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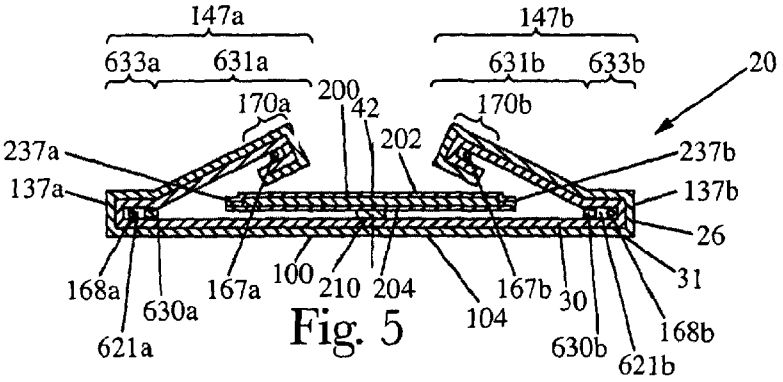

Fig. 5

(57) Abstract: A disposable absorbent article may comprise a chassis comprising side edges. The side edges of the chassis may comprise folded side edge segments disposed in the front and back waist regions and cut side edge segments disposed in the crotch region. The chassis may further comprise a barrier attachment zone disposed between a side edge of the absorbent assembly and the side edge of the chassis. The barrier attachment zone may extend continuously from the front waist region through the crotch region to the back waist region and may form an area of attachment between the side flaps and the backsheet. The chassis may also comprise an elastic gathering member disposed between the side barrier attachment zone and the side edge of the chassis.

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ABSORBENT ARTICLE COMPRISING A BARRIER ATTACHMENT ZONE

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. Consumers have different expectations based on the product forms they purchase, e.g. taped diapers or pull on diapers. The present invention addresses some of those needs by creating a simple flexible cuff/flap structure. The structure utilizes a barrier attachment which can be moved laterally inward or outward to adjust the relative heights of the cuff flap and side barrier. For consumers using taped diapers, performance may be most important. Thus, a taller cuff flap and shorter side barrier may be desirable since it provides a strong containment signal. On the other hand, pull on pant users have the need for ease of application, including placing the feet through the pre-formed leg openings. Thus, having a relatively shorter cuff flap and larger side barrier is advantageous for application because it makes the leg opening larger. The ability to make both of these cuff flap/side barrier constructions by simply moving the barrier attachment laterally inward or outward provides simple, low cost adjustability.

SUMMARY OF THE INVENTION

A disposable absorbent article may comprise an absorbent assembly comprising an absorbent core. The article may also comprise a chassis comprising a longitudinal axis, a lateral axis, a front waist region comprising a front waist edge, a back waist region comprising a back waist edge, a crotch region disposed between the waist regions, and laterally opposing side edges extending between the front waist edge and the back waist edge.

The side edges of the chassis may comprise folded side edge segments disposed in the front and back waist regions and cut side edge segments disposed in the crotch region. The chassis may comprise an exterior surface, and an interior surface to which the absorbent assembly is attached, a water-impermeable backsheet, and laterally opposing side flaps. Each of the side flaps may comprise a longitudinally extending first elastic gathering member attached at or adjacent to its proximal edge.

The chassis may further comprise a barrier attachment zone disposed between a side edge of the absorbent assembly and the side edge of the chassis. The barrier attachment zone may extend continuously from the front waist region through the crotch region to the back waist region and may form an area of attachment between the side flaps and the backsheet. The chassis may also comprise a second elastic gathering member disposed between the side barrier attachment zone and the side edge of the chassis.

BRIEF DESCRIPTION OF THE DRAWINGS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Figure 16 is a section view of an alternative embodiment of diaper 20 of Figure 1 comprising an inner liner taken at the section line 3-3.

Figure 17 is a section view of an alternative embodiment of diaper 20 of Figure 1 comprising an inner liner taken at the section line 6-6.

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

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

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

Figure 21 is a section view of an alternative embodiment of the side flaps 147 of Figure 1 comprising attached side flaps taken at the section line 4-4.

Figure 22 is a section view of the abdominal stretch panel 370 of Figure 1 taken along the longitudinal axis 42

Figure 23 is a section view of an alternative embodiment of the diaper 20 of Figure 1 taken along the longitudinal axis 42 comprising an inner liner.

Figure 24 is a simplified section view of an alternative embodiment of the interior surface 102 of Figure 1 taken at the section line 3-3.

Figure 25 is a plan view of an exemplary disposable absorbent article in the form of a diaper 20, which is shown in its flat, uncontracted state, i.e., without the contraction induced by elastic members. In Figure 25, the interior of the diaper is shown facing the viewer.

Figure 26 is a section view of the diaper 20 of Figure 25 taken at the section line 3-3.

Figure 27 is a section view of the diaper 20 of Figure 25 taken at the section line 4-4.

Figure 28 is a section view of the diaper 20 of Figure 25 taken at the section line 5-5.

Figure 29 is a section view of the diaper 20 of Figure 25 taken at the section line 6-6.

Figure 30 is a plan view of an exemplary disposable absorbent article in the form of a diaper 20, which is shown in its flat, uncontracted state, i.e., without the contraction induced by elastic members. In Figure 30, the interior of the diaper is shown facing the viewer.

DETAILED DESCRIPTION OF THE INVENTION

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

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

The term "diaper" refers to an absorbent article that is generally worn by infants and incontinent persons about the lower torso and that is specifically adapted to receive and contain urinary and fecal waste. A diaper may be in the form of a taped diaper or a pull-on (pant style) diaper.

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

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

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

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

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

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

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

The terms "water-permeable" and "water-impermeable" refer to the penetrability of materials in the context of the intended usage of disposable absorbent articles. Specifically, the term "water-permeable" refers to a layer or a layered structure having pores, openings, and/or interconnected void spaces that permit liquid water to pass through its thickness in the absence of

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

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

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

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

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

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

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

Description of Exemplary Diaper Embodiment

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

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

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

The basic structure of the diaper 20 also includes an absorbent assembly 200 that may be attached to the chassis 100. The absorbent assembly 200 has a laterally extending front edge 236 in the front waist region 36 and a longitudinally opposing and laterally extending back edge 238

in the back waist region 38. The absorbent assembly 200 has a longitudinally extending left side edge 237a and a laterally opposing and longitudinally extending right side edge 237b, both absorbent assembly side edges extending longitudinally between the front edge 236 and the back edge 238. The absorbent assembly 200 has an interior surface 202 and an exterior surface 204. The absorbent assembly 200 may be disposed symmetrically with respect to either or both of the longitudinal axis 42 and the lateral axis 44. Alternatively, the absorbent assembly 200 may be disposed asymmetrically with respect to either or both of the longitudinal axis 42 and the lateral axis 44. For example, the absorbent assembly 200 shown in Figure 1 is disposed symmetrically with respect to the longitudinal axis 42 and asymmetrically with respect to the lateral axis 44. In particular, the absorbent assembly 200 shown in Figure 1 is disposed asymmetrically toward the front waist region 36.

The respective front edge 236, back edge 238, left side edge 237a, and right side edge 237b of the absorbent assembly 200 may lie inward of the respective front waist edge 136, back waist edge 138, left side edge 137a, and right side edge 137b of the chassis 100, as in the exemplary diaper 20 shown in Figure 1. In certain embodiments, the front edge 236 and back edge 238 of the absorbent assembly 200 may lie inward of the front and back interior abdominal stretch panels 370 and 390, e.g., between the proximal edges 372 and 392 of the interior abdominal stretch panels 370 and 390 and the lateral axis 44. Alternatively, one or more of the edges of the absorbent assembly 200 may coincide with the corresponding edge(s) of the chassis 100. In yet another alternative embodiment, as shown in Figures 1 and 22, the interior front and back abdominal stretch panels 370 and 390 may overlap a portion of the absorbent assembly 200. In such an overlapping configuration, it may be advantageous for the interior abdominal stretch panels 370 and/or 390 to remain unattached to the absorbent assembly 200 over a portion of the longitudinal extent of the abdominal stretch panel 370 and/or 390, particularly in the laterally central portions of the chassis, i.e., area between the laterally opposing side flaps 147, for example 117 and 118, to provide an abdominal stretch panel waist cap or stand up waist feature forming a pocket 650 which helps to prevent leakage of urine and/or feces at the waist.

The chassis 100 and 100 may additionally include an inner liner 22 attached to the backsheet 26 and/or the absorbent assembly 200 as illustrated in Figures 16 and 17. The inner liner 22 may form a portion of the interior surface 102 of the chassis 100 that is intended to be placed against the body of the wearer. The inner liner 22 may be formed of a soft material that will not irritate the skin of the wearer. Such an inner liner 22 may serve to isolate the skin of the wearer from a portion of the backsheet 26 as may be desirable, for example, when the diaper 20

is worn under conditions in which contact between the skin and a backsheet 26 could be uncomfortable. Many suitable materials for the inner liner 22 are well-known in the art, including rayon and synthetic nonwovens such as spunbonded or carded polypropylene or polyester. The inner liner 22 may extend to the same width and the same length as the backsheet 26.

Alternatively, one or more of the edges of the inner liner 22 may lie inward of the edges (i.e., side edges 137a and b, and waist end edges 136 and 138) of the chassis 100. For example, with reference to the exemplary diaper 20 shown in Figure 1 only the portions of the inner liner 22 (see Figures 16 and 17) lying in a front gap 606 between the front edge 236 of the absorbent assembly 200 and the front waist edge 136 of the chassis 100 and a back gap 607 between the back edge 238 of the absorbent assembly 200 and the back waist edge 138 of the chassis 100 are exposed, while the remainder of the inner liner 22 is covered by the absorbent assembly 200 and the side flaps 147a and b. Therefore, a laterally extending strip of the inner liner 22 disposed in the front gap 606 in the front waist region 36 and a similar laterally extending strip of the inner liner 22 disposed in the back gap 607 in the back waist region 38 may suffice to isolate the skin of the wearer from the backsheet 26 in these two gaps. The inner liner 22 may be partially disposed under the side flaps 147 or alternatively the inner liner 22 may be disposed on top of the side flaps 147 in one or both of the waist regions 36 and 38. In certain embodiments, as shown in Figure 23, the inner liner 22 may overlap a portion of the absorbent assembly 200. In such an overlapping configuration, it may be advantageous for the inner liner 22 to remain unattached to the absorbent assembly 200 over a portion of the longitudinal extent of the inner liner 22 particularly in the laterally central portions, area between the laterally opposing side flaps 147, for example 117 and 118, to provide an inner liner waist cap or stand up waist feature forming a pocket 650 which helps to prevent leakage of urine and/or feces at the waist.

