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(54) **DISPOSABLE ABSORBENT ARTICLE HAVING REFASTENABLE SIDE SEAMS AND A WETNESS SENSATION MEMBER**

(52) **U.S. Cl. .... 604/361; 604/391**

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(57) **ABSTRACT**

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A disposable absorbent article including features facilitating toilet training of a wearer. A wetness sensation member provides a wetness sensation on the wearer's skin upon urination. Highlighting that is visible when viewing a body-facing surface of the article may be associatively correlated with the concept of toilet training and indicates the presence of the wetness sensation member in the article while providing a visual reference and topic for conversation relevant to toilet training. Refastenable side seams enable the configuration, application, and removal of the article as a pair of training pants or as a diaper, while providing an appearance like training pants when the article is worn and allowing easy inspection of the interior of the article without the necessity of pulling the article downward. The synergistic effect of each feature in combination with one or more of the other features enhances the usefulness of the article in toilet training.

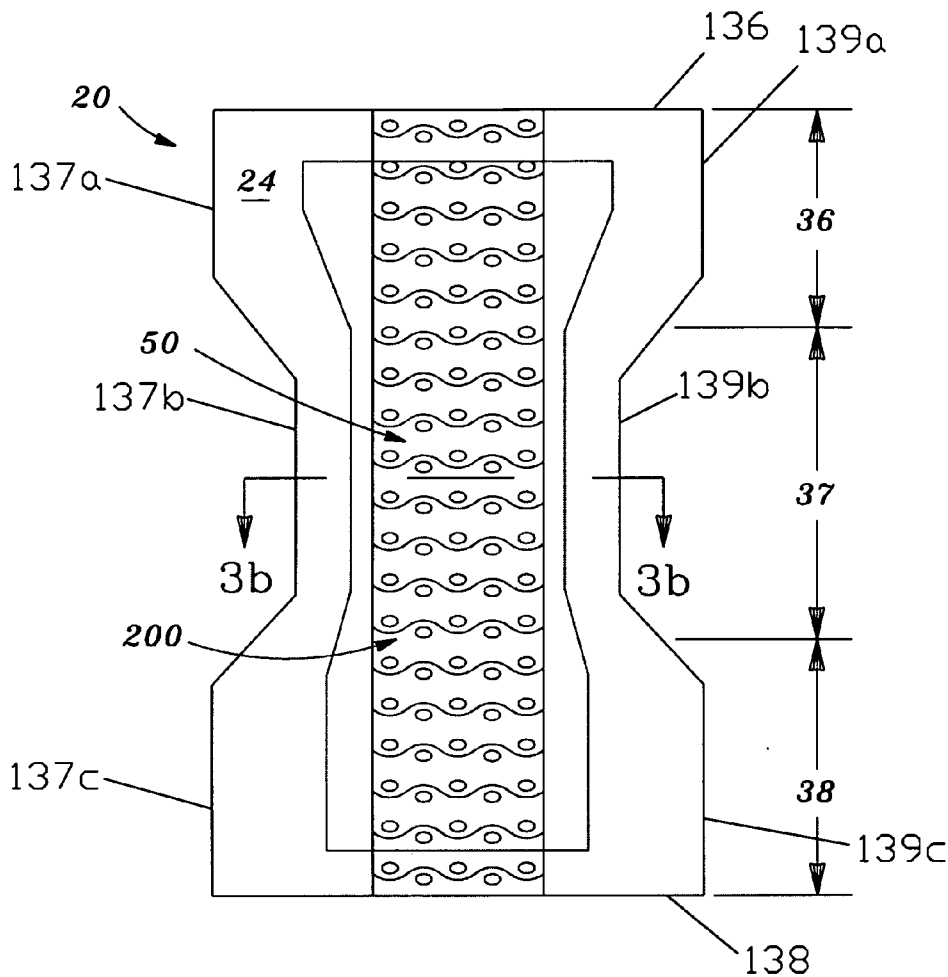
(73) **Assignee: The Procter & Gamble Company**

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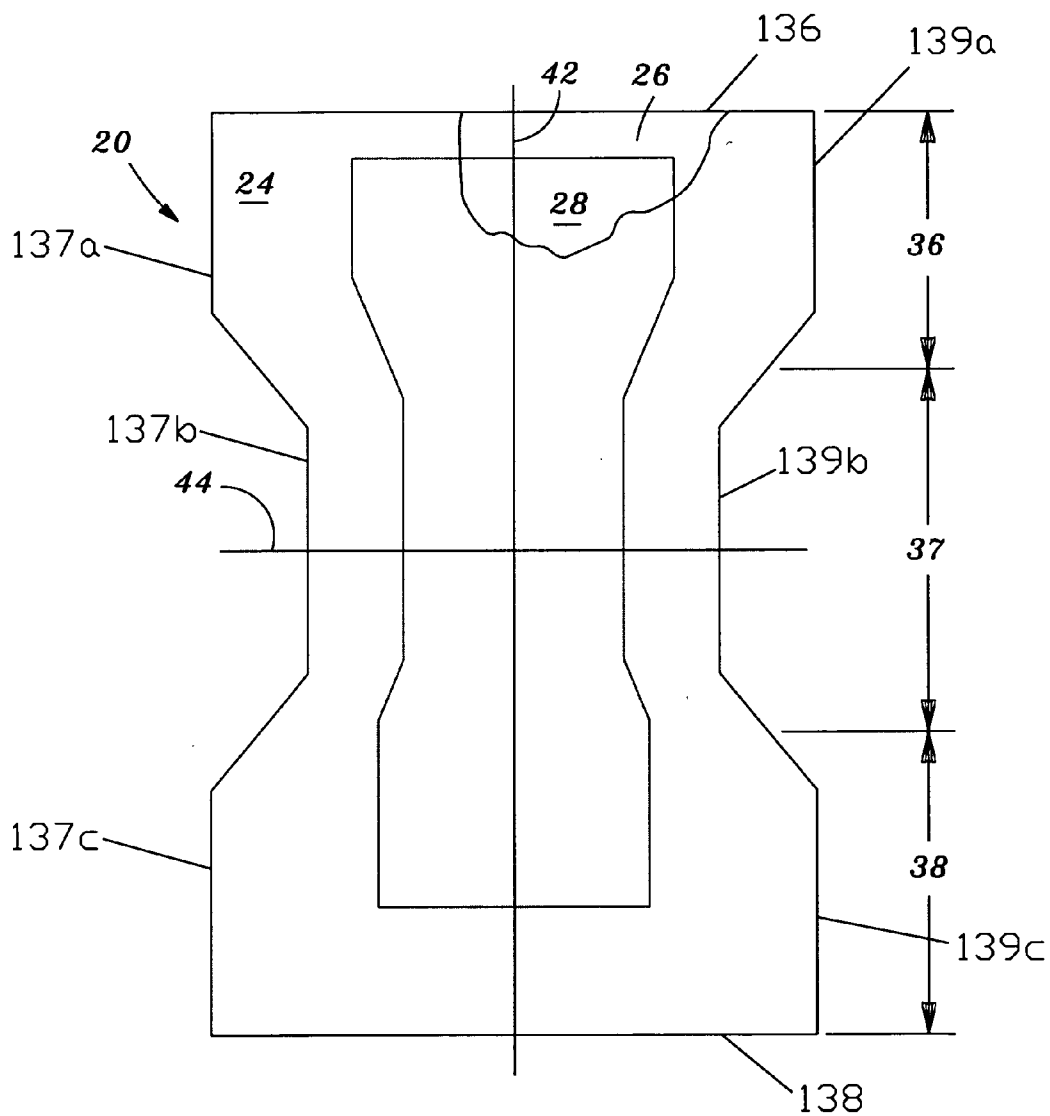


