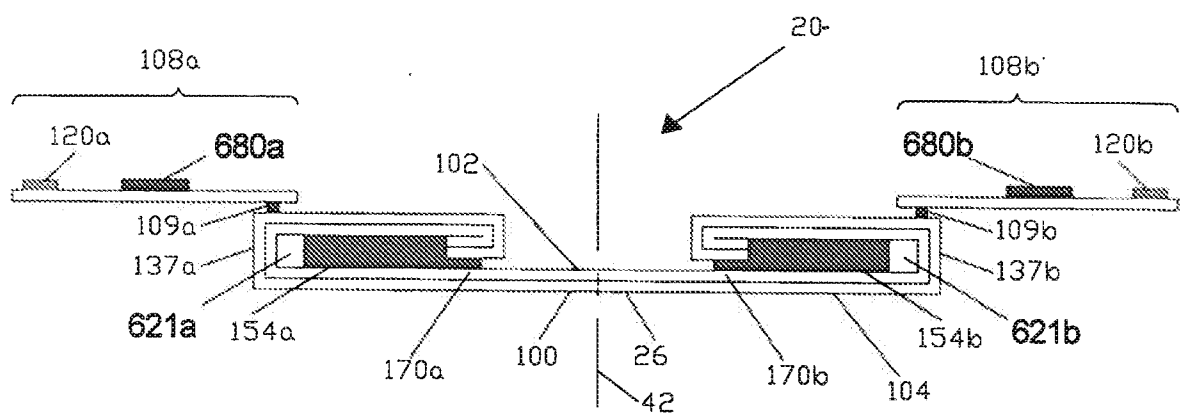


FIG. 31

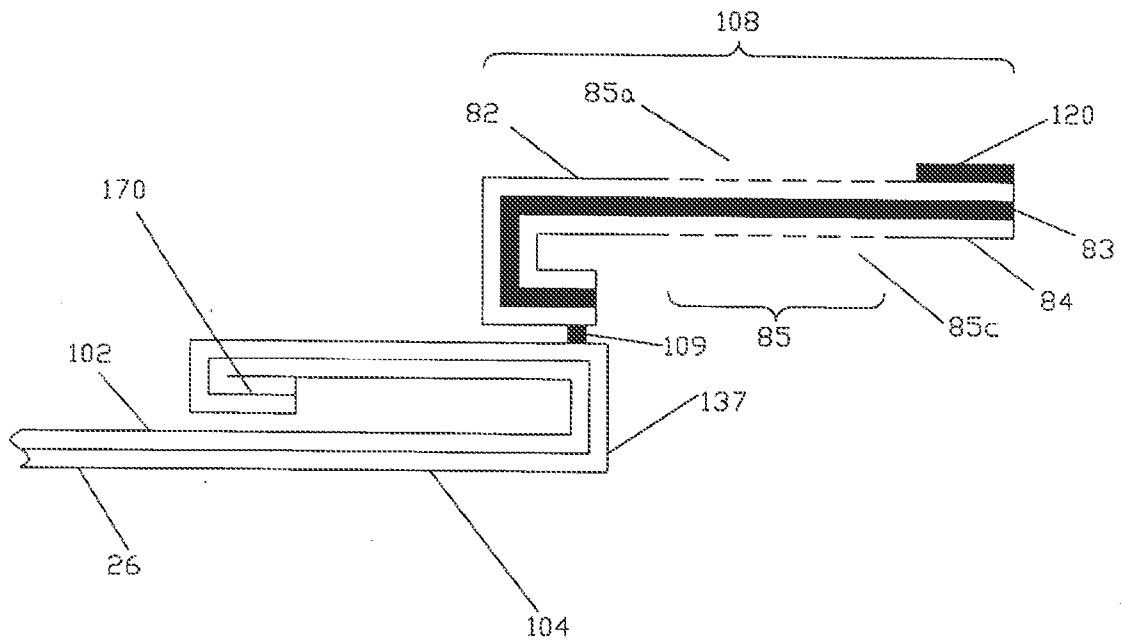


FIG. 32

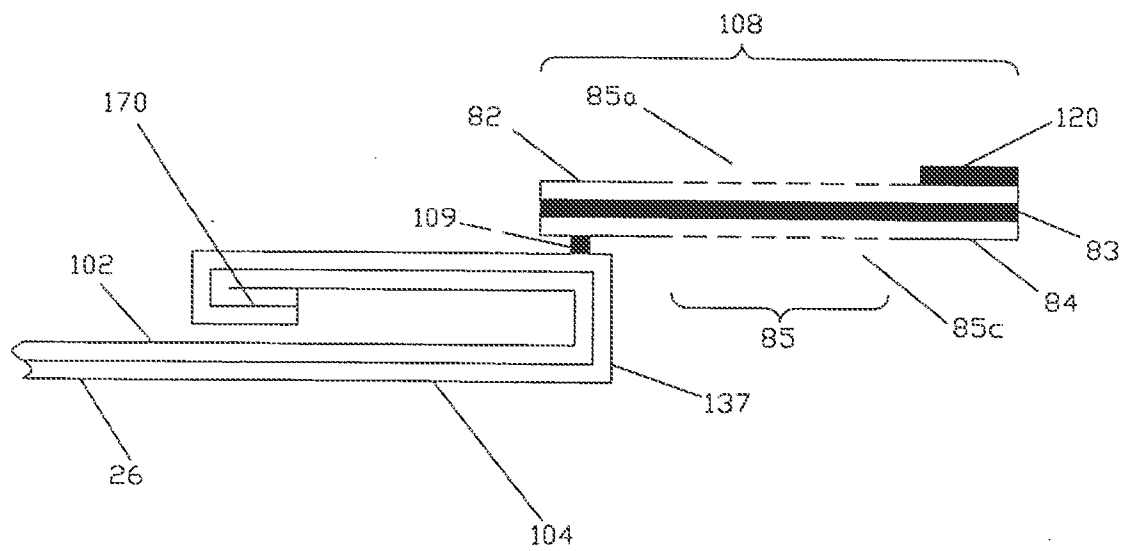


FIG. 33

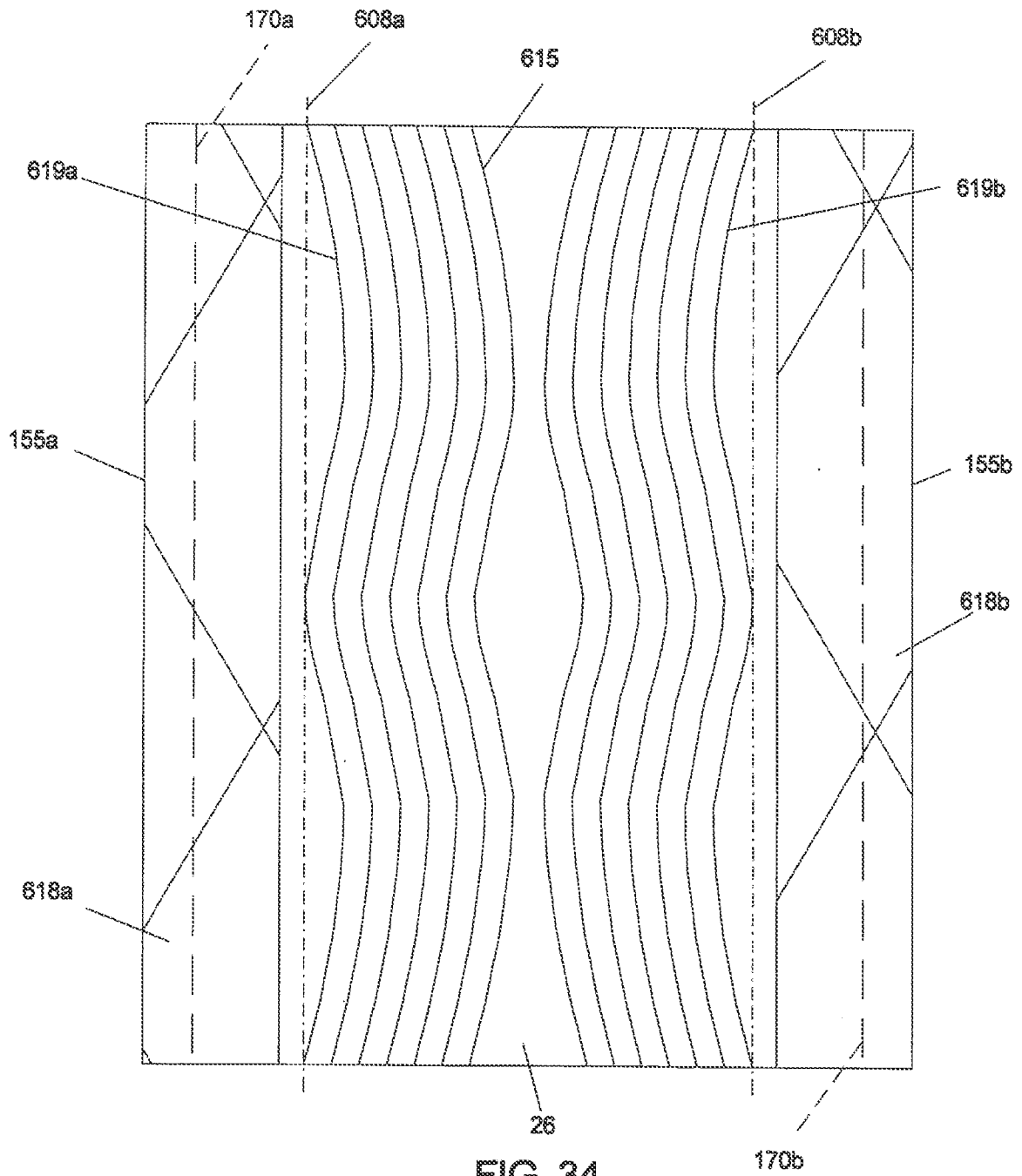


FIG. 34

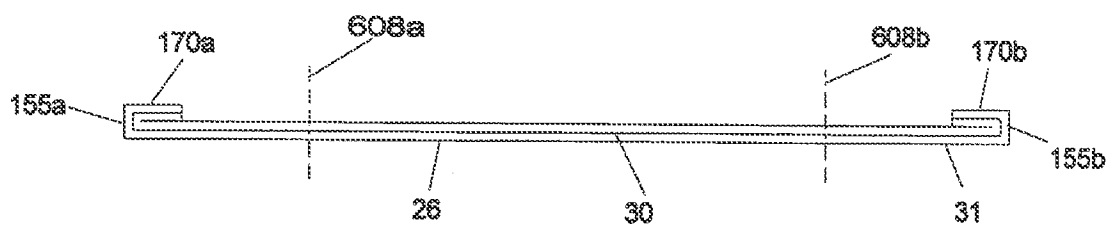