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

exterior abdominal stretch panel 360 is shown attached exteriorly to the chassis 100 in the front waist region 36. Finally, in Figure 2 and Figure 6, a back exterior abdominal stretch panel 380 is shown attached exteriorly to the chassis 100 in the back waist region 38 of the diaper 20. The abdominal stretch panel may be applied to the surface of the absorbent article in an untensioned state, i.e. the abdominal stretch panel applies little or no contractive force on the article until the waist region of the article is extended laterally, e.g. during application. Alternatively, the abdominal stretch panel may be applied to the surface of the absorbent article under tension and therefore applies some contractive force to the waist region of the article prior to use.

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

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

down on their own. Finally, the abdominal stretch panels 360, 370, 380, and 390 should provide an adequate level of wearing force or sustained fit force (i.e., the force that the abdominal stretch panels 360, 370, 380, and 390 apply to the waist of the wearer during wear providing the requisite sustained fit, including maintaining the position, fit, and gasketing of the diaper 20 at the waist, without marking the skin).

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

Description of the Chassis

The chassis 100 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. Multi-layer backsheets, such as a laminate of a film 30 and a nonwoven material 31 or a laminate of multiple nonwoven layers, may also be suitable for use as the backsheet 26. Such a backsheet may be oriented with the nonwoven 31 disposed exteriorly of the film, as shown in Figure 1, Figure 2, Figure 3, Figure 4, Figure 5, and Figure 6, to provide the feel and appearance of a more cloth-like outermost layer than would be provided by using the film 30 as the outermost layer. A multi-layer backsheet 26, such as a laminate of a film 30 and a nonwoven 31, may also be suitable for use with the nonwoven 31 disposed interiorly to separate the film 30 from the skin of the wearer, or with nonwoven 31 disposed both exteriorly and interiorly, such that the film 30 is sandwiched. In addition, the nonwoven 31 and film 30 layers of the multi-layer laminate may have different widths, for example the film 30 may be wider than the nonwoven 31 or alternatively the nonwoven 31 may be wider than the film 30.

As shown in Figure 1, Figure 2, Figure 3, Figure 4, Figure 5, and Figure 6, the exemplary chassis 100 has longitudinally extending and laterally opposing side flaps 147 that are disposed on the interior portion of the diaper 20 that faces inwardly toward the wearer and contacts the wearer. The side flaps 147 may be formed by folding portions of the chassis 100 laterally inward, *i.e.*, toward the longitudinal axis 42, to form both the respective side flaps 147 and the side edges 137 of the chassis 100. Alternatively, as shown in Figure 21, the side flaps 147 may

be formed by attaching an additional layer or layers to the chassis 100 at or adjacent to each of the respective side edges 137 of the chassis 100.

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

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

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

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

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

web 149 may extend longitudinally to the full extent, length, of the film 30 or alternatively the nonwoven 31 may have a longitudinal extent that is less than that of the film 30 layer. In an embodiment where the nonwoven 31 has a length, longitudinal extent, that is less than that of the film 30, the portion of the chassis 100 uncovered by the nonwoven 31 in the front and/or back waist regions 36 and 38 may be covered by the abdominal stretch panels 360, 370, 380, and 390.

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

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

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

100. This lifting of the proximal edges 157 when the diaper 20 is in the relaxed condition lifts the side flaps 147 into position to serve as side barriers adjacent to the side edges 237 of the absorbent assembly 200.

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

As shown in Figures 2, 4, 5, 18, 19 and 20 the side flaps 147 may be formed into cuff flaps 631 and side barriers 633. Particularly, side barrier attachments 630 may be oriented between the first and second elastic strands 167 and 168. The placement of side barrier attachments 630 relative to the longitudinal axis 42 has a direct and coupled effect on the depth of cuff flaps 631 and the size of the side barriers 633. For example, when the side barrier attachments 630 are moved laterally inward, the depth of the cuff flaps 631 decreases and the size of the side barriers 633 increases. Conversely, as shown in Figure 18, when the side barrier attachments 630 are moved laterally outward, the depth of the cuff flaps 631 increases and the size of the side barriers 633 decreases. The depth and/or size of the cuff flaps 631 and side barriers 633 may be adjusted for various applications to provide enhanced functionality. In one such embodiment, as shown in Figure 19, it has been found that reduced depth cuff flaps 631 and larger side barriers 633 provides better application ease with regard to a pull-on pant style application. This configuration increases the size of the leg opening (not shown in Figure 19) enabling the wearer to step into the diaper 20 more easily. In yet another embodiment, it has been found that increasing the depth of the cuff flaps 631 and reducing the size of the side barriers 633 provides improved leakage protection and increased perception of capacity.

The depth of the cuff flaps 631 as measured from the proximal edge 157 of the side flap 147 to the side barrier attachment 630 may be from about 2 cm to about 7 cm, from about 2.5 cm to

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

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

As shown in Figures 25-30, the basic structure of the diaper 20 includes a chassis 100. The chassis 100 has a laterally extending front waist edge 136 in the front waist region 36 and a longitudinally opposing and laterally extending back waist edge 138 in the back waist region 38. The finished chassis 100 has longitudinally extending front folded side edge segments 133a and 133b in the front waist regions, longitudinally opposing longitudinally extending back folded side edge segments 133c and 133d in the back waist region, and longitudinally extending cut side edge segments 135 in at least the crotch region, each of the cut side edge segments 135 connecting the respective front and back folded side edge segments 133. In combination, the respective folded side edge segments 133 and cut side edge segments 135 form the composite side edges 137, which connect the front waist edge and the back waist edge. The chassis 100 has an interior surface 102 and an exterior surface 104. The chassis 100 also has a longitudinal axis 42 and a lateral axis 44. The longitudinal axis 42 extends through the midpoint of the front waist edge 136 and through the midpoint of the back waist edge 138. The lateral axis 44 extends through the midpoint of the left side edge 137a and through the midpoint of the right side edge 137b. The exemplary chassis 100 shown in Figure 25 additionally has longitudinally extending and laterally opposing side flaps 147a and 147b that are described in more detail below.

In the finished diaper, the chassis has a generally "hourglass" shape, as in the exemplary diaper 20 shown in Figure 25. Such a non-rectangular shape may be desirable in order to impart a tailored appearance to the diaper 20 when it is worn. Such a non-rectangular shape may also

be desirable in order to impart an impression that the diaper 20 will fit comfortably between the legs of a wearer.

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

The contour of the side notch 139 that is formed by the removal of folded material along the cut side edge segment 135 is defined by the contour of that cut side edge segment. The contour may be continuously arcuate. Alternatively, the contour may be a composite formed by two longitudinally opposing arcuate portions 140 and a generally straight intermediate portion 141 connecting the arcuate portions, and thus not continuously arcuate, as in the exemplary diapers 20 shown in Figure 25. The side notches 139 may be disposed symmetrically with respect to either or both of the longitudinal axis 42 and the lateral axis 44 of the chassis 100. For example, the side notches 139 are shown disposed symmetrically with respect to both the longitudinal axis 42 and the lateral axis 44 in Figure 25. Alternatively, the side notches 139 may be disposed asymmetrically with respect to either or both of the longitudinal axis 42 and the lateral axis 44. For example, the side notches 139 may be disposed symmetrically with respect to the longitudinal axis 42 and asymmetrically with respect to the lateral axis 44, for example where the side notches are offset toward the front waist edge 136.

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

preferably acts as a dam to prevent the lateral escape of bodily waste material in the gap between the longitudinally separated front and back folded side edge segments.

A single barrier attachment 630 may be used to attach each side flap 147 or, alternatively, two or more barrier attachments 630 may be used to attach each side flap 147. One or more barrier attachments 630 used to attach each side flap can be described as forming a barrier attachment zone (that is, each side flap having its own barrier attachment zone). For example, in the exemplary diaper 20 shown in Figure 25, two laterally spaced barrier attachments 630 may be used to attach each side flap 147. As another example, a single barrier attachment 630 may be used to attach each side flap 147 in the exemplary diapers 20. As yet another example, four laterally spaced barrier attachments 630 may be used to attach each side flap 147 in the exemplary diaper 20. The use of a single barrier attachment 630 for each side panel 147 may help to minimize the cost of the diaper 20. On the other hand, the use of more than one barrier attachment 630 for each side panel 147 may help to prevent the lateral escape of bodily waste materials in the event that one side seal is not perfectly continuous and thereby allows flow past itself.

The barrier attachments 630 may be oriented generally parallel to the longitudinal axis 42 and to each other, as shown in Figure 25. The barrier attachments 630 may be configured as mirror images of each other.

The barrier attachments 630 may be formed by heat bonding, pressure bonding, a combination of heat bonding and pressure bonding, ultrasonic bonding, adhesive bonding, or in any other way or combination of ways known in the art for forming laterally water-impermeable bonds. Each barrier attachment 630 may extend from the front waist edge 136 to the back waist edge 138, as shown in Figure 25. Alternatively, a barrier attachment 630 may extend less far in the longitudinal direction. For example, a barrier attachment 630 may extend longitudinally only as far as the respective cut side edge segment 135 extends.

The barrier attachment 630 may initially extend through the side portion of the chassis 100 that is eventually removed to form the side notch 139. Exemplary barrier attachments 630 remaining longitudinally continuous after the formation of the side notches 139 are also shown in the finished exemplary diaper 20 of Figure 25 and Figure 30..

The barrier attachments 630 may be substantially linear in form as shown in Figure 25. Alternatively, a barrier attachment 630 may be curvilinear in form. For example, a barrier attachment 630 may have a contour generally concentric to the contour of the cut side edge segment 135 and thereby "follow" the contour of the cut side edge segment from a point at or

adjacent to a respective front folded side edge segment 133a or 133b to the respective corresponding back folded side edge segment 133c or 133d. In such a configuration, the combination of the front folded side edge segment, the side seal, and the back folded side edge segment may form a longitudinally continuous barrier to the lateral flow of bodily waste material between the front and back waist edges. As another alternative in which a combination of the front folded side edge segment, the side seal, and the back folded side edge segment may form a longitudinally continuous barrier to the lateral flow of bodily waste material, a barrier attachment 630 may be sufficiently wide to extend from laterally inward of the cut side edge segment 135 to the folded side edge segments 133, such as the exemplary side seals shown in Figure 30.