Fig. 1

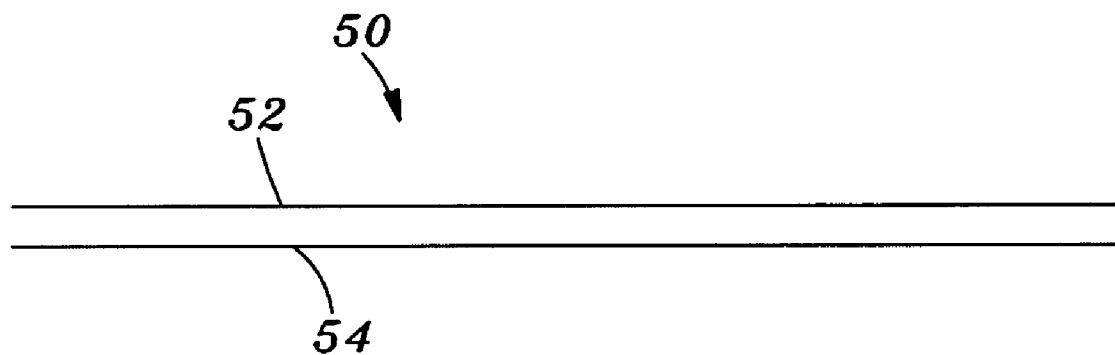


Fig. 2

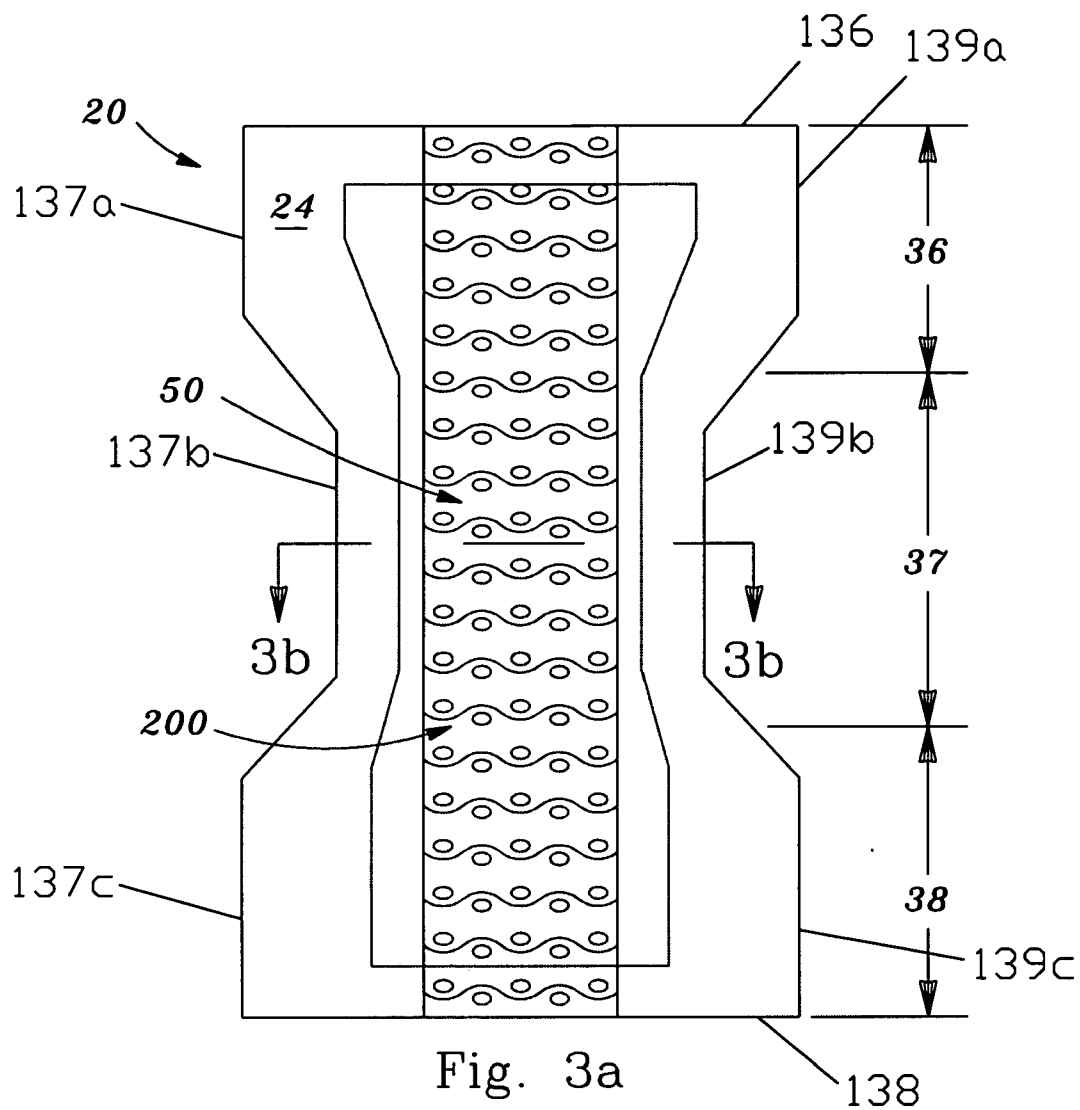


Fig. 3a

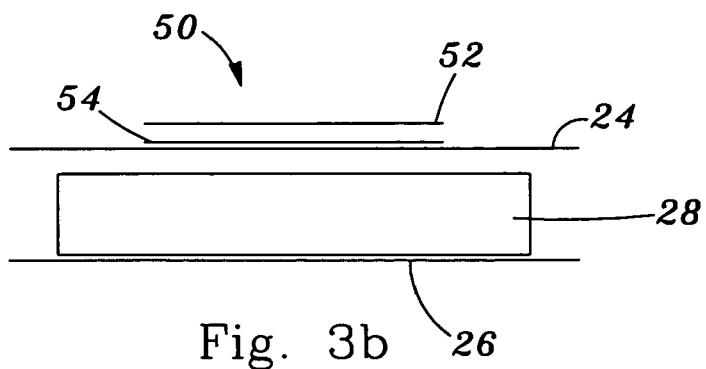


Fig. 3b

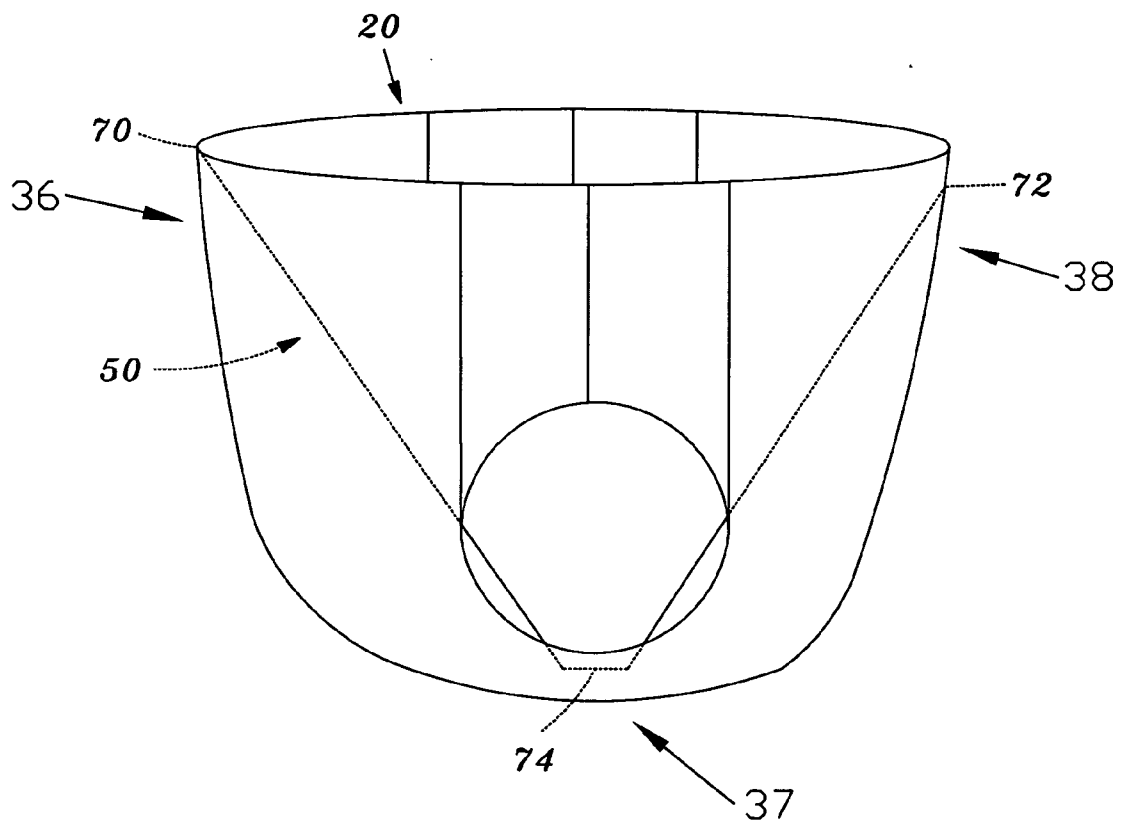


Fig. 4

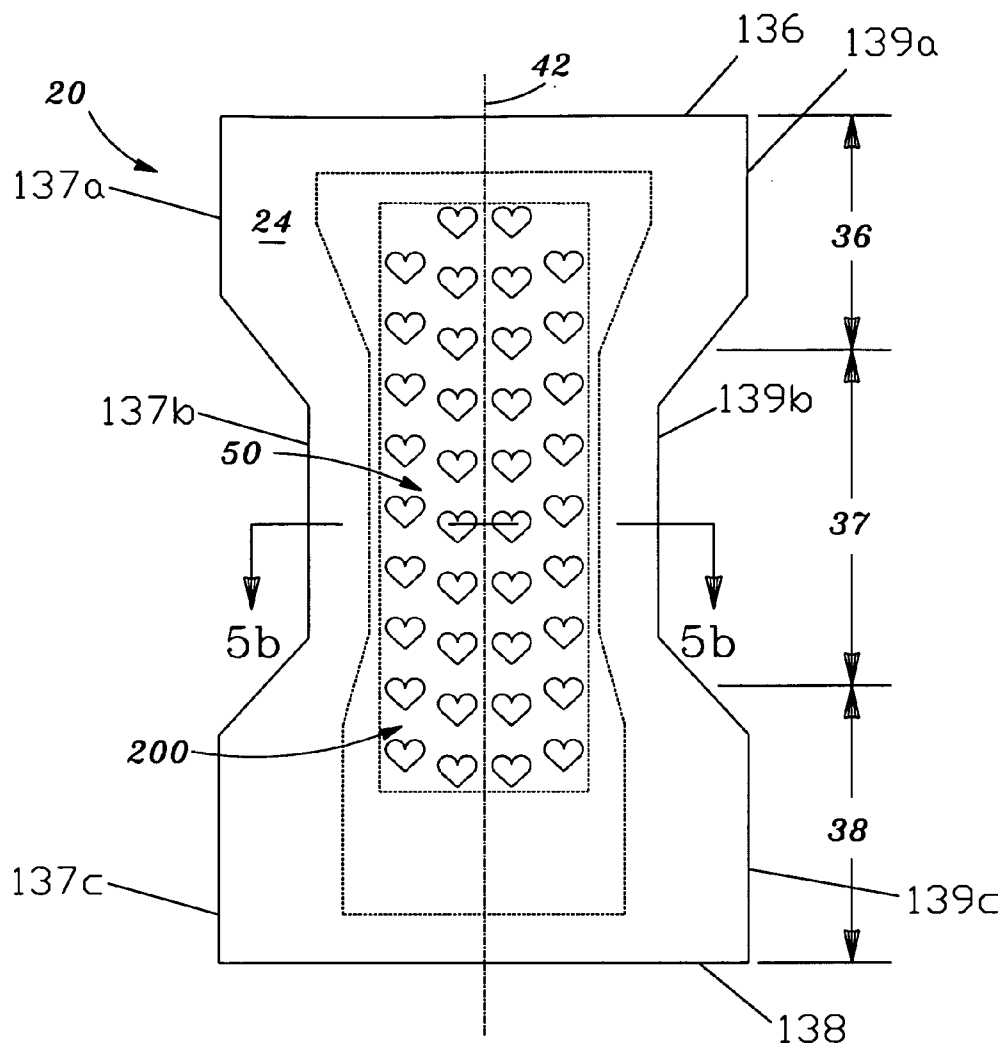


Fig. 5a

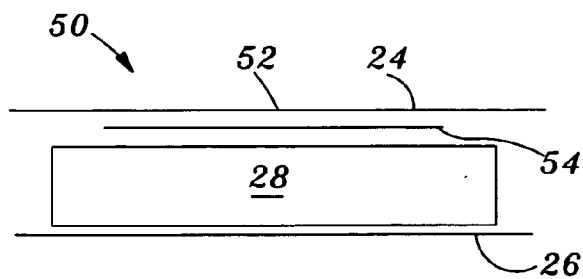


Fig. 5b