FIG. 35

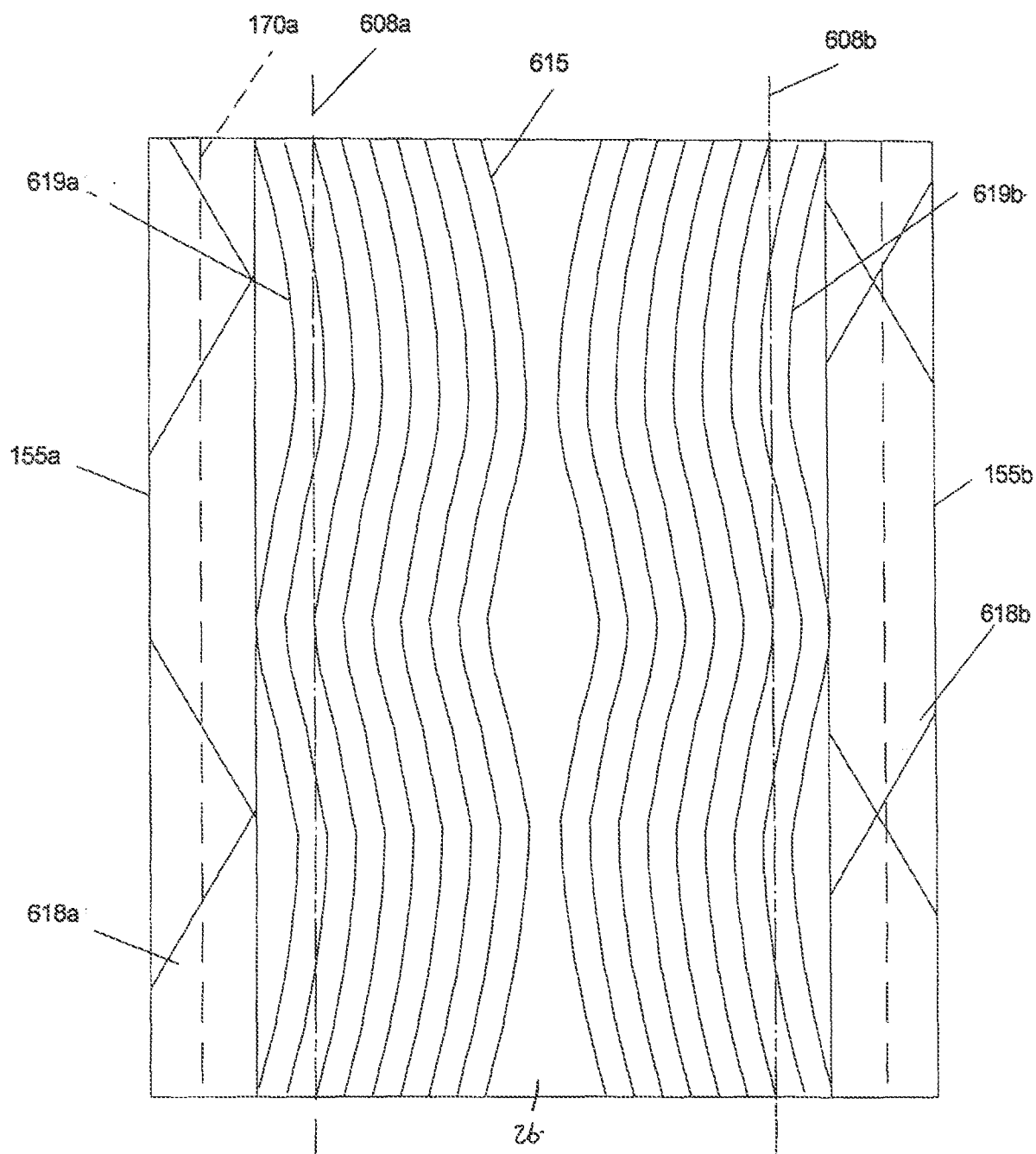


FIG. 36

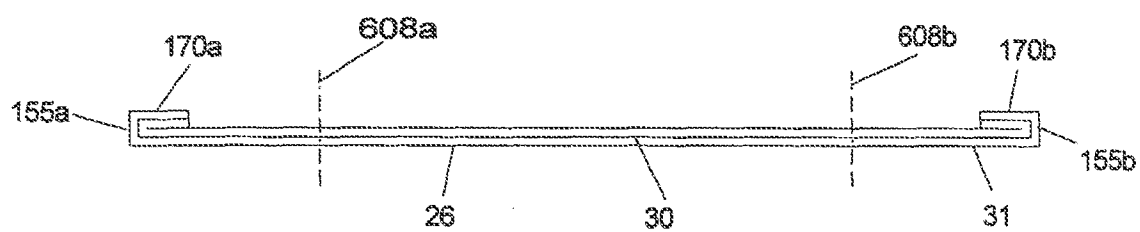


FIG. 37

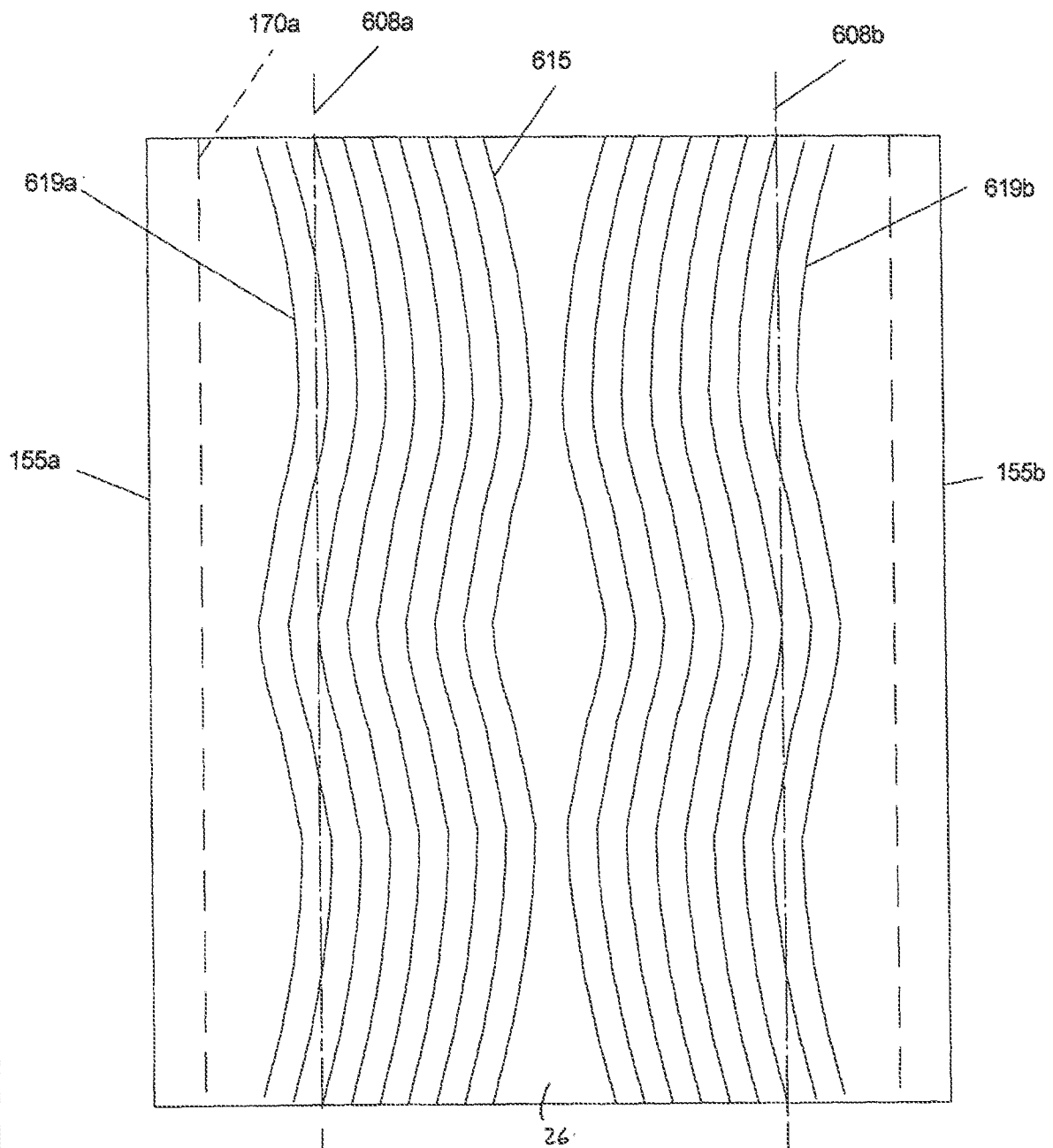


FIG. 38

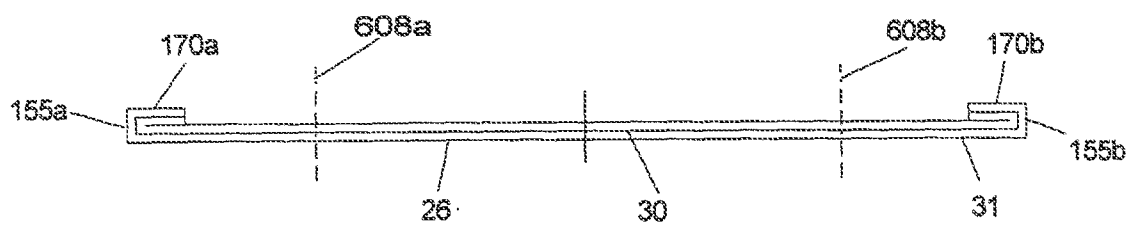


FIG. 39

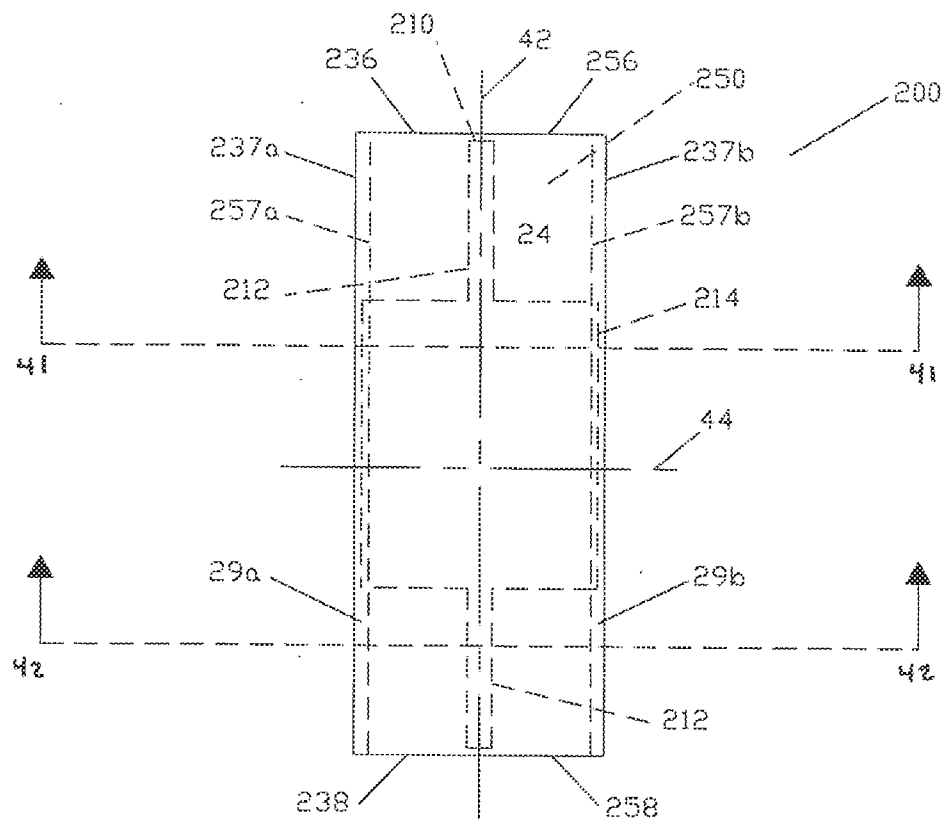