Each barrier attachment 630 may be formed as a relatively narrow stripe being at least ten times as long as it is wide, such as the exemplary side seals shown in Figure 25. Alternatively, each barrier attachment 630 may be formed as a relatively wide band being less than ten times as long as it is wide, such as the exemplary side seals shown in Figure 30.

At and/or adjacent to each of the side edges 137 of the chassis, the front waist region 36 and the back waist region 38 are attached together to form the finished pant product having a waist opening 10 and two leg openings 12. This attachment may have the form of side seams 115. Such a side seam may be formed where the waist regions are overlapped such that the interior surface of one lies against the exterior surface of the other. In another form, a side seam may be formed where the side edges in the waist regions are abutted. In another form, a side seam may be formed where either the interior surfaces or the exterior surfaces of the waist regions are in face-to-face contact, i.e., in a so-called flanged attachment. Such flanged attachments are shown in Figure 7, Figure 8, and Figure 9.

Referring to Fig. 7, side seam 115 may comprise primary closure members 700 which are refastenable. The primary closure members 700 may comprise any refastenable fastening components known in the art. For example, the primary closure members 700 may comprise mechanical fasteners, e.g. hook and loop fasteners, hook and hook fasteners, macrofasteners, buttons, snaps, tab and slot fasteners, tape fasteners, adhesive fasteners, cohesive fasteners, magnetic fasteners, hermaphrodidic fasteners and the like. Some suitable examples of fastening systems and/or fastening elements are discussed in U.S. Patent Nos. 3,848,594; 4,662,875; 4,846,815; 4,894,060; 4,946,527; 5,151,092; 5,221,274; 6,251,097; 6,669,618; and 6,432,098; U.S. Patent Application Serial Nos. 11/240,943, entitled, "Anti-Pop Open Macrofasteners" filed on September 30, 2005; and 11/240,838, entitled, "A Fastening System Having Multiple Engagement Orientations", filed on September 30, 2005. Additionally, various suitable pant

configurations are disclosed in U.S. Patent Nos. 5,246,433; 5,569,234; 6,120,487; 6,120,489; 4,940,464; 5,092,861; 5,897,545; 5,957,908; and U.S. Patent Publication Nos. 2003/0233082; 2005/0234419A1; 2003/0088220; 2005/0130821; 2003/0233082; 2005/0215971; 2005/0215970; 2007/0078427; 2007/0093769; 2007/0074381; 2007/007 8426A1; and 2008-0107861.

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

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

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

extensibility may be desirable in order to minimize the cost of the diaper. For example, an amount of material that would otherwise be sufficient only to make a relatively smaller diaper lacking this extensibility can be used to make a diaper capable of being extended to adequately cover a wearer that is larger than the unextended smaller diaper would fit.

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

Additional lateral extensibility in the chassis 100 may be provided in a variety of ways. For example, a material or materials from which the chassis 100 is made may be pleated by any of many known methods. Alternatively, all or a portion of the chassis may be intermittently activated to create a structured elastic-like formed web material or a formed laminate of web materials like those described in U.S. Patent No. 5,518,801 issued on 21 May 1996 in the name of Chappell *et al.* This formed web material 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.

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

As illustrated in Figure 24, when exterior abdominal stretch panels 360 and 380 are used, but not interior abdominal stretch panels 370 and 390, ring-roll type (e.g. continuous) activation may create corrugations 636 in the interior of the waist regions 36 and 38. Specifically, the chassis 100 (including the backsheet 26, side flaps 147, and inner liner 22 (when present)), may be corrugated to provide an undulating inner surface 102, forming the corrugations 636. These corrugations 636 are believed to promote breathability and, overall, a healthier environment for the wearer's skin, particularly in the waist region.

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

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

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

Description of the abdominal stretch panels

As shown in the figures, each abdominal stretch panel has a circumferentially extending longitudinally distal edge that is disposed at or adjacent to the respective waist edge of the chassis 100 and a longitudinally opposing circumferentially extending longitudinally proximal edge that is disposed relatively nearer to the lateral axis 44 than the longitudinally distal edge of the same abdominal stretch panel is disposed. As shown in Figures 10 and 11, each abdominal stretch panel also has laterally opposing longitudinally extending side edges 373, an interior surface 374, and an exterior surface 375.

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

interior surface 364, and an exterior surface 365. Similarly, when present, the back exterior abdominal stretch panel 380 has a distal edge 381, a proximal edge 382, side edges 383, an interior surface 384, and an exterior surface 385.

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

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

Description of the Absorbent Assembly

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

The absorbent assembly 200 may be attached to the interior surface 102 of the chassis 100 over any part or the whole of the area of the absorbent assembly 200. The absorbent assembly 200 may be attached on its exterior surface 204 to the chassis 100 in a shaped attachment pattern,

for example a cruciform attachment pattern, *i.e.,* an attachment pattern that forms or is arranged in a cross or "+" shape.

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

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. A disposable 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 chassis;

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 chassis, respectively;

the chassis further comprising a barrier attachment zone disposed between a side edge of the absorbent assembly and the side edge of the chassis;

a cuff flap formed between the barrier attachment zone and the proximal edge of the side flap;

a side barrier formed between the barrier attachment zone and the distal edge of the side flap;

wherein the lateral disposition of the barrier attachment zone determines the relative lateral dimensions of each of the cuff flap and side barrier;

wherein the lateral width of the side flap, as measured from its distal edge to its proximal edge, is equal to the sum of the lateral widths of the cuff flap, side barrier, and barrier attachment zone; and

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

2. The disposable absorbent article according to Claim 1, wherein the chassis comprises a first activation pattern in the front waist region and/or the back waist region, and wherein the crotch region of the chassis is not activated or comprises a second activation pattern which is different from the first activation pattern.

3. The disposable absorbent article according to any of the preceding claims, wherein the front waist region and the back waist region being attached together at or adjacent to the respective side edges and thereby forming a waist opening and two laterally opposing leg openings.

4. The disposable absorbent article according to any of the preceding claims, wherein at least one abdominal stretch panel attached to the interior surface or the exterior surface of the chassis in the front waist region or the back waist region and comprising a circumferentially extending longitudinally distal edge disposed at or adjacent to the respective waist edge and a longitudinally opposing circumferentially extending longitudinally proximal edge, the at least one abdominal stretch panel providing a circumferential contractive force around the waist opening when the chassis is stretched circumferentially.

5. The disposable absorbent article according to any of the preceding claims, wherein the barrier attachment zone comprises a plurality of barrier attachments.

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

7. The disposable absorbent article according to any of the preceding claims, wherein the closure member is refastenable.

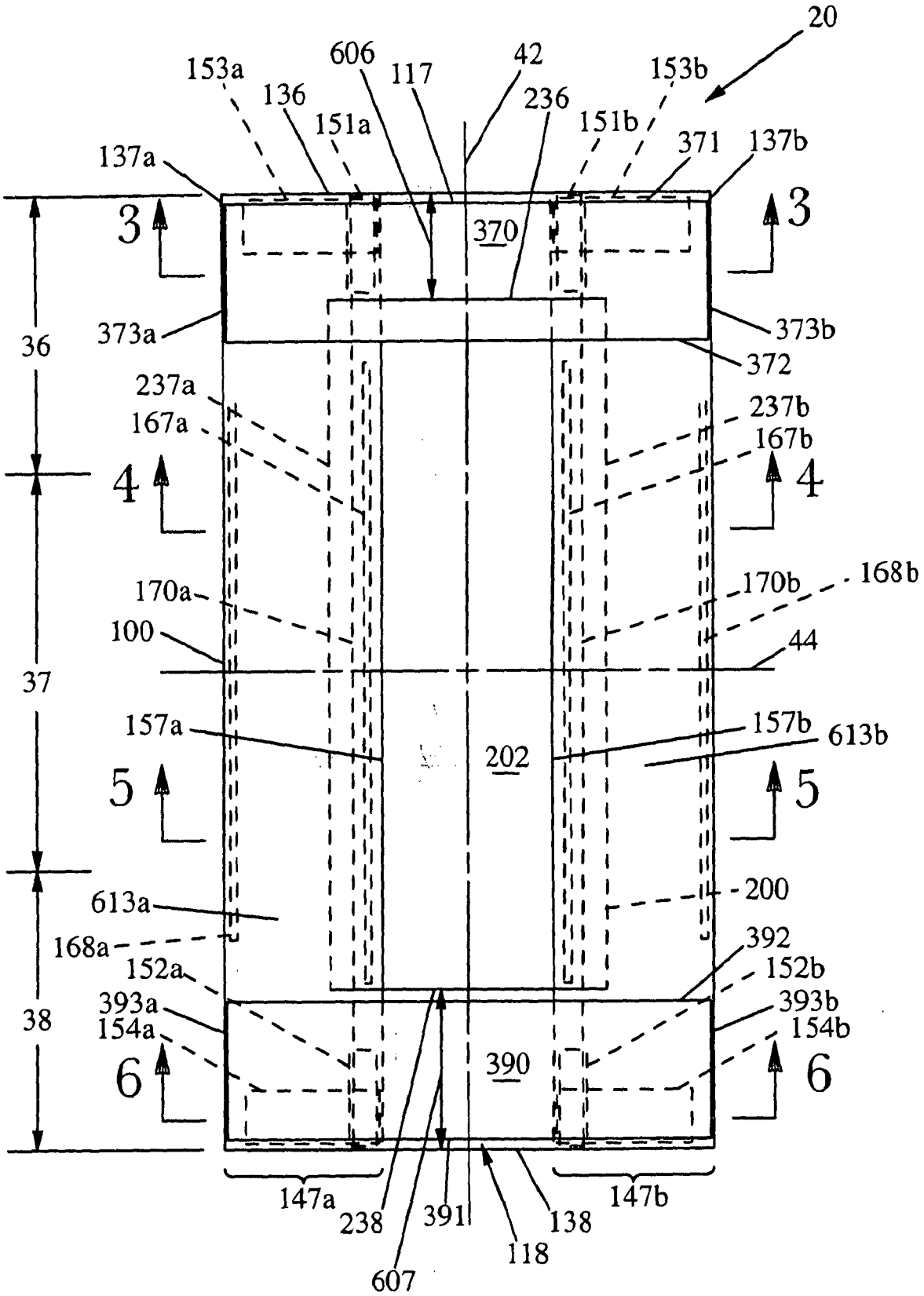
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Fig. 1