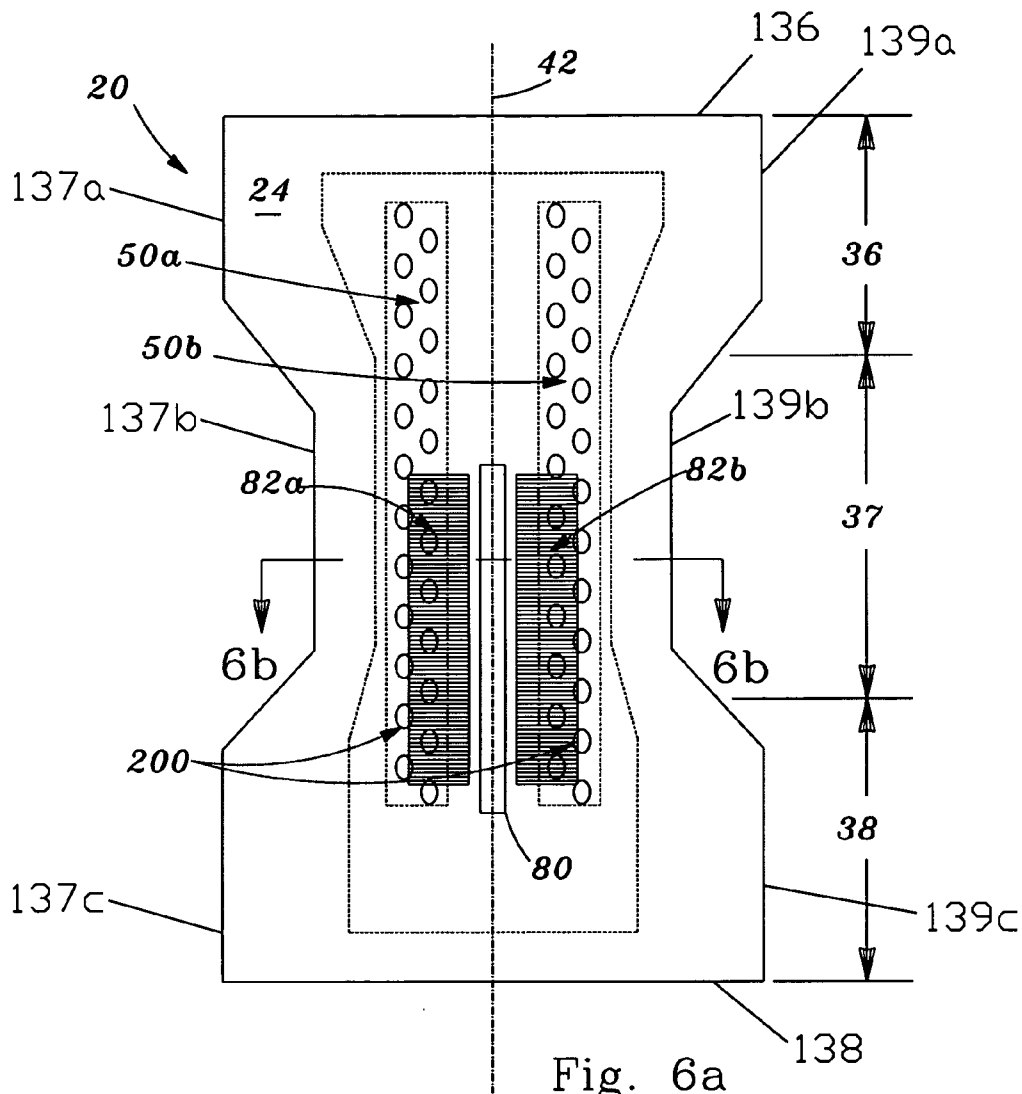


Fig. 6a

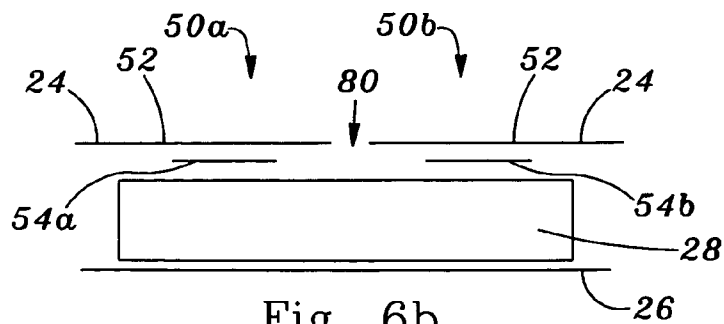
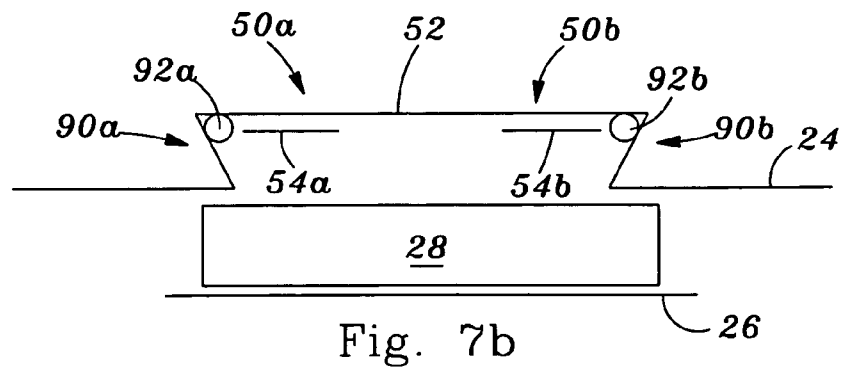
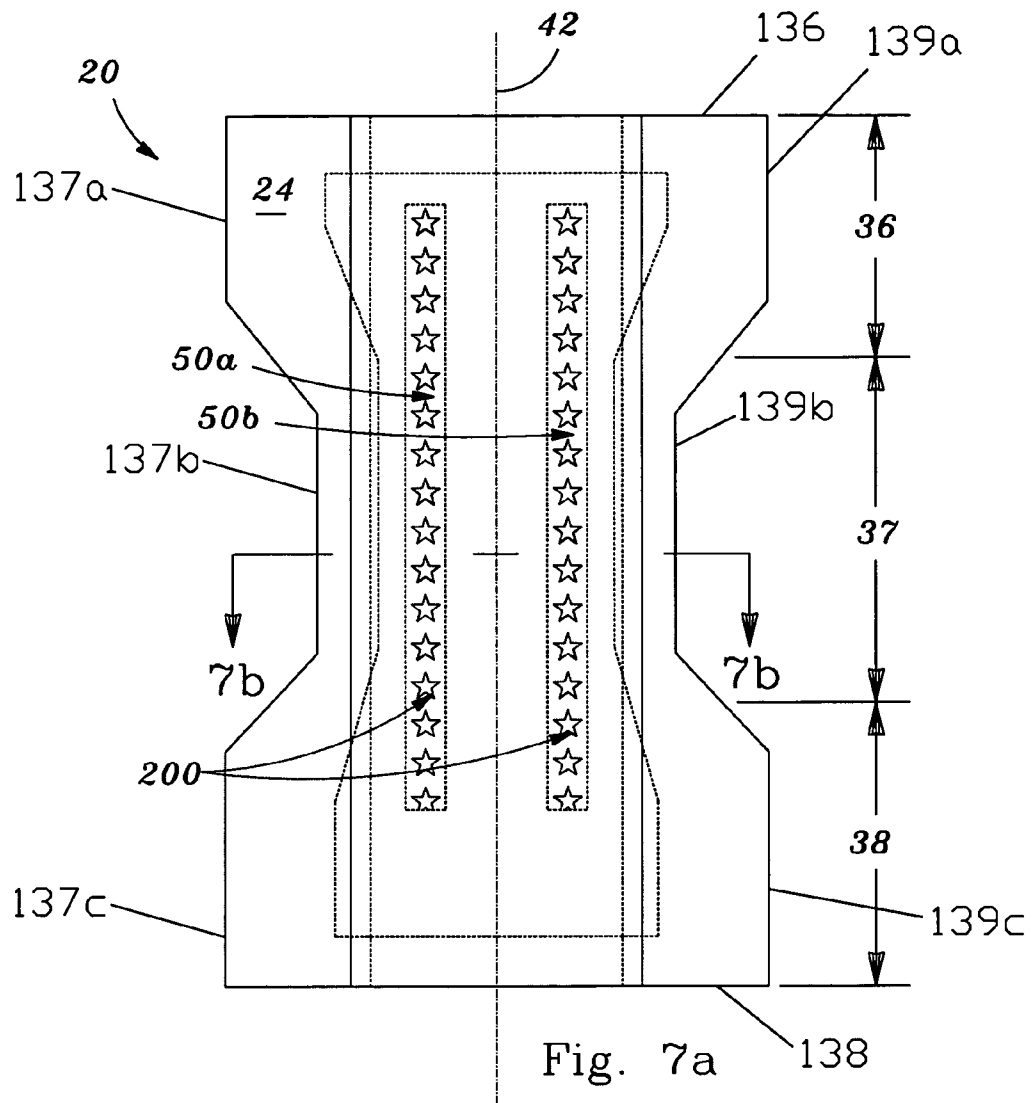
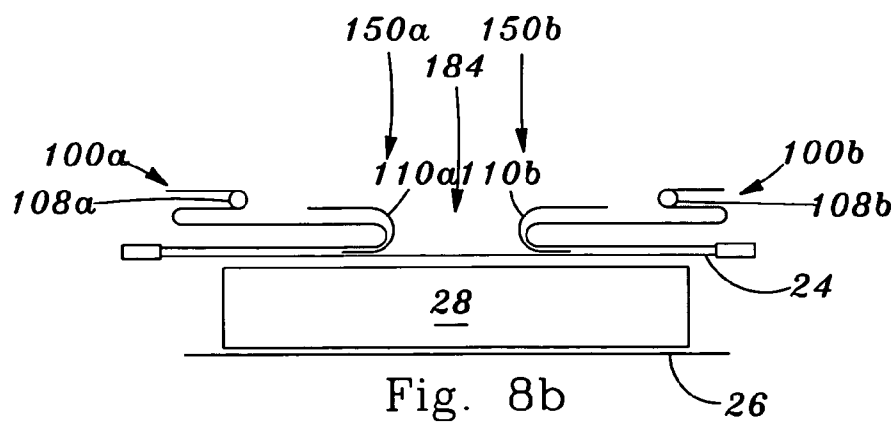
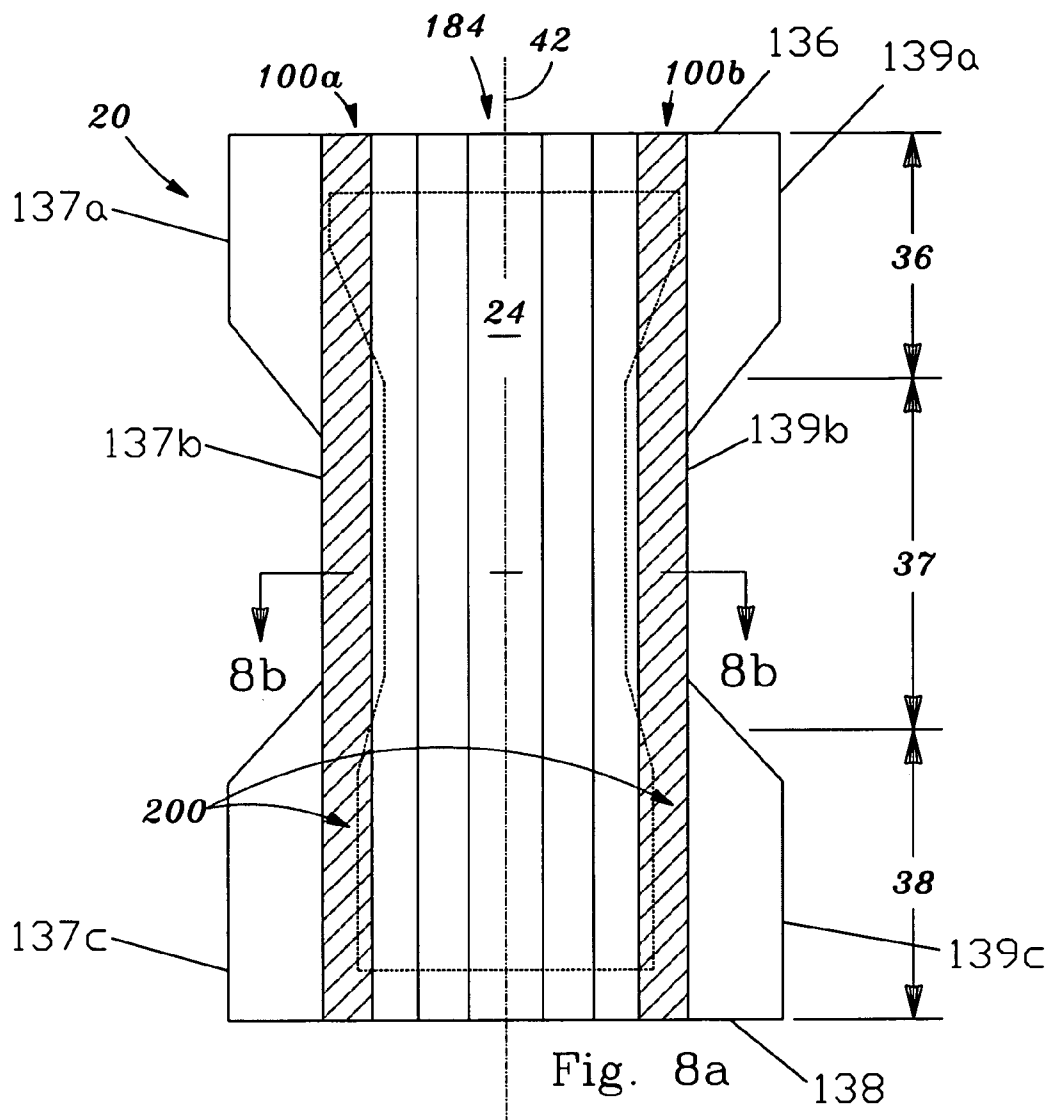
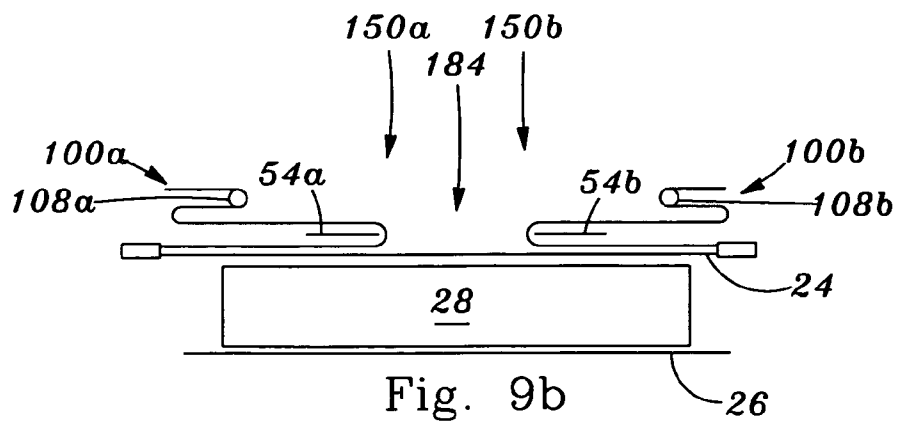
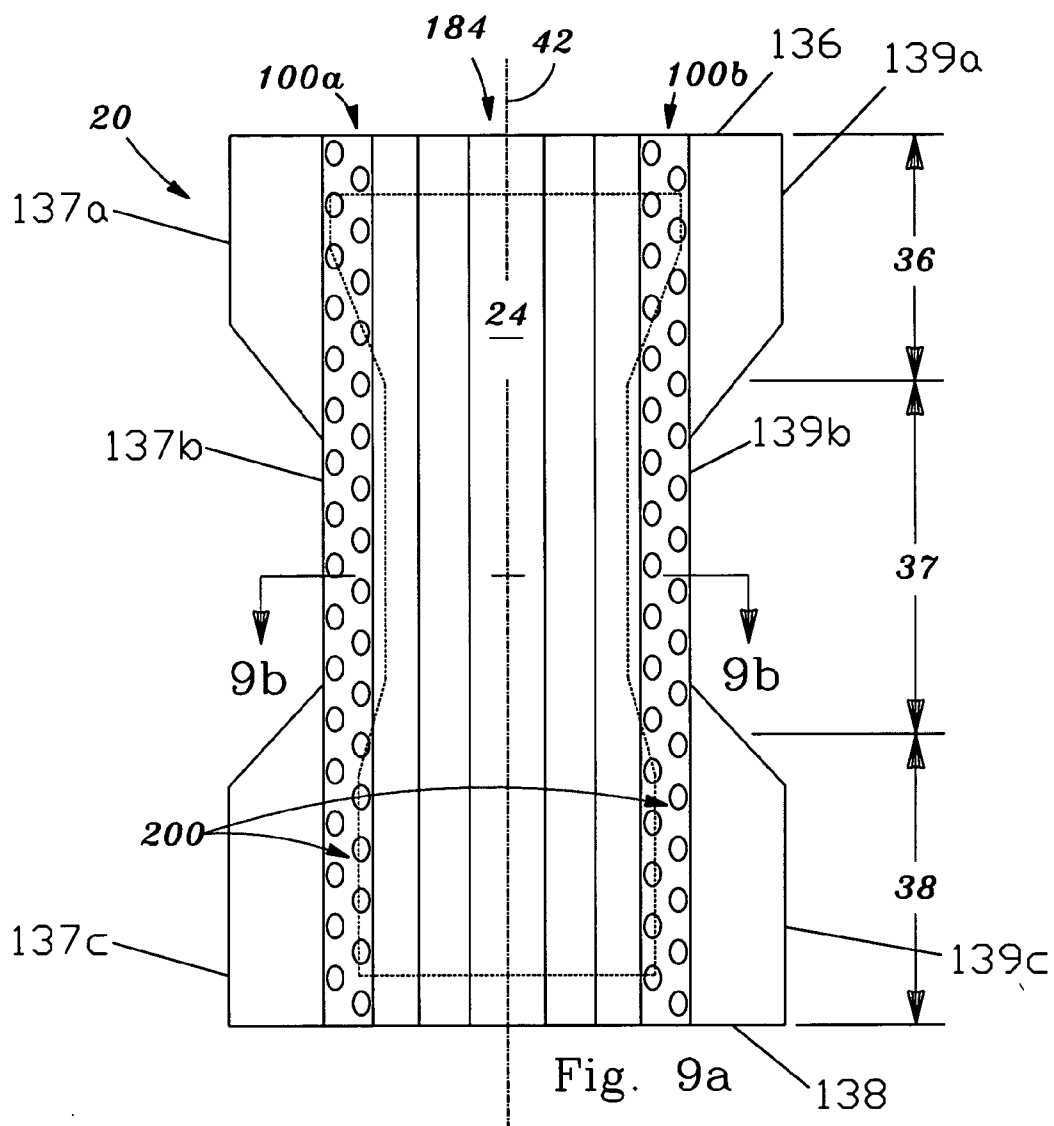