FIG. 40

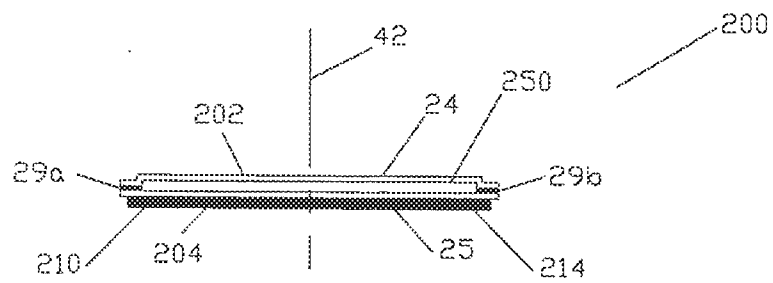


FIG. 41

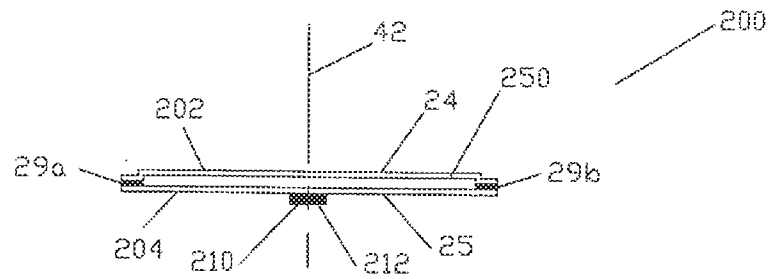


FIG. 42

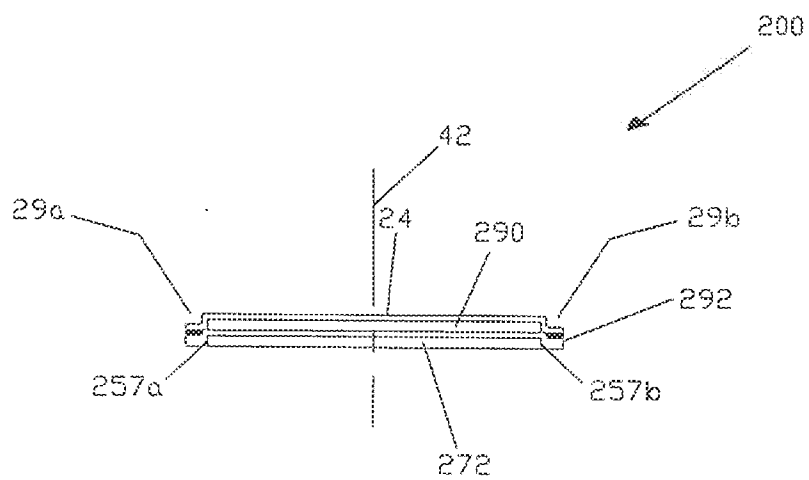


FIG. 43

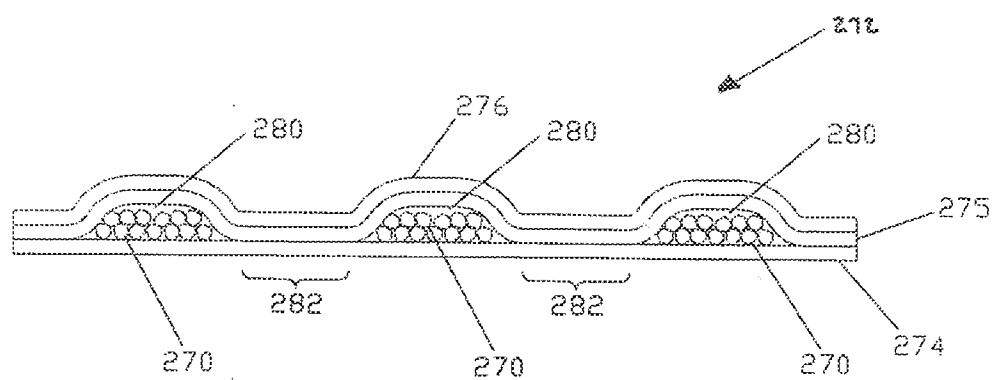


FIG. 44

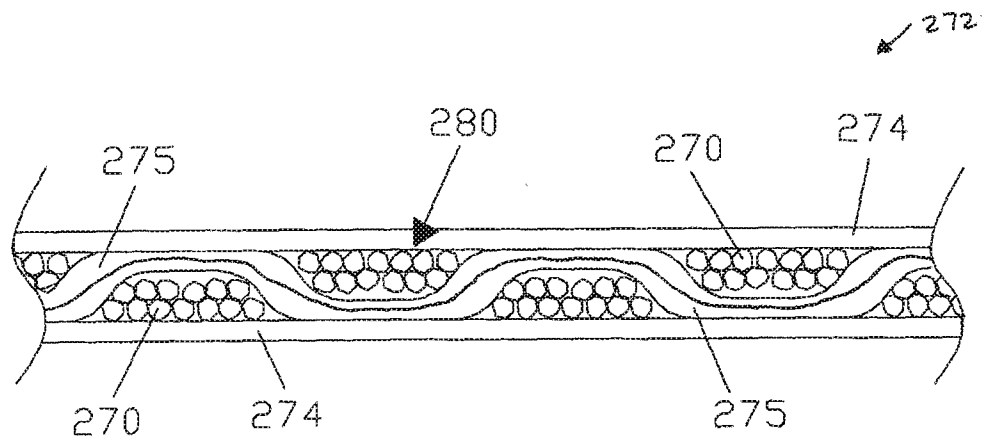