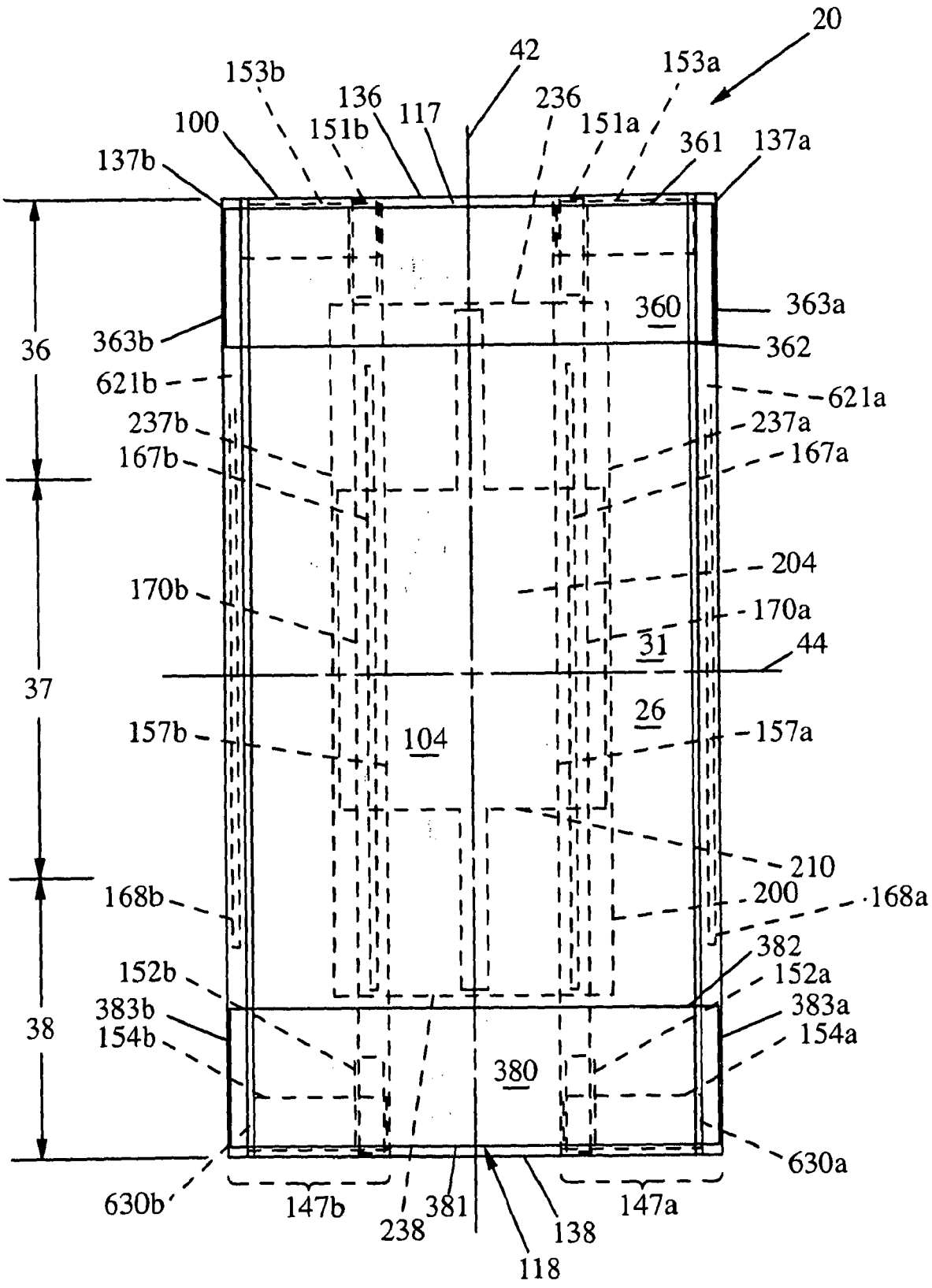
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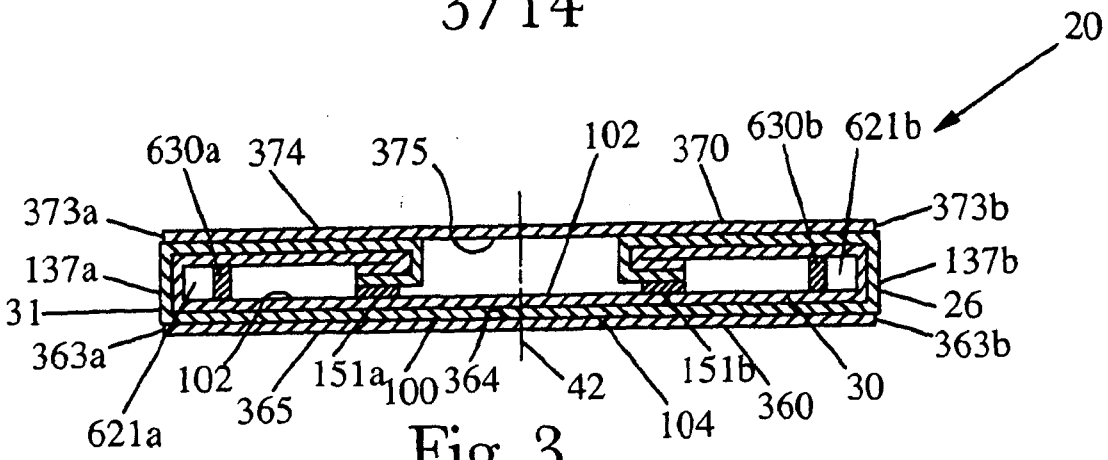
Fig. 2



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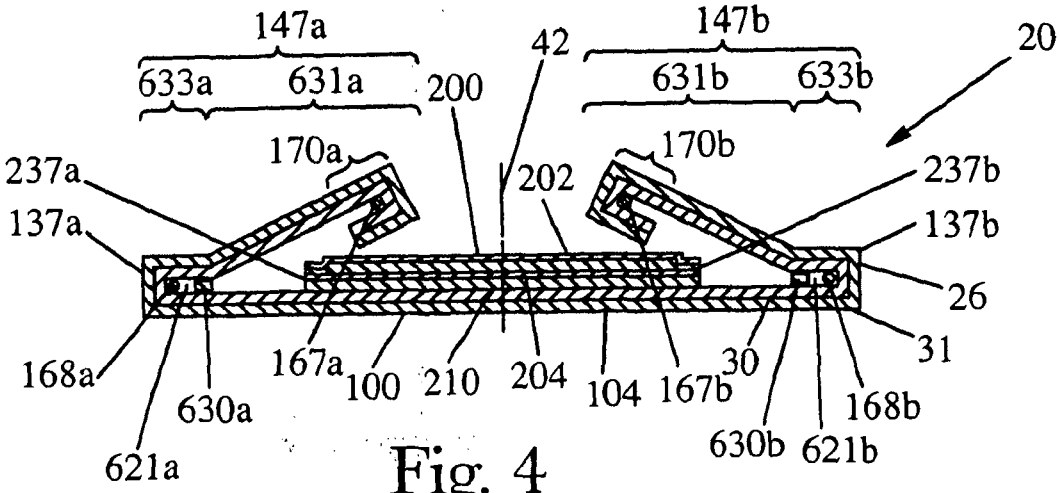
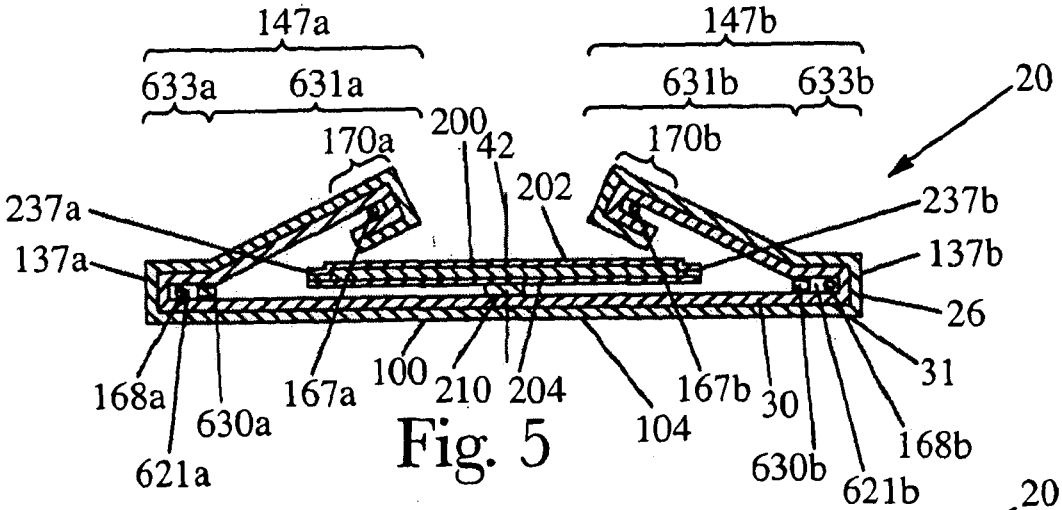


Fig. 4



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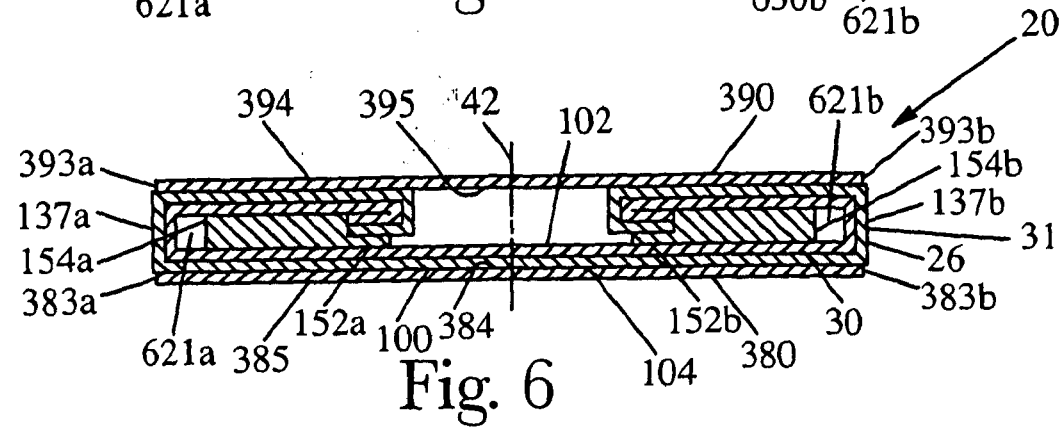