Fig. 6b









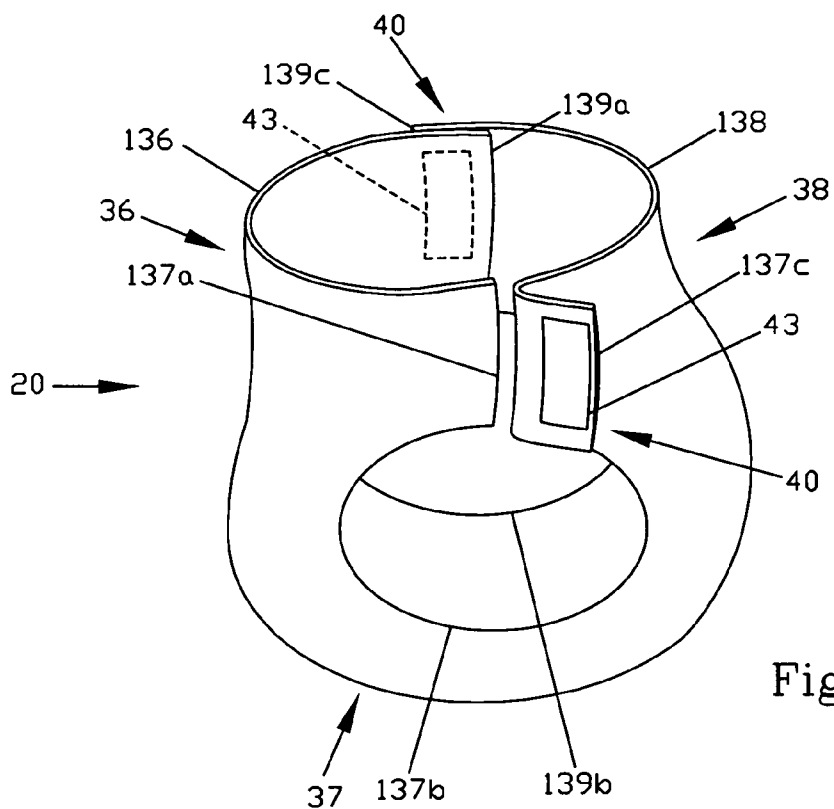


Fig. 10

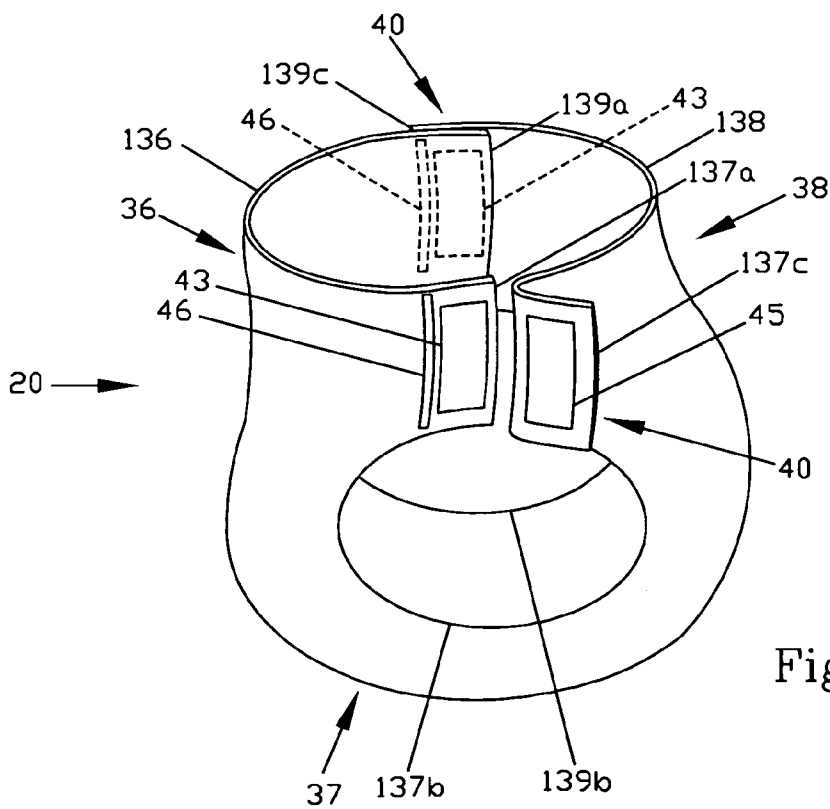


Fig. 11

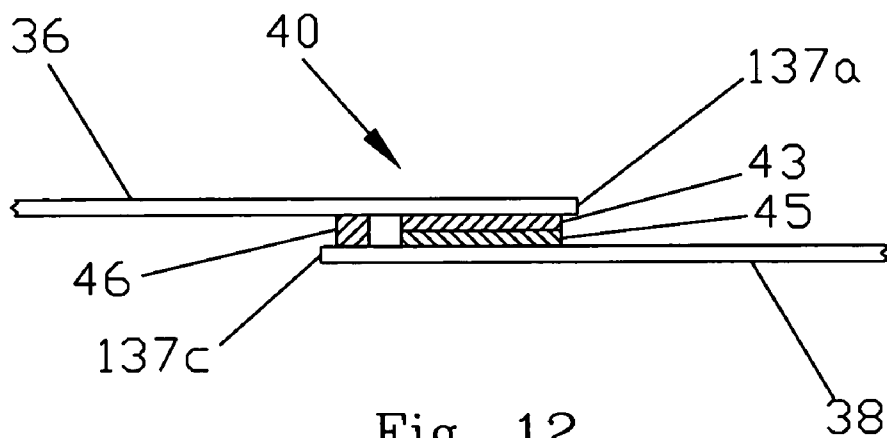


Fig. 12

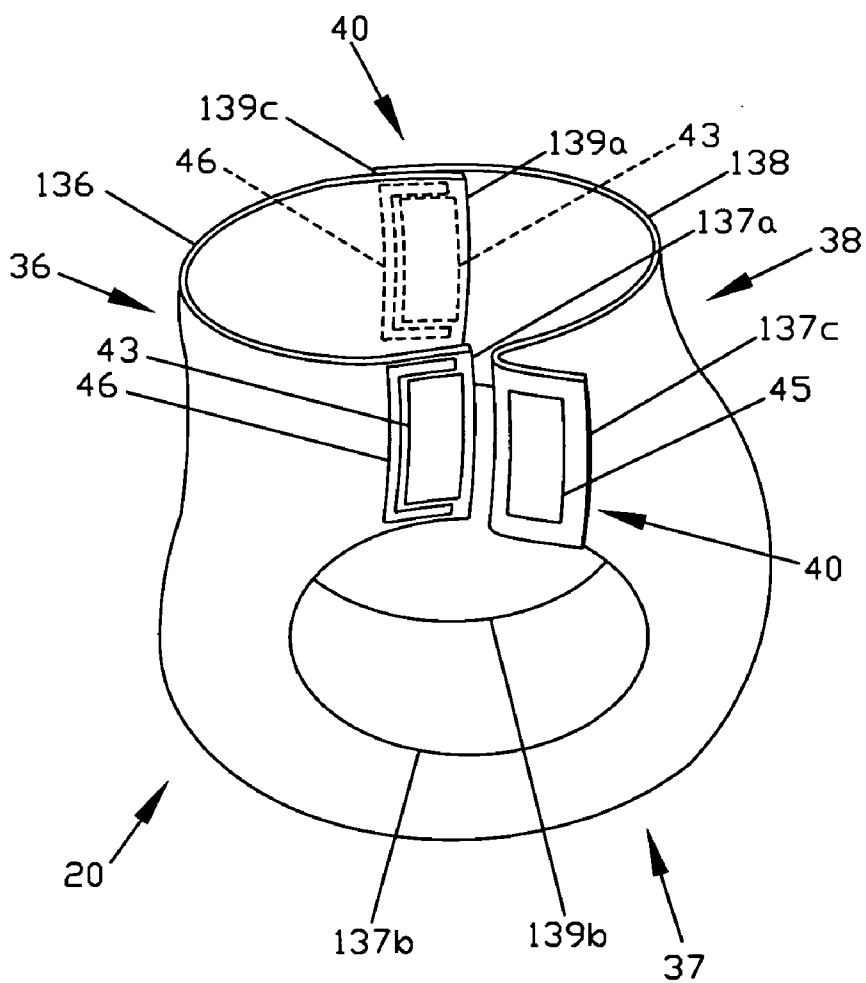


Fig. 13

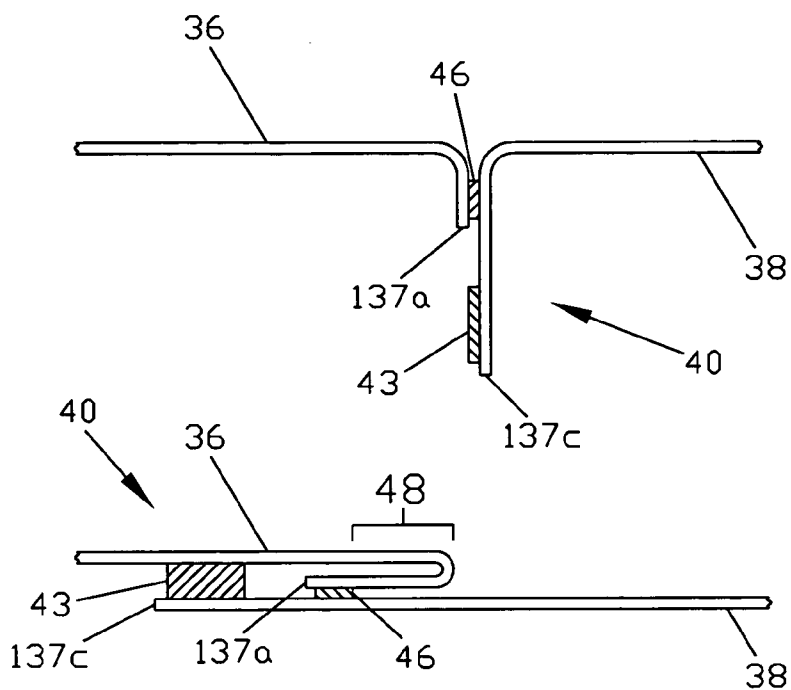


Fig. 14

Fig. 15

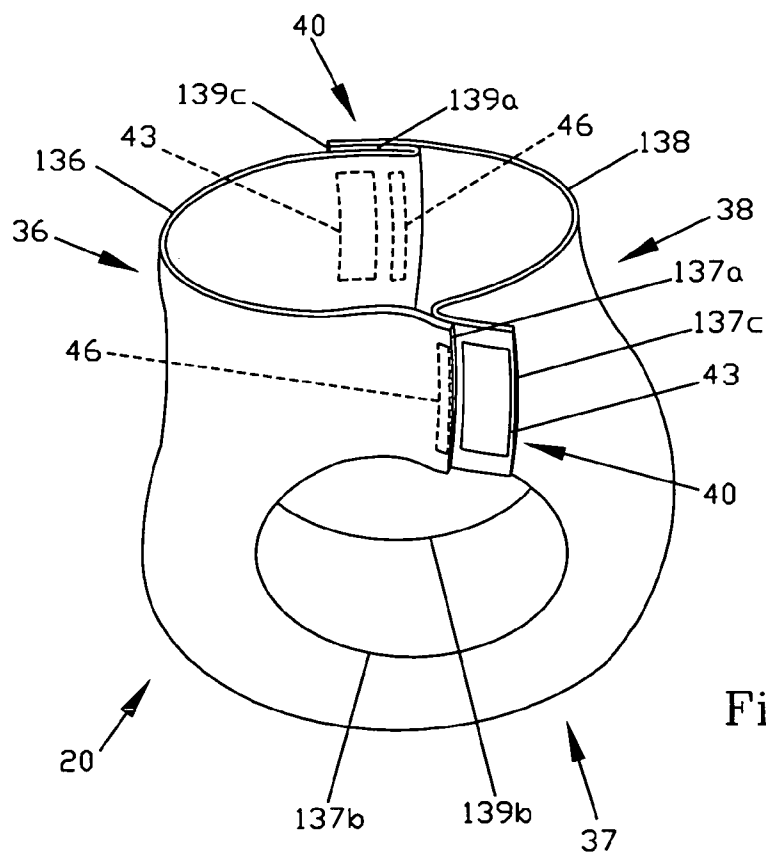


Fig. 16

**DISPOSABLE ABSORBENT ARTICLE HAVING  
REFASTENABLE SIDE SEAMS AND A WETNESS  
SENSATION MEMBER**

**FIELD OF THE INVENTION**

[0001] The present invention is applicable to disposable absorbent articles including diapers, training pants, pull-on diapers, incontinence briefs, incontinence undergarments, absorbent inserts, diaper holders and liners, and the like. This invention is particularly related to disposable absorbent articles that are specially adapted for use in urinary toilet training.