FIG. 45

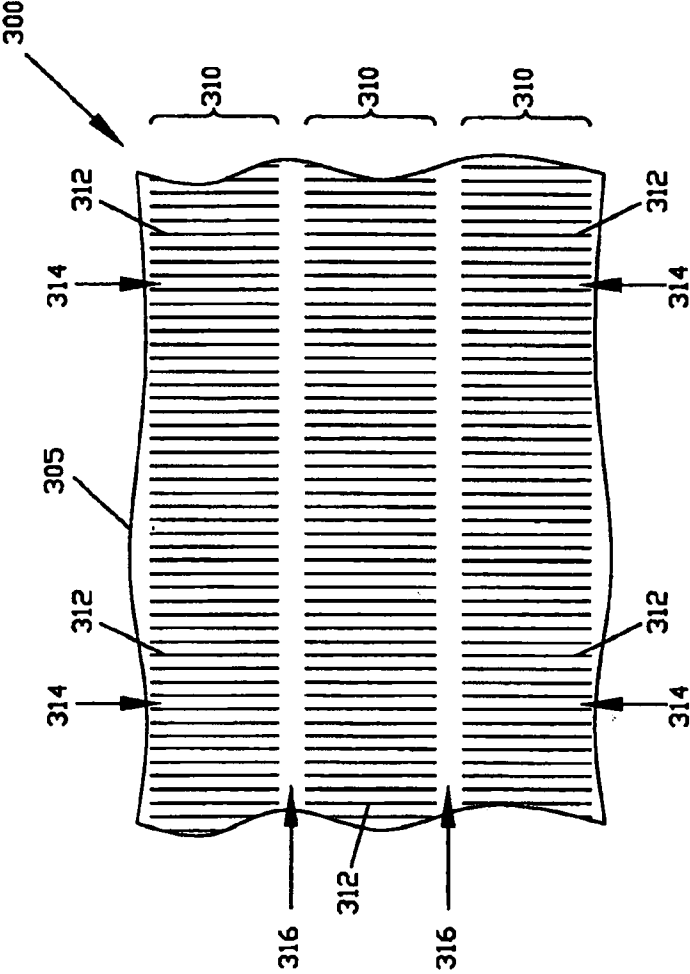


FIG. 46

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2009/047656

A. CLASSIFICATION OF SUBJECT MATTER

INV. A61F13/15

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)

EP0-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Y	WO 2006/017718 A (PROCTER & GAMBLE [US]; MATSUDA TOSHIYUKI [JP]; FUJIMOTO KENJI [JP]; NA) 16 February 2006 (2006-02-16) page 6, line 27 - page 7, line 9; figures 1-3	1-10
P,X	WO 2008/118713 A (PROCTER & GAMBLE [US]; HAMALL KENNETH MICHAEL [US]; LAVON GARY DEAN [U] 2 October 2008 (2008-10-02) page 6 - page 12; figures 1-5,8	1-10

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

☒ See patent family annex.

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Date of the actual completion of the international search

13 August 2009

Date of mailing of the international search report

26/08/2009

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Boccignone, Magda

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2009/047656

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Information on patent family members

International application No

PCT/US2009/047656

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