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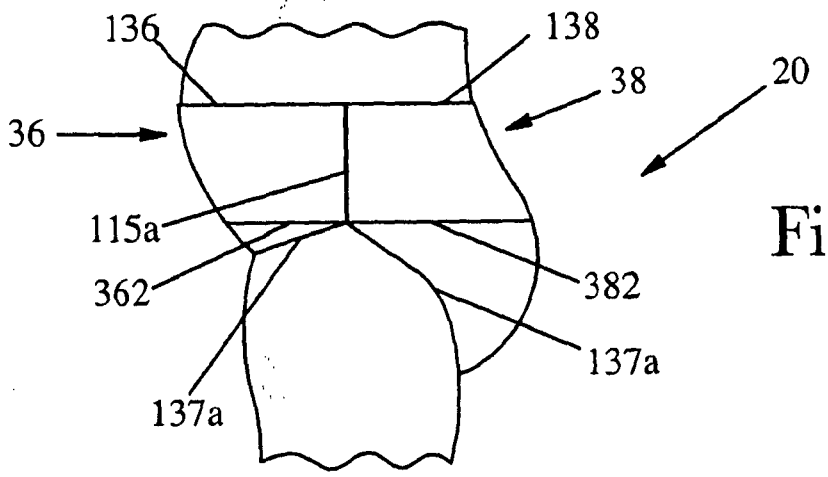

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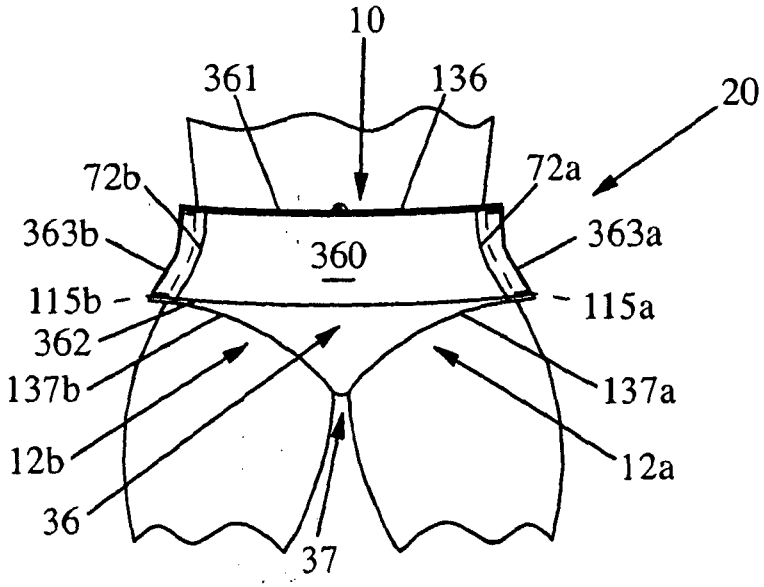

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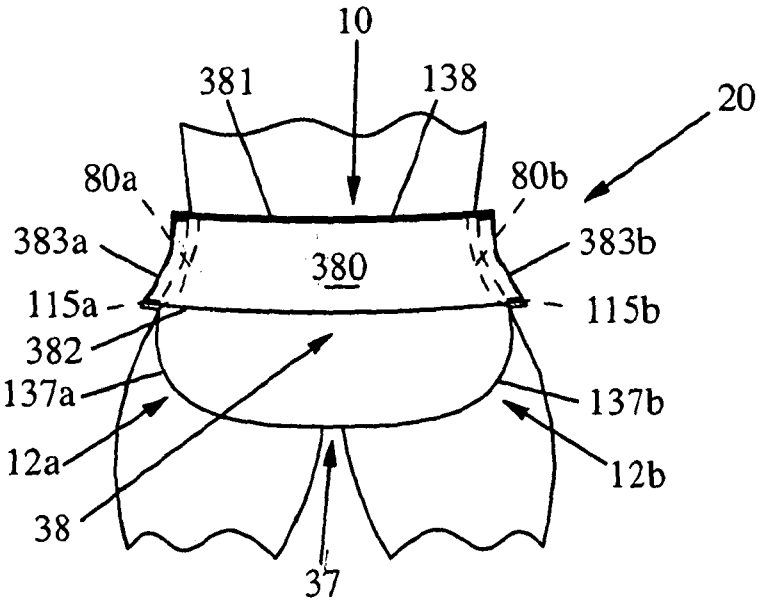

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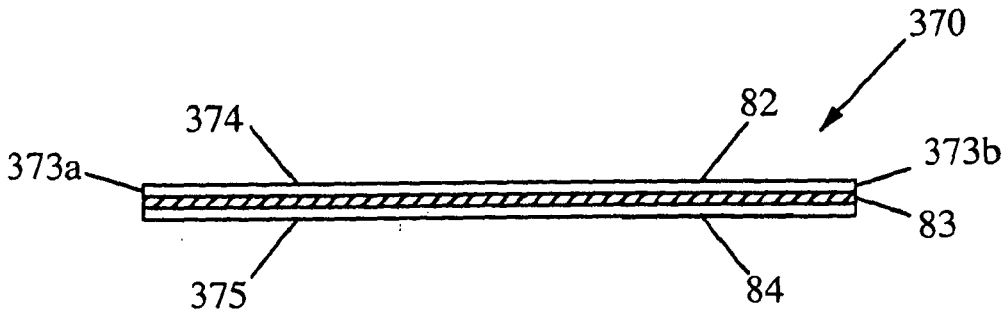
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Fig. 10

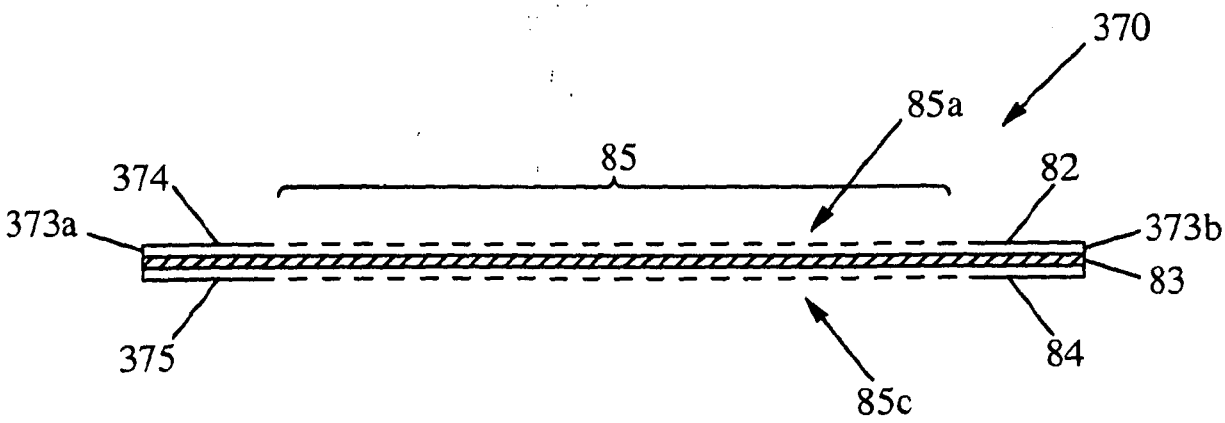
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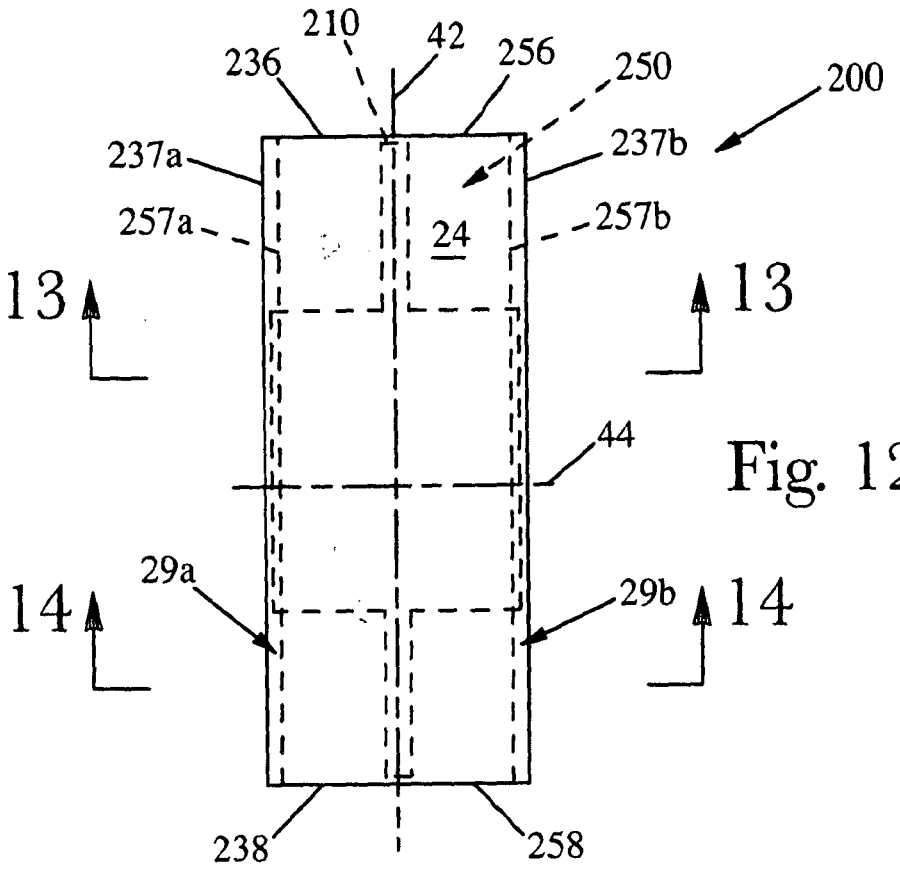
Fig. 11



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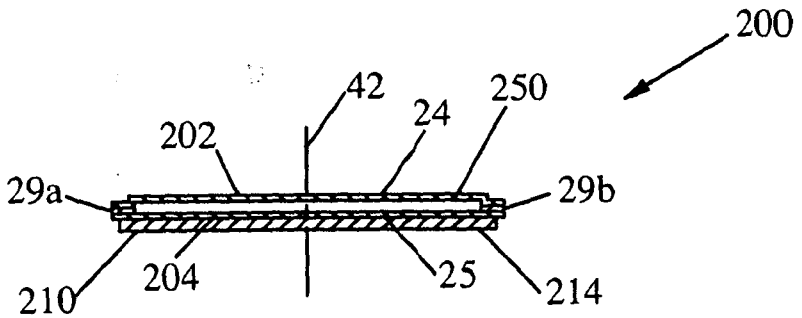