**BACKGROUND OF THE INVENTION**

[0002] When wearing a typical modern disposable absorbent article, a child may have dry skin even after one or more occurrences of urination. As a result, the child may feel little or no discomfort and often may not even be aware that he or she has urinated. However, having the child feel discomfort following urination in his or her "pants" may assist with learning and/or provide motivation to learn to voluntarily retain urine. It is possible to use cloth training pants that leave the skin wet and, due to their high breathability, promote evaporative cooling of the skin, further enhancing discomfort. However, cloth training pants have poor urine containment, often leading to wet clothing and wet surroundings, e.g., carpeting, furniture, etc.

[0003] Disposable absorbent training pants successfully address the need to prevent soiling of the wearer's clothing and surroundings. These products are particularly appealing to caregivers and are useful in the toilet training process because the pants have a very garment-like look. Children identify disposable absorbent article products with babies and often do not like being identified with or as babies. Consequently, children of toilet training age often do not want to wear baby disposable absorbent articles, and instead prefer to wear training pants that look like adult underwear. Thus, the switch from a traditional disposable absorbent article to more garment-like or underwear-like training pants can be an important step in the toilet training process.

[0004] Current training pants are typically limited to being pulled on like a pair of pants because the side seams are permanently bonded. However, in the context of toilet training, a product that can be opened and refastened at the side seams may be particularly useful because this capability permits the interior of the product to be easily inspected without having to pull the product downward. Thus, a caregiver can easily and quickly check for wetting while choosing either to describe to the child what he or she is doing in order to remind the child of the intention of toilet training or to check without interrupting the child's current activity. When choosing to involve the child and finding that the interior of the article is still dry, the caregiver can praise the child for not wetting the disposable absorbent article "like a baby" and instead behaving "like a big kid". The caregiver can also invite the child to observe and/or to feel the interior of the article as a way of reinforcing the notion that a dry interior is desirable. In addition, if the article includes a feature that provides a wetness sensation upon urination and that is visibly highlighted in the interior of the article, the caregiver can point out the visible highlighting to the child when inspecting the interior in order to further

reinforce the concept of toilet training. Thus, refastenable side seams may provide significant synergistic benefits in combination with other features related to the article's use in toilet training, particularly a wetness sensation feature and especially one that is visibly highlighted.

[0005] Thus, it would be desirable to provide an article that can facilitate urinary toilet training by enhancing a wearer's awareness that urination has occurred by ensuring that the wearer feels an uncomfortable wetness sensation resulting from urination. It would also be desirable to visibly highlight the presence in the article of the feature that provides this wetness sensation to facilitate an opportunity for urinary toilet training. In addition, it would be desirable to provide a disposable absorbent article that provides the garment-like look of training pants and includes refastenable side seams to allow for easy inspection of the interior of the article without the necessity of pulling the article downward to gain access.

**SUMMARY OF THE INVENTION**

[0006] A disposable absorbent article including features facilitating toilet training of a wearer is provided. A wetness sensation member provides a wetness sensation on the wearer's skin upon urination. Highlighting that is visible when viewing a body-facing surface of the article may be associatively correlated with the concept of toilet training and indicates the presence of the wetness sensation member in the article while providing a visual reference and topic for conversation relevant to toilet training. Refastenable side seams enable the configuration, application, and removal of the article as a pair of training pants or as a diaper, while providing an appearance like training pants when the article is worn and allowing easy inspection of the interior of the article without the necessity of pulling the article downward. The synergistic effect of each feature in combination with one or more of the other features enhances the usefulness of the article in toilet training.

**BRIEF DESCRIPTION OF THE DRAWINGS**

[0007] 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.

[0008] FIG. 1 is a plan view of a disposable disposable absorbent article.

[0009] FIG. 2 is a cross sectional view of a wetness sensation member according to the present invention.

[0010] FIG. 3a is a plan view of a disposable absorbent article having a wetness sensation member disposed on a body-facing surface.

[0011] FIG. 3b is a cross sectional view of the disposable absorbent article shown in FIG. 3a illustrating the layers of the wetness sensation member.

[0012] FIG. 4 is an isometric view of a pull-on disposable absorbent article illustrating the attachment of the wetness sensation member.

[0013] FIG. 5a is a plan view of a disposable absorbent article having a wetness sensation member integrated with the topsheet.

[0014] FIG. 5b is a cross sectional view of the disposable absorbent article illustrated in FIG. 5a.

[0015] FIG. 6a is a plan view of a disposable absorbent article having two wetness sensation members integrated with the topsheet and disposed parallel to and spaced apart from the longitudinal axis with an elongated slit opening interposed therebetween.

[0016] FIG. 6b is a cross sectional view of the disposable absorbent article illustrated in FIG. 6a.

[0017] FIG. 7a is a plan view of a disposable absorbent article having a Z-folded topsheet with two wetness sensation members integrated with the topsheet and disposed in the Z-folds in the topsheet.

[0018] FIG. 7b is a cross sectional view of the disposable absorbent article illustrated in FIG. 7a.

[0019] FIG. 8a is a plan view of a disposable absorbent article with barrier leg cuffs including wetness sensation members integrated with the barrier leg cuffs.

[0020] FIG. 8b is a cross sectional view of the disposable absorbent article illustrated in FIG. 8a.

[0021] FIG. 9a is a plan view of a disposable absorbent article with an alternative form of barrier leg cuffs including wetness sensation members integrated with the barrier leg cuffs.

[0022] FIG. 9b is a cross sectional view of the disposable absorbent article illustrated in FIG. 9a.

[0023] FIG. 10 is a perspective view of an exemplary disposable absorbent article 20, which is shown in its relaxed, contracted state, i.e., with the contraction induced by elastic members. In FIG. 10, the interior portion of the article 20 that faces inwardly toward the wearer and contacts the wearer is shown facing upward.

[0024] FIG. 11 is another perspective view similarly oriented.

[0025] FIG. 12 is a cross sectional view of the refastenable side seam 40 shown in an open condition in FIG. 11, showing the side seam in a fastened condition.

[0026] FIG. 13 is another perspective view oriented similarly to the views of FIG. 10 and FIG. 11, showing an alternative form of secondary fastening component.

[0027] FIG. 14 is a cross sectional view of an alternative refastenable side seam 40 shown in an open condition.

[0028] FIG. 15 is a cross sectional view of the refastenable side seam 40 of FIG. 14 shown in a fastened condition.

[0029] FIG. 16 is perspective view of an exemplary disposable absorbent article 20, which is shown in its relaxed, contracted state, i.e., with the contraction induced by elastic members. In FIG. 16, the interior portion of the article 20 that faces inwardly toward the wearer and contacts the wearer is shown facing upward.

## DETAILED DESCRIPTION OF THE INVENTION

### [0030] Definitions

[0031] As used herein, the following terms have the following meanings:

[0032] 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.

[0033] The term “disposable” refers to absorbent articles that generally are not intended to be laundered or otherwise restored or reused as absorbent articles, i.e., they are intended to be discarded after a single use and, preferably, to be recycled, composted or otherwise disposed of in an environmentally compatible manner.

[0034] The term “unitary” refers to an absorbent article that is formed of separate parts united together to form a coordinated entity so as to not require separate manipulative parts like a separate holder and liner.

[0035] The term “diaper” refers to an absorbent article generally worn by infants and incontinent persons about the lower torso and having the general form of a sheet, different portions of which are fastened together to encircle the waist and the legs of the wearer.

[0036] The term “training pants” refers to an absorbent article generally worn by infants and incontinent persons about the lower torso and having the general form of a pair of short pants that can be applied or removed from the wearer without unfastening.

[0037] The term “refastenable” refers to the property of two elements being capable of releasable attachment, separation, and subsequent releasable reattachment without substantial permanent deformation or rupture.

[0038] The terms “releasably attached,” “releasably engaged”, and variations thereof refer to two elements being connected or connectable such that the elements tend to remain connected absent a separation force applied to one or both of the elements, and the elements being capable of separation without substantial permanent deformation or rupture. The required separation force is typically beyond that encountered while wearing the absorbent garment.

[0039] The term “toilet training” refers to the development of continence, which is the ability to voluntarily retain one’s urine and feces. Individuals who are incontinent are unable to voluntarily retain their bodily discharges and, instead, urinate and defecate reflexively. For example, newborn babies are incontinent. Coincident with the development of continence, children typically develop the ability to voluntarily urinate and defecate, and cease reflexive elimination. This development of continence and of voluntary elimination, in place of reflexive elimination, may be accelerated and/or guided by caregivers through associative and conditioning techniques of training the child. For the purpose of the present invention, the term “toilet training” is used to denote training both for continence, itself, and for the voluntary elimination that is associated with continence. It is also noted that the term “toilet training” is synonymous with the term “potty training”.

[0040] The term “longitudinal” refers to a direction running parallel to the maximum linear dimension of the article and includes directions within  $\pm 45^\circ$  of the longitudinal direction.

[0041] The term “lateral” or “transverse” refers to a direction running at a 90 degree angle to the longitudinal direction and includes directions within  $\pm 45^\circ$  of the lateral direction.

[0042] The term “x-y plane” refers to the generally planar structure of a sheet material defined by its length and width and lies between the sheet material’s two major surfaces regardless of whether or not the sheet material is flat or curved.

[0043] The term “z-direction” refers to the direction through the thickness of a sheet material and generally orthogonal to the x-y plane.

[0044] The term “disposed” refers to an element being attached and positioned in a particular place or position in a unitary structure with other elements.

[0045] The term “attached” 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 adhesive bonding, pressure bonding, thermal bonding, mechanical fastening, etc. Such attachment methods may be used to attach elements together over a particular area either continuously or intermittently.

[0046] The term “cohesive” refers to the property of a material that sticks to itself but does not to any significant degree stick to other materials.

[0047] The terms “proximal” and “distal” refer respectively to the location of an element relatively 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.

[0048] 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” and “top” and “bottom”, respectively.

[0049] 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 “hydro-head” 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).

[0050] The term “retard” refers to the hindrance or the prevention of the flow of liquid water. In the context of the term “flow control layer”, both terms together refer to the fact that different layers in a layered structure may be water-permeable, yet differ in the respective flow rates at which they permit liquid water, and likewise bodily wastes that are aqueous in nature, to pass through their respective thicknesses. For example, a layer containing capillary channels and through whose thickness liquid water wicks in the absence of any forcing pressure is considered to be water-permeable. However, the flow rate at which liquid water can pass through the thickness of such a layer may be lower than the flow rate at which liquid water can pass through the thickness of a layer containing holes that are too large to act as capillary channels. Similarly, two layers both containing capillary channels and through whose thicknesses liquid water wicks in the absence of any forcing pressure are both considered to be water-permeable. However, the capillary channels in one of the layers may differ in size from those in the other layer or may be more numerous than those in the other layer, such that the wicking flow rate of liquid water through the one layer may be greater than that through the other layer. Thus, in a layered structure, one layer serving as a flow control layer may retard the passage of liquid water through the thickness of the layered structure, relative to the greater flow rate at which another of the layers would permit the passage of the liquid water through its thickness in the absence of the flow control layer. It is noted that when the flow control layer is water-impermeable, it effectively prevents the passage of liquid water through its thickness in the absence of a forcing pressure, i.e., the prevention of the passage of liquid water is included within the meaning of the term “retard”.

[0051] The term “visible” refers to the quality of being capable of being seen by the naked eye under conditions of normal room lighting or in natural light during the daytime. Becoming “more visible” or “less visible” means changing in visibility to a noticeable extent when viewed under a generally constant or equal lighting condition.

[0052] The term “visible highlighting” refers to the visible differentiation of an object such that it noticeably stands out from its surroundings, e.g., by differing in coloration, hue, or tint, by differing in lightness, darkness, or contrast, by differing due to the presence or absence of graphical or solid color forms, or by any other variation serving to create noticeable visible differentiation.

[0053] The term “coloring” refers to the effect produced by applying or combining colors in and/or on an object or a portion of an object.



[0054] The term “coloration” refers to the arrangement or degree of coloring especially when used to visibly differentiate an object or a portion of an object in order to visibly highlight it.

[0055] The term “solid coloring” refers to the unbroken, i.e., uninterrupted, coloring of an area as contrasted with the discrete line-like form of some graphics.

[0056] The term “graphic” refers to a product of graphic art or a graphic representation in a pictorial form.