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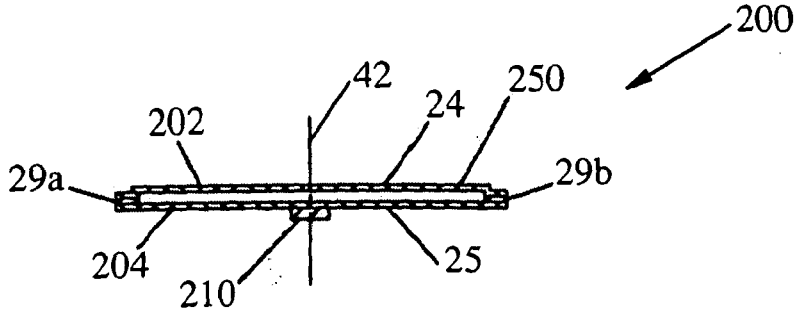

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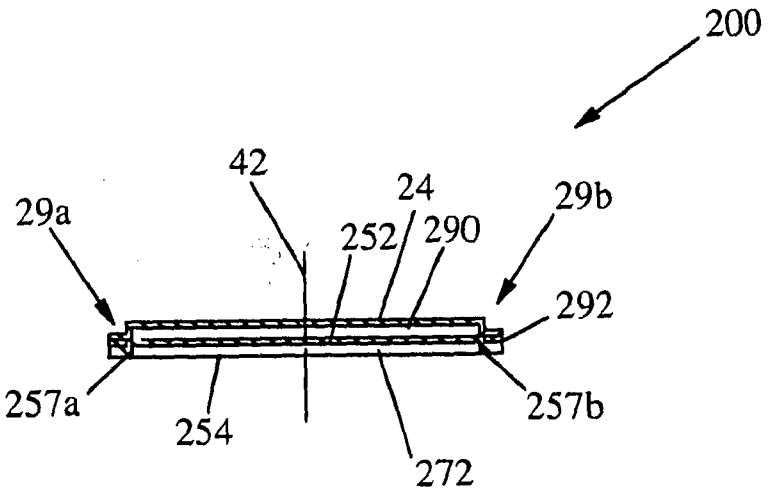

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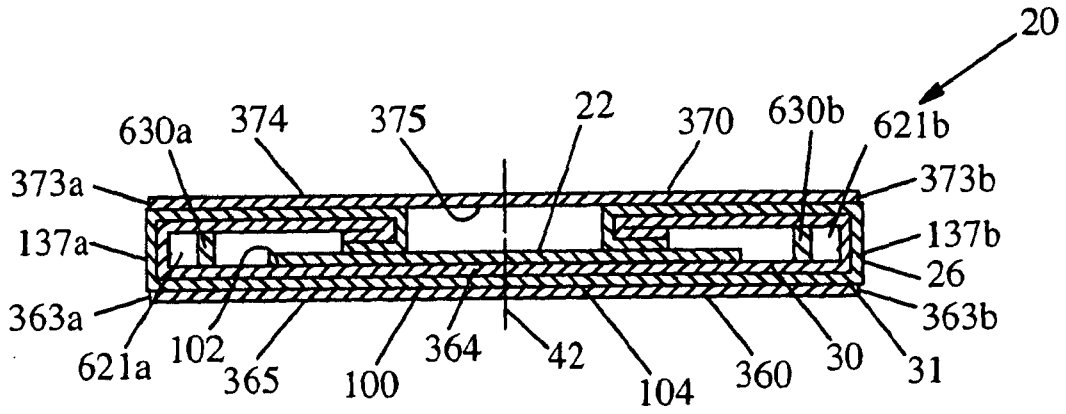
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Fig. 16

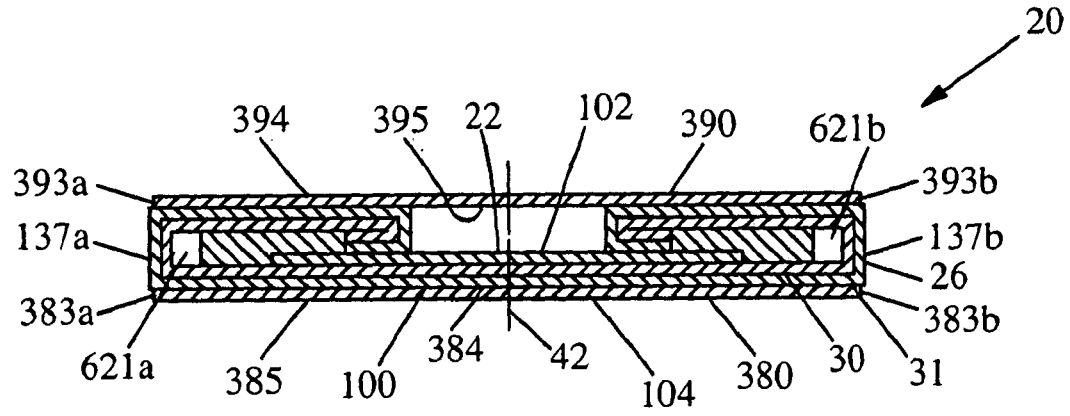
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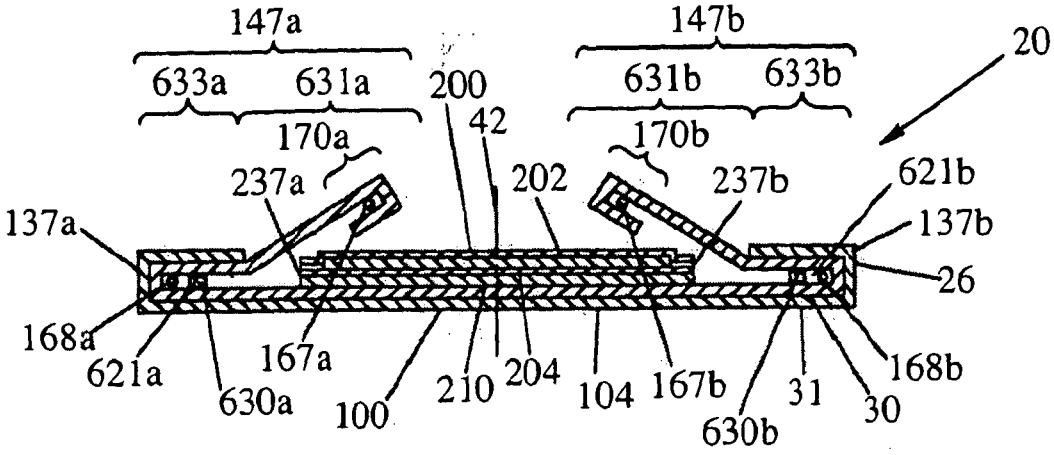
Fig. 17



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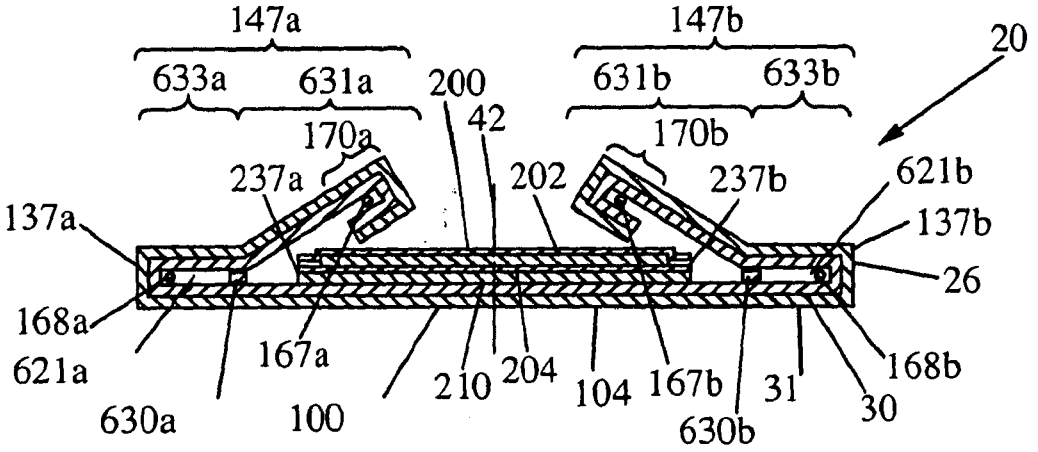

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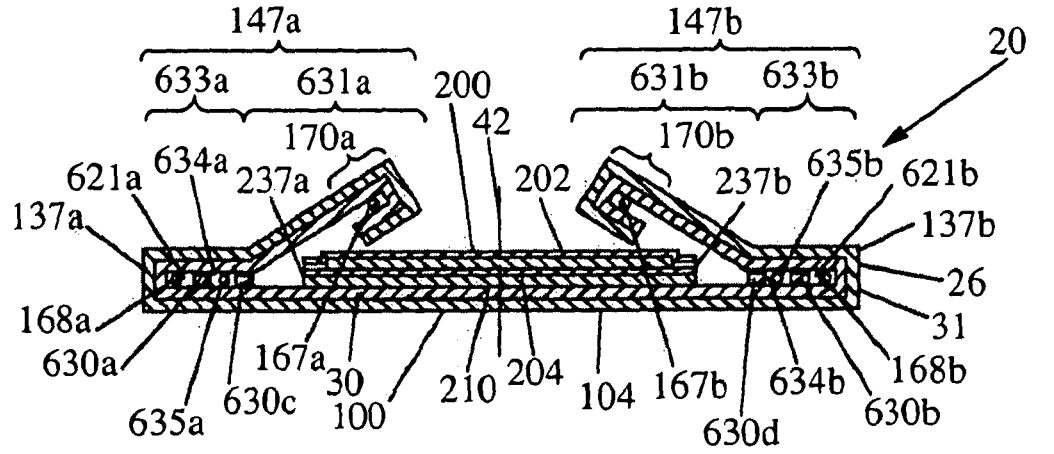