[0057] The term “associative correlation” refers to establishing a mutual or reciprocal relation between the visible highlighting and that with which it is being associatively correlated so that an association, i.e. a mental connection or bond, is formed between the two. This term is used in the context of associatively correlating the respective visible forms of the visible highlighting and an externally visible marking in or on the absorbent article as well as in the context of associatively correlating the visible highlighting with the concept of urinary toilet training. For example, associatively correlated graphics may serve in concert to draw attention to an opportunity for urinary toilet training when an absorbent article is viewed prior to its being worn, to provide an externally visible reminder of the presence of the wetness sensation member in the interior of the absorbent article while it is being worn, etc. Similarly, visible highlighting that provides a visual reference to a topic related to urinary toilet training, such as dryness, wetness, or protection from wetness, may serve to associatively correlate the visible highlighting to the concept of urinary toilet training and thereby facilitate an opportunity for urinary toilet training.

[0058] The terms “interactively interrelated”, “interactively unrelated”, “related in subject matter”, “unrelated in subject matter”, and “related by a common story line” are intended to have the same meanings as in U.S. Pat. No. 6,297,424 issued to Olson et al. on 2 Oct. 2001, U.S. Pat. No. 6,635,797 issued to Olson, et al. on 21 Oct. 2003, and U.S. Pat. No. 6,307,119 issued to Cammarota et al. on 23 Oct. 2001.

[0059] FIG. 1 is a plan view of an exemplary disposable absorbent article 20 in its flat out, uncontracted state, i.e., without elastic-induced contraction, with portions of the structure being cut away to more clearly show the underlying structure of the disposable absorbent article 20 and with the portion of the disposable absorbent article 20 which contacts the wearer facing the viewer. The disposable absorbent article 20 has a longitudinal axis 42 and a transverse axis 44. One end portion of the disposable absorbent article 20 is configured as a first waist region 36 of the disposable absorbent article 20. The opposite end portion is configured as a second waist region 38 of the disposable absorbent article 20. The waist regions 36 and 38 generally comprise those portions of the disposable absorbent article 20 which, when worn, encircle the waist of the wearer. The waist regions 36 and 38 may include elastic elements such that they gather about the waist of the wearer to provide improved fit and containment. An intermediate portion of the disposable absorbent article 20 is configured as a crotch region 37, which extends longitudinally between the first and second waist regions 36 and 38. The crotch region 37 is that portion of the disposable absorbent article 20 which, when the disposable absorbent article 20 is worn, is gener-

ally positioned between the legs of the wearer. The disposable absorbent article 20 has a laterally extending first waist edge 136 in the first waist region 36 and a longitudinally opposing and laterally extending second waist edge 138 in the second waist region 38. The disposable absorbent article 20 has a first side edge 137 and a laterally opposing second side edge 139, both side edges extending longitudinally between the first waist edge 136 and the second waist edge 138. The portion of the first side edge 137 in the first waist region 36 is designated 137a, the portion in the crotch region 37 is designated 137b, and the portion in the second waist region 38 is designated 137c. The corresponding portions of the second side edge 139 are designated 139a, 139b, and 139c, respectively.

[0060] The disposable absorbent article 20 preferably comprises a water-permeable topsheet 24, a water-impermeable backsheet 26, and an absorbent core 28 encased between the topsheet 24 and the backsheet 26. The topsheet 24 may be fully or partially elasticated or may be foreshortened so as to provide a void space between the topsheet 24 and the core 28 and/or to tend to draw the wetness sensation member 50 against the skin of the wearer. Exemplary structures including elasticized or foreshortened topsheets are described in more detail in U.S. Pat. No. 4,892,536 issued to DesMarais et al. on Jan. 9, 1990, U.S. Pat. No. 4,990,147 issued to Freeland on Feb. 5, 1991, U.S. Pat. No. 5,037,416 issued to Allen et al. on Aug. 6, 1991, and U.S. Pat. No. 5,269,775 issued to Freeland et al. on Dec. 14, 1993.

[0061] The disposable absorbent article 20 may include a variety of features known in the art, such as outer leg cuffs, barrier leg cuffs, front and rear ear panels, waist cap features, elastics, and the like to provide desired fit, containment, and aesthetic characteristics. Such additional features are well known in the art and are described in U.S. Pat. No. 3,860,003 and U.S. Pat. No. 5,151,092, among others.

[0062] The disposable absorbent article 20 includes refastenable side seams 40 that can be used to fasten the waist regions together at the sides to apply the article like a diaper and that can also be used to configure the article like a pair of pull-on training pants, as described in more detail below.

[0063] The disposable absorbent article 20 includes a wetness sensation member. Several suitable structures for a wetness sensation member are described in U.S. Pat. No. 6,627,786 issued on 30 Sep. 2003 in the name of Roe et al. An exemplary wetness sensation member is shown in FIG. 2. The wetness sensation member 50 comprises a water-permeable body-facing layer (upper layer) 52 and a flow control layer 54 disposed in a face-to-face arrangement with the water-permeable layer 52. The flow control layer is preferably impermeable to liquid water but permeable to vapor so that it is breathable. Preferably, but not necessarily, some portion of the wetness sensation member and/or a layer to which the wetness sensation member is attached is configured to draw the wetness sensation member toward the skin of the wearer, such as by being elastically foreshortened, formed to have a lesser length than another layer disposed relatively exteriorly, etc.

[0064] During insults of urine, the water-permeable layer allows urine to penetrate in the z-direction and also provides a medium for the flow of urine in the x-y plane via wicking. The flow control layer retards the passage of the urine

through the wetness sensation member in the z-direction, thereby expanding the wetted area of the wetness sensation member, which preferably is held in contact with the wearer's skin. The combination of limited penetration in the z-direction and wicking in the x-y plane causes the urine to spread out and effectively wet a large area before being absorbed into the absorbent core, thereby maximizing the wetness signal experienced by the wearer.

**[0065]** Exemplary water-permeable layers suitable for use in the wetness sensation members of the present invention include nonwovens, foams, woven materials, etc. The water-permeable layer is preferably hydrophilic. Exemplary flow control layers suitable for use in the wetness sensation members of the present invention include polyolefinic films, microporous or breathable films, other films, and hydrophobic nonwovens. Suitable hydrophobic nonwovens include SM (spunbond meltblown), SMS (spunbond meltblown spunbond), and SMMS (spunbond meltblown meltblown spunbond) composites.

**[0066]** In the absorbent articles of the present invention, visible highlighting may be provided in the interior of the article to indicate the presence of the wetness sensation member or members and thereby facilitate an opportunity for the urinary toilet training of the wearer of the article. Such visible highlighting is described in co-pending and commonly assigned U.S. patent application Ser. No. 10/697, 225 filed on 30 Oct. 2003 in the name of Davis et al. Although a wetness sensation member lacking this visible highlighting is fully functional in terms of providing a noticeable wetness signal to the wearer, the caregiver might overlook or forget the possibility of capitalizing on each opportunity for urinary toilet training if the body-facing portion of the absorbent article presents a generally uniform appearance, such as in absorbent articles that present a generally uniform white appearance on their body-facing surfaces.

**[0067]** Furthermore, once the caregiver decides to mention urinary toilet training to the wearer, the visible highlighting can serve to draw the wearer's interest or can be pointed out by the caregiver and incorporated into an explanation of the upcoming opportunity. Thus, the visible highlighting can provide a topic for conversation between the caregiver and the wearer on the subject of urinary toilet training and can likewise provide a nameable object for reference by the wearer, greatly simplifying the mental task required of the wearer who desires to communicate his or her need to go to the toilet or to communicate his or her improving recognition of the wetness signal provided by the wetness sensation member.

**[0068]** Even a simple solid coloring form of visible highlighting can serve to facilitate an opportunity for urinary toilet training, especially when used with wearers possessing some recognition of colors or colored forms. In addition, visible highlighting in the form of a color or colors may facilitate the teaching of recognition of colors and differences between colors, and the associated learning may enhance the urinary toilet training process in turn.

**[0069]** Because it is located in what may be generally termed the laterally central region of the absorbent article, visibly highlighting the wetness sensation member may provide additional benefits related to the learning achieved by the wearer. For example, a visibly highlighted wetness

sensation member may provide a line of reference for the visual separation of the two leg openings, including their differentiation into right and left leg openings for the respective feet to be inserted into the corresponding leg openings. Similarly, a longitudinally oriented visible highlighting may serve as a visual reference for the front to back direction, both for orienting the article prior to applying it, if done by the caregiver, or prior to donning it, if done by the wearer. This longitudinally oriented visual reference may also aid in the teaching of such skills as wiping one's self clean after using the toilet by using a longitudinal motion. The concept of something being central or "in the middle" may be taught and learned by visual reference to the visible highlighting and this concept may then be applied to related subjects, such as the anatomical location of the source of urine and the corresponding proper position in which to sit on the toilet. Thus, in the above and similar ways, the wearer can be made more aware of his or her own body, which may tend to enhance and facilitate the urinary toilet training experience.

**[0070]** In addition, the visible highlighting can serve to enhance the self-esteem of the wearer through a reminder that he or she is mature enough to be engaged in urinary toilet training. This effect can be compounded when the wearer succeeds in recognizing the need to go to the toilet and then sees the dry condition of the visibly highlighted wetness sensation member inside the article after pulling it down.

**[0071]** The visible highlighting may be provided by means of printing onto a surface of the wetness sensation member or one of its layers. For example, solid coloring or a graphic may be printed onto a surface of the flow control layer underlying the water-permeable layer. As another example, an adhesive or a gel may be printed onto a surface of either of the two layers. Such an adhesive or gel may be colored differently from the surrounding area. Alternatively, the adhesive or gel may be uncolored or may have the same color as the surrounding area, but may still provide visible highlighting by forming a distinctive raised area or pattern and/or by surrounding a distinctive recessed area or pattern.

**[0072]** The visible highlighting may also be provided by forming one or more layers of the wetness sensation member of a colored material, for example, a fibrous layer containing colored fibers, a monolithic layer containing a dispersed or imbedded colorant, a layer of an unbleached material that is colored in its virgin state, and so on.

**[0073]** In some embodiments, the visible highlighting may be provided by impressing or embossing the wetness sensation member or one of its layers. The impressed, embossed, or bonded portions of the wetness sensation member may provide a tactile sensation in addition to visibly highlighting the presence and location of the wetness sensation member. For instance, a raised area or a recessed area or the combination of raised and recessed areas adjacent to each other may be felt by the hand and, in some embodiments, may be felt by the wearer while wearing the article. Similarly, the raised area or pattern formed by a printed adhesive or gel, as mentioned above, may provide such a tactile sensation. Just as with the visible highlighting alone, the combination of visible highlighting and this tactile sensation can serve to draw the wearer's interest or can be pointed out by the caregiver and incorporated into an explanation of the upcoming opportunity for urinary toilet training.

[0074] In addition, the visible highlighting may be provided by incorporating distinctive fibers or filaments in one or both layers of the wetness sensation member or by distinctively orienting fibers or filaments in one of these layers. For example, a fiber or a filament of a distinctive color may be incorporated into the flow control material to visibly highlight its presence and its location in the article. Similarly, a distinctively thicker fiber or filament may be embedded in one of the two layers and thereby form a distinctive raised area or pattern.

[0075] If the portions of the structure of the absorbent article surrounding the wetness sensation member are of one color, the visible highlighting can be provided by the use of another color, by the use of contrast, by the use of a different pattern in the same or a similar color, or by any other method that visibly differentiates the wetness sensation member from the surrounding structural elements.

[0076] In some embodiments, the visible highlighting may include more than one color, more than one difference in contrast, more than one pattern, more than one graphic; more than one area of solid coloring, and so on, such that all portions of this description referring to the singular of a form of visible highlighting are meant to include the plural, and vice versa.

[0077] The visible highlighting may include open or closed geometric figures, a two dimensional representation of a three dimensional object, a representation of a commonly named or nameable shape or object, a representation of a recognizable object used in play, and/or a representation of a character that may be known to the wearer, such as a teddy bear, a character appearing on a television show for children, a character appearing in a game or a storybook for children, etc. In embodiments in which the visible highlighting includes a variety of figures, objects, and/or characters, the various elements of the visible highlighting may be interactively interrelated, related by subject matter, and/or related by a common story line. Conversely, the various elements may be interactively unrelated, unrelated by subject matter, and/or not related by a common story line.

[0078] When solid coloring is used, it may partially or completely fill the area bounded by a graphic outline, appear as shading inside or outside such a graphic outline, itself form a "filled-in" graphic, or simply uninterrupted occupy an area, e.g., occupy the entire width of a layer of the wetness sensation member over all or a portion of the corresponding length.

[0079] In some embodiments, the visible highlighting may become more or less visible when the wetness sensation member is wetted. In addition, the visible highlighting may change color when the wetness sensation member is wetted. Any of these effects may be created by the use of inks or dyes or other agents that undergo chemical reactions or are dispersed or concentrated when wetted by urine. In general, any of the wetness indicating compositions commonly used in externally visible wetness indicators, such as so-called "appearing" or "disappearing" wetness indicators that may become more or less visible when wetted and in wetness indicators that may change color when wetted, may be used for these versions of visible highlighting.

[0080] It is important to note that rather than being structurally disposed in such a way as to provide a wetness

indication that is visible from the outside of the absorbent article, any wetness indicating compositions used for the visible highlighting of the wetness sensation member must be visible from the body-facing surface of the absorbent article. This different disposition enables the caregiver to apply different techniques to the task of urinary toilet training when using an absorbent article of the present invention, as compared to using an absorbent article having only a wetness indicator visible from the outside of the article. For example, while the change in an exterior wetness indicator is visible for all to see, any change in the visible highlighting of an interior wetness sensation member remains "private" until either the caregiver or the wearer peers into the absorbent article or it is removed. Therefore, whether or not any wetting of the absorbent article has occurred can, itself, become the focus of a playful activity resembling a game, with the "secret" being revealed only when the caregiver and the wearer agree to conclude the game. If the wearer notices a sensation of wetness or merely desires to check the condition of the "private" indication, he or she can simply look inside the absorbent article. If the appearance of the visible highlighting has changed, the wearer can then choose to bring this to the attention of the caregiver in the context of asking to go to the bathroom. In addition, because the visible highlighting serves as a "private" indication, the wearer might be able to detect a change in its appearance before the appearance of any externally visible wetness indicator changes and thereby be the first person to mention the subject of going to the toilet. Furthermore, the provision of both visual and tactile sensations to the wearer may serve to reinforce the tactile sensation of wetness and thereby enhance the training effect of the wetness sensation member. An absorbent article in which the wetting is indicated by both a wetness sensation and a visible change in the appearance of the visible highlighting may thus facilitate faster learning on the part of the wearer.

[0081] Although the appearance of the visible highlighting remains "private" until either the caregiver or the wearer peers into the absorbent article or it is removed, the visible highlighting may be associatively correlated in visible form with marking that is located elsewhere in or on the absorbent article and is visible from the outside of the absorbent article. This externally visible marking may be permanent or may change in appearance while the absorbent article is being worn. For example, the externally visible marking may be an externally visible wetness indicator. By giving the visible highlighting of the wetness sensation member a visible form that is similar to the visible form of an externally visible marking, an opportunity for urinary toilet training may be enhanced. For instance, the caregiver can point out the similarity between the externally visible marking and the "private" visible highlighting of the wetness sensation member and ask the wearer to remember the hidden visible highlighting every time he or she notices the externally visible marking.

[0082] Even in embodiments in which the appearance of the visible highlighting is not affected by its being wetted, the associative correlation of the respective visible forms of an externally visible marking and the visible highlighting may serve to facilitate an opportunity for urinary toilet training. For example, if both the externally visible marking and the visible highlighting have the visible form of similar graphics, the externally visible marking can serve to draw the wearer's interest or can be pointed out by the caregiver

and incorporated into an explanation of the ongoing opportunity for urinary toilet training.

[0083] Such associative correlation of the respective visible forms of an externally visible marking and the visible highlighting can be achieved without the respective visible forms being similar, so long as the respective visible forms are mutually related in a recognizable way. For example, the visible forms may be related in subject matter and/or may be related by a common story line and/or be interactively interrelated. Even an associative correlation of a simple solid coloring form of an externally visible marking with a similar solid coloring form of visible highlighting can serve to facilitate an opportunity for urinary toilet training, especially when used with wearers possessing some recognition of colors or colored forms.

[0084] Alternatively, the visible highlighting may be associatively uncorrelated with any externally visible marking. The lack of associative correlation may be complete or may be specific, e.g., the respective visible forms of the visible highlighting and the externally visible marking may be unrelated in subject matter, not related by a common story line, and/or interactively unrelated, while still being associatively correlated in another way.

[0085] The visible form of the visible highlighting of the wetness sensation member need not be associatively correlated with the concept of urinary toilet training. However, in some embodiments, the visible form of the visible highlighting may be associatively correlated with the concept of urinary toilet training by, for example, providing a visual reference to the liquid-related nature of urinary toilet training, such as wetness, dryness, protection from wetness, the flow of a liquid, water, et cetera, and thus may serve to facilitate an opportunity for urinary toilet training.

[0086] The visible highlighting may emphasize dryness by depicting the sun, fair weather clouds, a sunny day, etc., while wetness may be referenced by a depiction of a water puddle, a cloud with falling rain, etc. A visual reference to protection from wetness may be provided by a depiction of an umbrella, a raincoat, a rain hat, galoshes, a submarine, or some other object that may be associated by the wearer with the concept of staying dry in a wet environment.

[0087] In any of these visible forms of visible highlighting that are associatively correlated with the concept of urinary toilet training, a human form and/or a recognizable character may be depicted in the visible highlighting. For example, a child may be shown in conjunction with inanimate objects, a child may be shown sitting on a potty chair, and/or a character from a children's storybook or a children's television program may be shown in similar poses, etc.

[0088] The wetness sensation member according to the present invention may be arranged in an absorbent article in a variety of configurations. In addition, absorbent articles may include a single wetness sensation member or a plurality of wetness sensation members. In any event, the wetness sensation member(s) are preferably a part of, or attached to, an element or web, such as a topsheet, which is reliably held against the skin of the wearer. The wetness sensation member may extend over a portion of the disposable absorbent article spanning less than one half of the length of the article or else extend over a substantial part of the article spanning more than one half the length of the

article. In addition, the wetness sensation member(s) are preferably positioned within the absorbent article to enhance the likelihood of being wetted with urine.

[0089] An exemplary embodiment of a disposable absorbent article **20** including a wetness sensation member **50** disposed with the topsheet **24** is illustrated in **FIG. 3a** and **FIG. 3b**. The wetness sensation member in this embodiment is a separate composite member attached to the topsheet. The wetness sensation member comprises a water-permeable body-facing layer **52** and a flow control layer **54** disposed in a face-to-face arrangement with the body-facing layer. The visible highlighting **200** is shown in **FIG. 3a** as an exemplary pattern of wavy lines and circles.

[0090] In an embodiment illustrated in **FIG. 4**, the wetness sensation member **50** has elastic properties and includes a first longitudinal end **70** attached to the first waist region **36** and a second longitudinal end **72** attached to the second waist region **38**. In addition, a center portion **74** of the member **50** is preferably attached to the crotch region **37** in order to stabilize the member and facilitate fitting the article to the wearer, prevent interference with bowel movements and ensure good contact with the wearer's skin.

[0091] In an alternate embodiment shown in **FIG. 5a** and **FIG. 5b**, the flow control layer **54** of the wetness sensation member **50** is attached to the inner surface of the topsheet **24** such that a portion of the topsheet **24** serves as the water-permeable layer **52** of the wetness sensation member **50**. For this embodiment, the topsheet **24** is preferably elastically foreshortened to deflect the wetness sensation member **50** into contact with the wearer's skin. Alternatively, this embodiment may include a topsheet that is shorter in length than the backsheets, having the longitudinal ends of the topsheet contiguous with the longitudinal ends of the backsheets so that as the disposable absorbent article is fitted around the wearer, the topsheet is forced into contact with the wearer's skin. The visible highlighting **200** is shown in **FIG. 5a** as an exemplary pattern of heart shapes.

[0092] Absorbent articles according to the present invention may include a plurality of wetness sensation members disposed on the body-facing surface of the article. An example of an embodiment providing a plurality of wetness sensation members is shown in **FIG. 6a** and **FIG. 6b**. Two flow control layers **54a** and **54b** are attached to the bottom surface of the topsheet **24** forming two wetness sensation members **50a** and **50b**. For this embodiment, the flow control layers **54a** and **54b** are disposed between the topsheet and the absorbent core **28** so that the topsheet serves as the water-permeable layers **52** of the wetness sensation members. The two flow control layers **54a** and **54b** are disposed parallel to and spaced apart from the longitudinal centerline **42** of the disposable absorbent article **20**. The spacing is determined to allow enough liquid to pass through to the core so as to prevent flooding that can result in leakage of the absorbent article during urination, while at the same time allowing enough liquid to flow and wick toward the flow control layers forming the wetness sensation members. The spacing between the flow control layers can be about 10 mm but can range from about 5 mm to about 15 mm and from about 8 mm and to about 12 mm. Although the embodiment shown in **FIG. 6a** and **FIG. 6b** has only two wetness sensation members, other absorbent article embodiments having three or more wetness sensation members are

contemplated. The visible highlighting **200** is shown in **FIG. 6a** as an exemplary pattern of oblong ovaloid shapes.

[0093] As shown in **FIG. 6a** and **FIG. 6b**, the spacing of the flow control layers provides room for an elongated slit opening **80** in the topsheet **24**. The elongated slit opening **80** is adapted to receive feces from the wearer and isolate the same from the wearer's skin. The elasticized regions **82a** and **82b** located adjacent to the slit opening **80** maintain alignment of the slit opening with the wearer's anus during use. The elasticized regions may also deflect the wetness sensation members toward the wearer's skin to maintain contact therewith during use. Exemplary elasticized topsheets including elongated slit openings are disclosed in U.S. Pat. No. 6,482,191 issued 19 Nov. 2002 in the name of Roe et al. Alternatively, the flow control layers **54a** and **54b** of the wetness sensation members may be elastically foreshortened to provide benefits similar to those provided by the elasticized regions disposed in the topsheet.

[0094] In another alternate embodiment shown in **FIG. 7a** and **FIG. 7b**, the topsheet **24** serves as the water-permeable layer **52** similar to the previous embodiment. However, the flow control layers **54a** and **54b** are disposed in two parallel oppositely facing Z-folds **90a** and **90b** formed in the topsheet **24** along the longitudinal length of the disposable absorbent article **20**, thus forming two wetness sensation members **50a** and **50b**. The Z-folded topsheet may be attached to the underlying layers along the longitudinal edges of the topsheet **24**, thus allowing the portion of the topsheet between the Z-folds to float freely. Longitudinally extending elastic elements **92a** and **92b** are disposed along the flow control layers **54a** and **54b** in order to deflect the center portion of the Z-folded topsheet away from the absorbent core **28**. The elastic elements may be disposed along the outer edges of the flow control layers **54a** and **54b** as shown in **FIG. 7b**, or alternatively, may be disposed in a face-to-face arrangement with the flow control layers. The combination of the Z-folded topsheet and the elastic elements maintains the wetness sensation members in contact with the wearer's skin in the event that the disposable absorbent article sags or fits loosely around the wearer. The visible highlighting **200** is shown in **FIG. 7a** as an exemplary pattern of star shapes.

[0095] In order to prevent the portion of the topsheet between the Z-folds from being forced into the gluteal groove and from interfering with the barrier leg cuffs, which are not shown in **FIG. 7a** or **FIG. 7b**, the spacing between the Z-folds can be about 65 mm and can range from about 50 mm to about 90 mm. Further, in order to control the deflection of the portion of the topsheet between the Z-folds, transverse bonds may be formed between the Z-folds in the first waist region, the second waist region and the crotch region using adhesives, ultrasonic bonds, radio frequency bonds, or other suitable means in order to control deflection. These transverse bonds may attach the Z-folded section to the body-facing surface of the topsheet and the section between the Z-folds to the underlying core.

[0096] As an alternative to a portion of the topsheet serving as a layer of a wetness sensation member, other components of the disposable absorbent article such as the barrier leg cuffs may serve as such a layer. The barrier leg cuffs may be made from either water-permeable or water-impermeable material. In either case, the barrier leg cuff

material may serve as one of the layers of the wetness sensation member. In such exemplary embodiments, the structure of the barrier leg cuffs preferably holds the wetness sensation members in contact with the skin of the wearer to provide the sensation of wetness against the wearer's legs and/or crotch crease.

[0097] An exemplary embodiment in which barrier leg cuffs serve as layers of the wetness sensation members is shown in **FIG. 8a** and **FIG. 8b**. The disposable absorbent article **20** for this embodiment includes barrier leg cuffs **100a** and **100b** made from water-impermeable material and a portion of each barrier leg cuff serves as the flow control layer of the respective wetness sensation member. The water-permeable layer **110** can extend the length of each of the barrier leg cuffs and preferably extends at least the length of the crotch region **37** and the front waist region **36**. The water-permeable layer **110** is preferably disposed on portions of the cuff closest to the longitudinal axis **42** of the disposable absorbent article **20** to increase the likelihood of becoming wetted during urination. As shown in **FIG. 8a** and **FIG. 8b**, the barrier leg cuffs **100a** and **100b** include elastic elements **108a** and **108b**, which serve to deflect the leg cuffs away from the topsheet **24** toward the skin of the wearer. The visible highlighting **200** is shown in **FIG. 8a** as an exemplary pattern of angled lines.

[0098] Another exemplary embodiment in which barrier leg cuffs serve as layers of the wetness sensation members is shown in **FIG. 9a** and **FIG. 9b**. In this embodiment, the barrier leg cuffs **100a** and **100b** are made of a water-permeable material and are otherwise arranged similarly to the embodiment shown in **FIG. 8a** and **FIG. 8b**. However, because the barrier leg cuff material serves as the water-permeable body-facing layer of each of the wetness sensation members **150a** and **150b** in this embodiment, flow control layers **54a** and **54b** are located between the absorbent core and each respective water-permeable layer formed by the barrier leg cuff material. The visible highlighting **200** is shown in **FIG. 9a** as an exemplary pattern of oval shapes.