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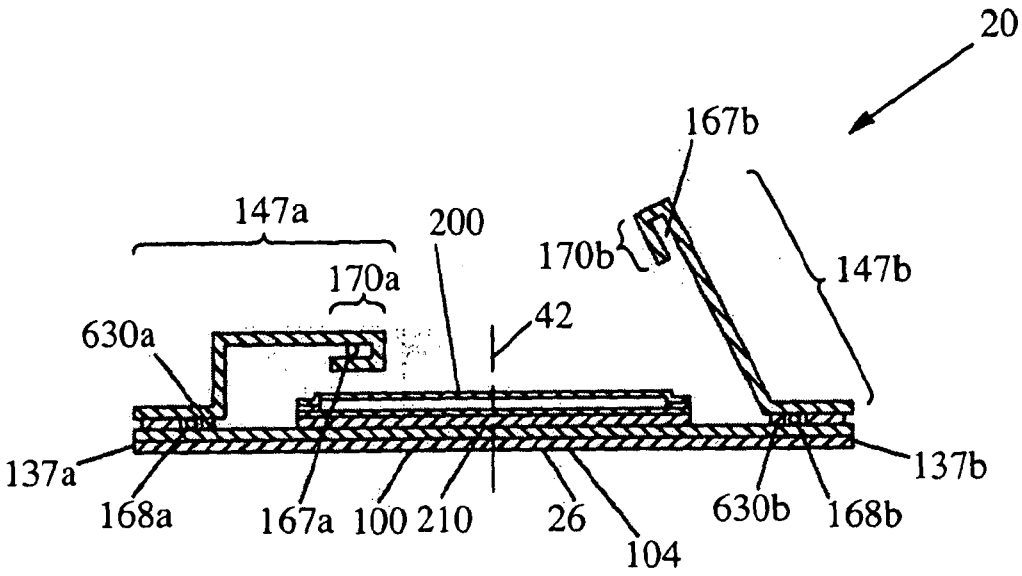

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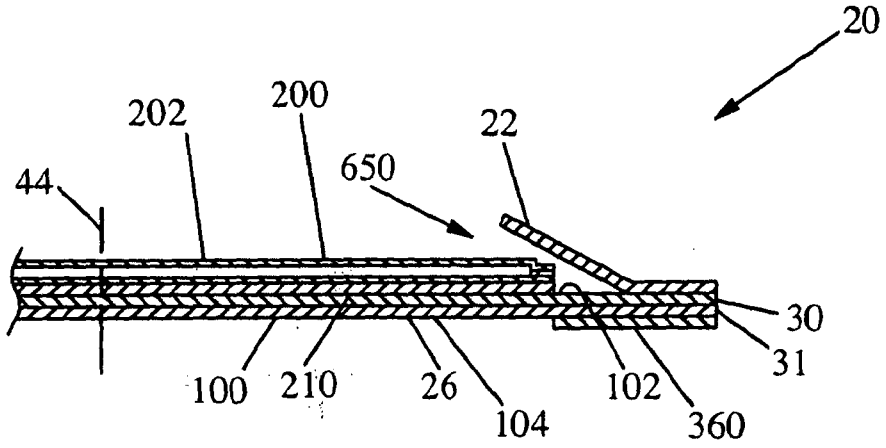

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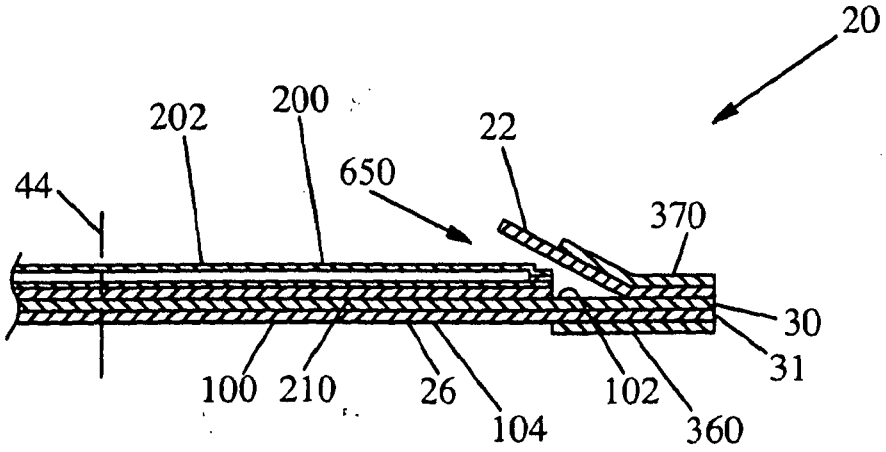

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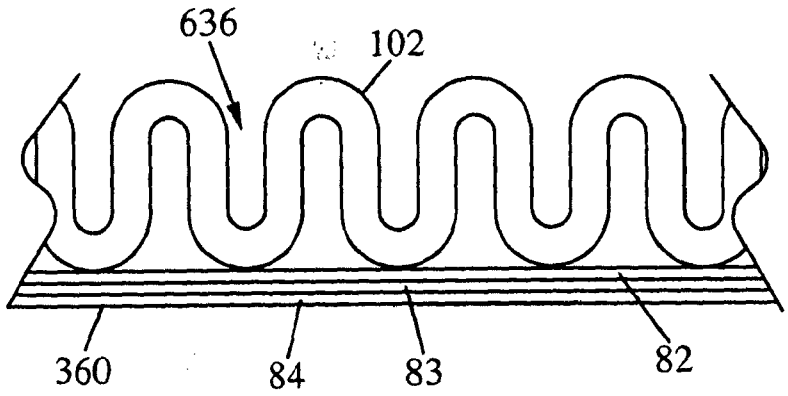

Fig. 24

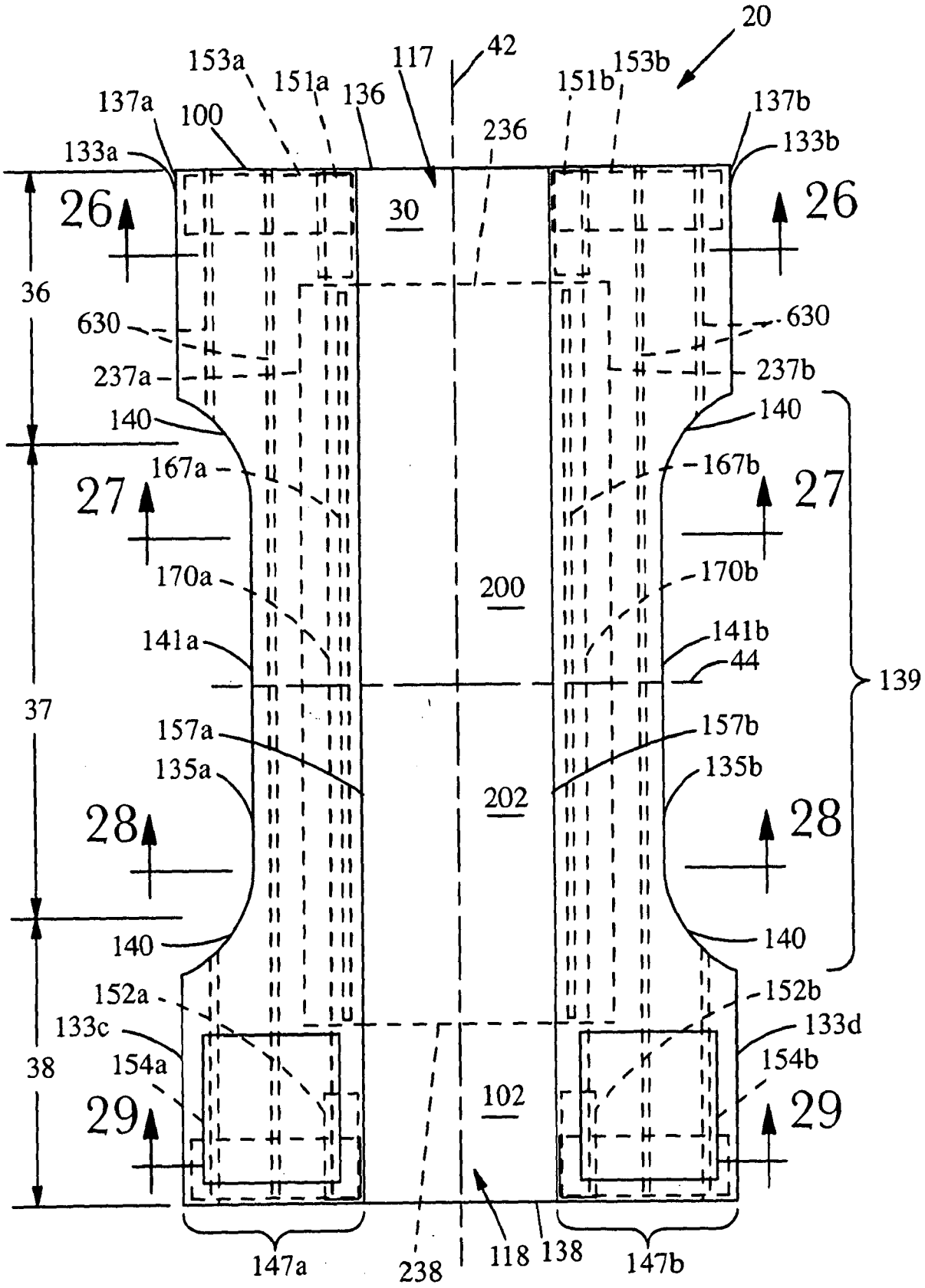
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Fig. 25

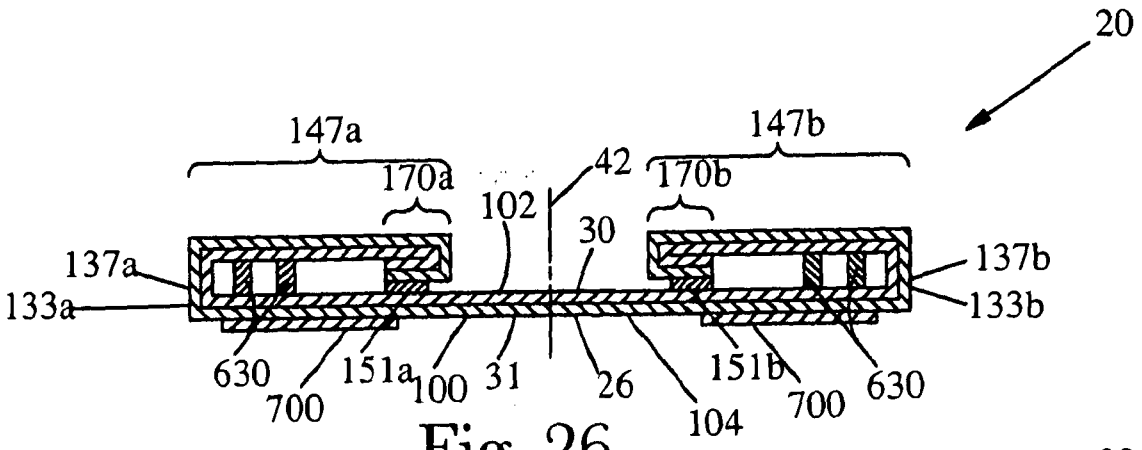

Fig. 26

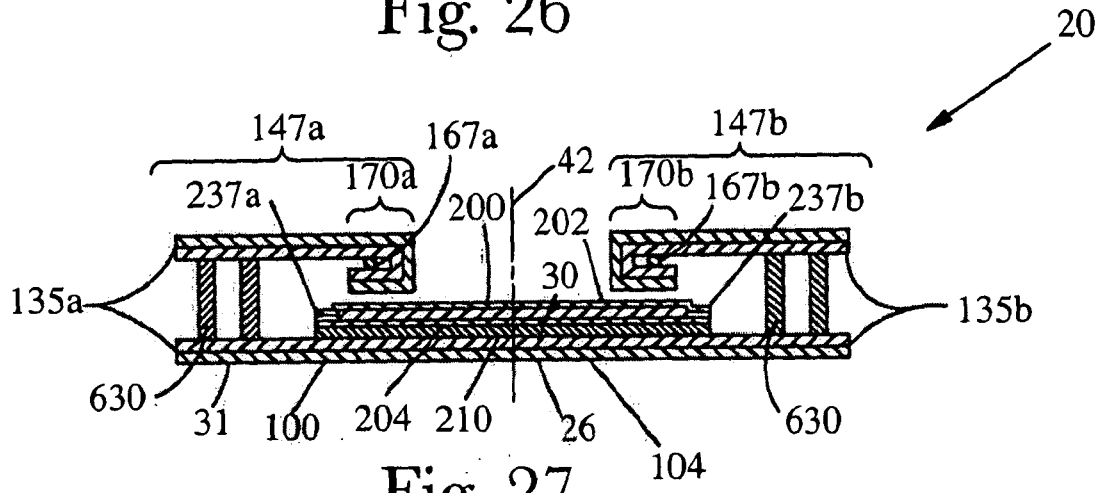

Fig. 27

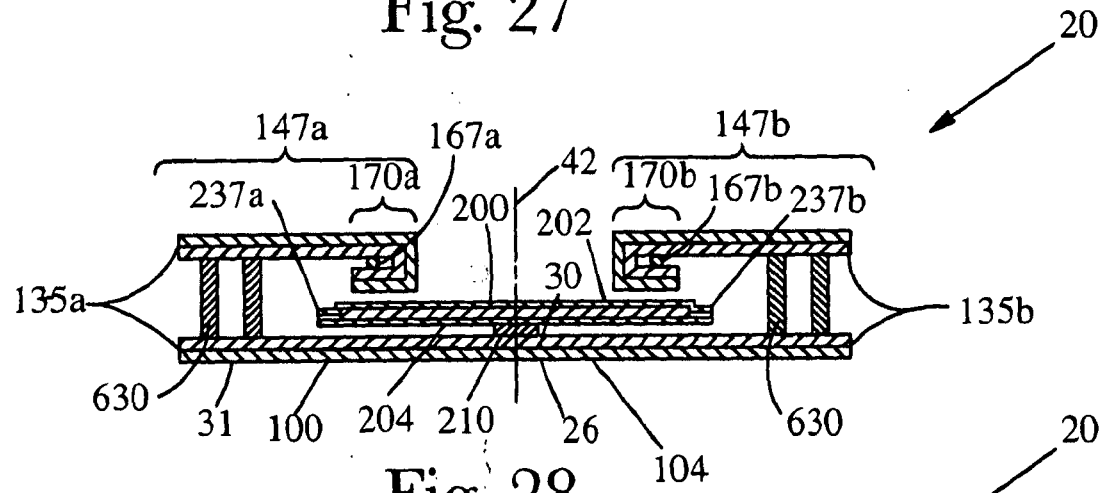

Fig. 28

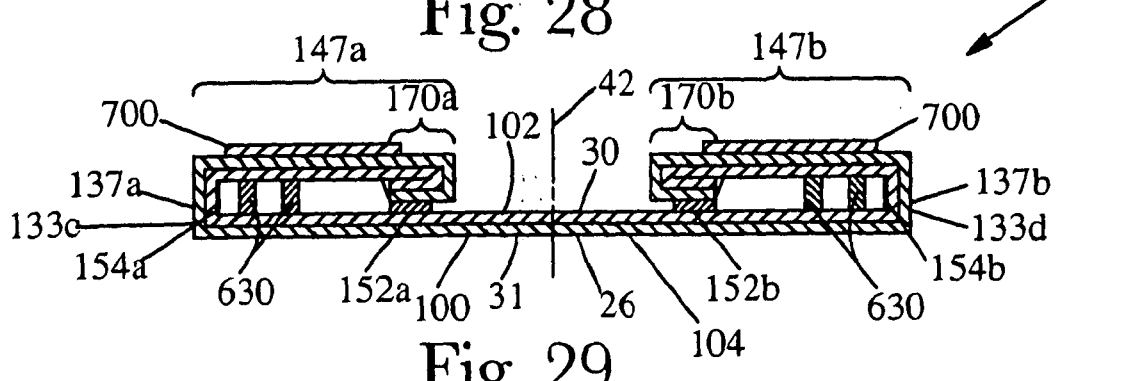

Fig. 29

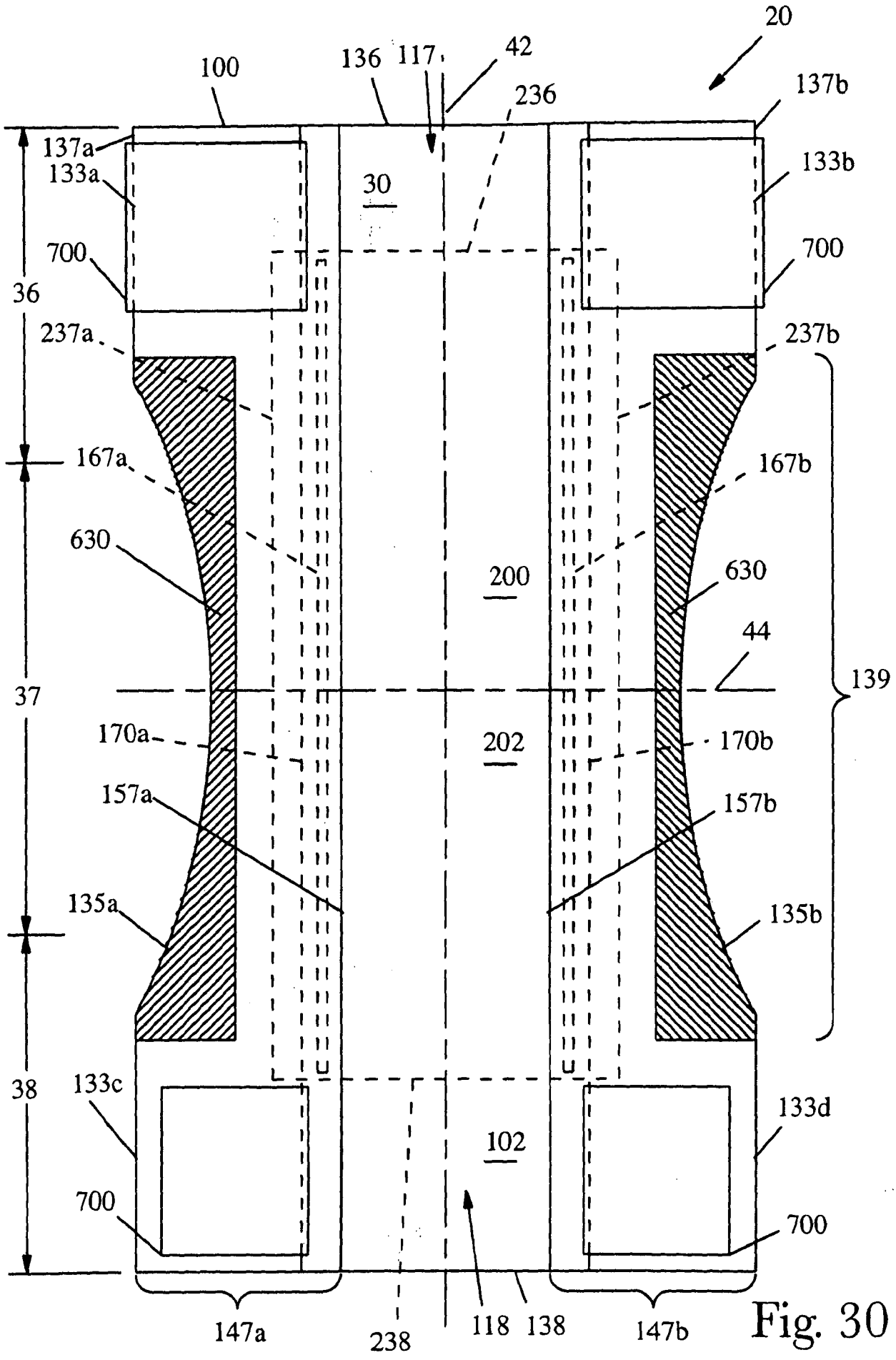
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Fig. 30

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2009/047659

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)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2001/039408 A1 (TANJI HIROYUKI [JP] ET AL) 8 November 2001 (2001-11-08)	1-4,6
Y	figure 5 column 4, line 31 - column 4, line 50	1-7
X	JP 2004 181253 A (UNI CHARM CORP) 2 July 2004 (2004-07-02)	1-4,6
Y	abstract figure 4	5,7
X	EP 1 902 694 A1 (KAO CORP [JP]) 26 March 2008 (2008-03-26)	1-4,6
Y	figures 4,5,8	5,7
Y	WO 2006/124984 A1 (PROCTER & GAMBLE [US]; BECK THEODORA [US]; LAVON GARY DEAN [US]) 23 November 2006 (2006-11-23) figure 2 claim 1	1-7

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

X See patent family annex.

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

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

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

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

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

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Date of the actual completion of the international search	Date of mailing of the international search report
2 September 2009	21/09/2009

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

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2009/047659

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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