[0099] The embodiments of wetness sensation members disclosed hereunder perform most effectively when held in contact with the skin of the wearer. In order to ensure that contact is made with the wearer's skin during use, the body-facing portion of the wetness sensation members may include a body-adhering composition, such as a topical adhesive, which acts to hold the wetness sensation member in place during use. The body-adhering composition may be applied to at least a portion of the body-facing surface of the wetness sensation member. However, the body-adhering composition may also be integral with the material making up the body-facing layer of the wetness sensation member. Further, the body-adhering composition may be disposed on any portion of the wetness sensation member contacting the skin of the wearer in any pattern or configuration including, but not limited to lines, stripes, dots, and the like. Such a body-adhering composition may include any of one or more substances capable of releasably adhering to the skin of the wearer, such as those disclosed in U.S. Pat. Nos. 4,231,369, 4,593,053, 4,699,146, 4,738,257, 5,726,250, 4,078,568, 4,140,115, 4,192,785, 4,393,080, 4,505,976, 4,551,490, 4,768,503, 5,614,586, and 5,674,275, and in the PCT Application published as WO 94/13235A1.

[0100] As previously mentioned, the disposable absorbent article **20** includes refastenable side seams that can be used

to fasten the waist regions together at the sides to apply the article like a diaper onto the body of the wearer and that can also be used to configure the article like a pair of pull-on training pants. These refastenable side seams provide several benefits including the significant synergistic benefits related to the article's use in toilet training that are described above. The refastenable side seams can be fastened by the user before the article is applied onto the body of the wearer and the article can then be applied like a pair of pull-on training pants. The refastenable side seams can be opened and refastened after the article is applied onto the body of the wearer in order to gain access for the inspection of the interior of the article and/or to adjust its configuration while being worn. Of course, the side seams can also be opened for the ultimate removal of the article for disposal, as an alternative to leaving the article in the form of a pair of training pants and pulling it downward over the legs and feet for removal.

[0101] The refastenable side seams also facilitate the pre-configuration of the article in the form of a pair of training pants prior to the point of sale to the consumer, if such a pre-fastened presentation is desired by the manufacturer, distributor, and/or retailer, while still providing the user with the alternative of opening the side seams in preparation for applying the article like a diaper. For example, several like disposable absorbent articles of the present invention may be pre-configured by fastening their side seams and then packaged together for shipment and subsequent sale. The packaging may take any desired form, e.g., a stack of folded articles contained inside a sealed film bag, a stack of folded articles inside a closed carton, or any other form of a number of articles contained inside a closed container. When the user removes each pre-fastened article from the package and prepares to use it, he or she can decide whether to apply it while the side seam is still fastened, i.e., while remaining configured as a pair of training pants, or to open the side seams and apply the article as a diaper by refastening the side seams after properly positioning the article relative to the wearer's body. Thus, regardless of whether or not the articles inside the package are pre-fastened, the user is provided with the option of applying each article having refastenable side seams as a pair of training pants or as an open diaper that must then be fastened at the side seams.

[0102] Some existing disposable absorbent articles have refastenable side seams. However, some older children, such as those of toilet training age, may be able to open conventional refastenable side seams and thereby remove a disposable absorbent article. A child may intentionally attempt to remove the article or may simply manipulate the refastenable side seams and inadvertently remove the article. Therefore, it may be desirable to include elements that restrict access to the refastenable side seams and/or that make the opening of the side seams relatively more difficult than the opening of conventional refastenable side seams in order to help protect against the opening of the side seams by the child while allowing an adult caregiver to open and refasten the side seams at will.

[0103] An example of refastenable side seams **40** is shown in **FIG. 10**. In this embodiment, a primary fastening component **43** is disposed on the interior of the disposable absorbent article **20** in the second waist region **38** adjacent to the portion **137c** of the first side edge and another primary

fastening component **43** is disposed on the interior of the disposable absorbent article **20** in the second waist region adjacent to the portion **139c** of the second side edge. The portion **137c** of the side edge is shown in an open condition, such as prior to closing and fastening or after being reopened. The portion **139c** of the opposing side edge is shown fastened, i.e., forming a pants configuration. In **FIG. 10**, the second waist region **38** overlaps the first waist region **36** when they are fastened together. Alternatively, the primary fastening components **43** may be disposed on the interior of the article **20** in the first waist region **36** such that the first waist region **36** overlaps the second waist region **38** when they are fastened together. In addition, the primary fastening components **43** may be disposed on the exterior of the article **20** rather than on the interior.

[0104] The primary fastening component may be formed of any material and in any form that will releasably attach to the mating surface of the opposing waist region when pressed against it. For example, the primary fastening component may be a mechanical fastener that releasably engages with the mating surface, such as by means of a plurality of hooks engaging with loops formed by fibers in a nonwoven sheet. Alternatively, the primary fastening component may be an adhesive that releasably adheres to the mating surface.

[0105] As described in more detail below, the primary fastening component may also interact with a discrete mating fastening component. For example, a mechanical primary fastening component containing hooks may engage with a discrete mating fastening component containing loops. Similarly, an adhesive primary fastening component may adhere to a discrete mating fastening sheet that is specifically selected for good adhesion. Also similarly, a cohesive primary fastening component may cohere to a mating cohesive fastening component. Each of the fastening components may have any suitable shape, such as rectangular, circular, ovaloid, undulating, etc. The shape may be chosen according to various criteria, such as to maximize or minimize the area of the fastening component, to impart a particular appearance to the fastening component, to distribute the stresses and forces to which the fastening component is subjected when the article is worn in a particular way, etc.

[0106] Another example of refastenable side seams is shown in **FIG. 11**. In this embodiment, the primary fastening components **43** are disposed on the exterior of the disposable absorbent article **20** in the first waist region adjacent to the portions **137a** and **139a** of the respective side edges. Discrete mating fastening components **45** are correspondingly disposed on the interior of the article **20** in the second waist region **38** adjacent to the portions **137c** and **139c** of the respective side edges. In addition, secondary fastening components **46** are disposed laterally adjacent to the primary fastening components **43**.

[0107] When both primary fastening components and discrete mating fastening components are present, their disposition relative to the interior and exterior of the disposable absorbent article is generally interchangeable, i.e., they may be disposed as shown in **FIG. 11** or the primary fastening component may be disposed interiorly and the mating fastening component may be disposed exteriorly. Similarly, their disposition relative to the first waist region and the second waist region is generally interchangeable, i.e., they may be disposed such that the second waist region **38**

overlaps the first waist region **36** when they are fastened together as shown in **FIG. 11** or they may be disposed such that the first waist region **36** overlaps the second waist region **38** when they are fastened together. In addition, the secondary fastening components may be disposed adjacent to the primary fastening components and on the same surface as the primary fastening components, as shown in **FIG. 11**, or may be disposed on a mating surface and/or adjacent to a discrete mating fastening component. In general, as is apparent from the above description, the initial disposition(s) of the primary fastening component(s) is (are) not critical, so long as the opposing waist regions can be fastened together in an overlapped configuration to sandwich the fastening component(s) between them.

**[0108]** In the exemplary embodiment shown in **FIG. 12**, each of the secondary fastening components serves to fasten the overlapping portions of the waist regions together adjacent to the releasable attachment formed by the adjacent primary and the mating fastening components. When disposed between the primary fastening component **43** and the portion **137c** of the side edge that exteriorly overlaps in the fastened side seam **40**, as shown in **FIG. 12**, the secondary fastening component may restrict and/or prevent direct lateral access to the primary fastening component and thereby help protect against the opening of the side seams by a child who is wearing the disposable absorbent article. In order to enhance this protection, the secondary fastening component may overlap the primary fastening component in addition to being disposed between it and the exteriorly overlapped side edge, thereby eliminating any laterally extending gap between the two, into which a finger could be inserted to pry the overlapping waist region loose from the overlapped waist region. Alternatively or in addition, a secondary fastening component may be disposed between the side edge that is interiorly overlapped and the primary fastening component, i.e., laterally symmetrically opposite the secondary fastening component shown in **FIG. 12**.

**[0109]** Alternatively or in addition, a secondary fastening component may be disposed between the primary fastening component and the adjacent waist edge and/or between the primary fastening component and the crotch region. Such a longitudinally adjacent disposition of the secondary fastening component relative to the primary fastener in the fastened side seam may more effectively restrict the access to the primary fastener than only a laterally adjacent disposition. Also, the secondary fastening component may be disposed both laterally adjacent and longitudinally adjacent to the primary fastener. For example, the secondary fastening component **46** shown in **FIG. 13** extends around three sides of the primary fastening component **43** so as to be disposed between the primary fastening component and each of the exteriorly overlapping side edge portion **137c**, the adjacent waist edge **136**, and the crotch region **37**, when the side seam is fastened. As an alternative to a continuously extending secondary fastening component like that shown in **FIG. 13**, more than one discrete secondary fastening component and/or a segmented secondary fastening component may be provided. For example, a discrete laterally adjacent longitudinally extending secondary fastener like that in **FIG. 11** may be provided in combination with one or more discrete longitudinally adjacent laterally extending secondary fastener(s) to form an overall secondary fastening component pattern similar to that formed by the continuous secondary fastening component of **FIG. 13**.

**[0110]** The secondary fastening component may be formed of any material that is suitable for the primary fastening component. In some embodiments, the secondary fastening components may be formed of a different material from the primary fastening component in order to take advantage of the unique properties of different materials. For example, a mechanical fastener may be used for the primary fastening component in order to provide sufficient shear strength when fastened to resist the hoop forces to which the waist regions are subjected when the disposable absorbent article is worn. An adhesive may be used for the corresponding secondary fastening component because the mechanical fastener resists substantially all of the shear forces and the only force exerted on the secondary fastening component is a peel force that is applied when the caregiver desires to gain access to the primary fastening component. The secondary fastening component is preferably refastenable after being opened, so that it can continue to be used to restrict access to the primary fastening component after the latter has been opened and refastened.

**[0111]** Another example of refastenable side seams is shown in **FIG. 14**, **FIG. 15**, and **FIG. 16**. In this embodiment, a primary fastening component **43** is disposed on the interior of the disposable absorbent article **20** in the second waist region **38** adjacent to the portion **137c** of the first side edge and another primary fastening component **43** is disposed on the interior of the disposable absorbent article **20** in the second waist region adjacent to the portion **139c** of the second side edge. In addition, a secondary fastening component **46** is disposed laterally adjacent to each of the primary fastening components. These secondary fastening components **46** serve to fasten the waist regions together in a flanged arrangement adjacent to the portion **137a** of the first side edge in the first waist region **36** and adjacent to the portion **139a** of the second side edge in the first waist region.

**[0112]** As shown in **FIG. 14**, the secondary fastening component **46** can be used to fasten the waist regions together in the flanged arrangement without fastening the primary fastening component **43**. Then, as shown in **FIG. 15**, the primary fastening component may also be fastened to form a refastenable side seam **40** in which the waist regions are overlapped where they are fastened together by the primary fastening component **43** and are arranged in a flanged configuration where they are fastened together by the secondary fastening component **46**. The waist regions may first be fastened together by only the secondary fastening components **46** and the disposable absorbent article thus configured as a pair of training pants. Then, after the article is applied onto the body of the wearer by being pulled up over the legs, the primary fastening components **43** may be used to firmly secure the article in place.

**[0113]** As can be understood by reference to **FIG. 15**, the primary fastening component **43** may be placed at any selected position on the overlapped waist region, such that the overlapping waist region may be overlapped by any selected distance onto the opposing waist region. The distance of overlap may be selected to fit the disposable absorbent article onto the wearer as desired, e.g., loosely, tightly, etc. For example, as shown in **FIG. 15**, the second waist region **38** may be overlapped onto the first waist region **36** a distance that creates a desired tightness of fit around the waist of the wearer by creating a fold **48** in the first waist region of the necessary width. In other words, the overlap-

ping waist region may be cinched as tightly as desired and then fastened to the overlapped waist region by the primary fastening component **43** to retain the tightness thus achieved. In particular, the disposable absorbent article may be packaged with the secondary fastening component fastened and the primary fastening component open, with the secondary fastening component located such that the fit around the waist of a wearer of the intended size is relatively loose. Such a configuration presents the article to the user as a pair of training pants that can be easily applied onto the body of a wearer. After application, the primary fastening component can be used to achieve the desired fit for wear over a period of time.

[0114] In FIG. 16, the portion **137c** of the side edge in the second waist region **38** is shown in an open condition, such as prior to cinching the waist and fastening the primary fastening component **43** to the first waist region **36** or after being reopened, while the adjacent secondary fastening component **46** is shown already fastened. The portion **139c** of the opposing side edge is shown in a fastened condition, i.e., forming a pants configuration, with both the primary fastening component **43** and the secondary fastening component **46** fastening the first waist region **36** and the second waist region **38** together.

[0115] As noted above, the secondary fastening components may be formed of any material that is suitable for the primary fastening components and/or may be formed of a different material from the primary fastening components in order to take advantage of the unique properties of different materials. In addition, in at least the embodiment shown in FIG. 14, FIG. 15, and FIG. 16, the secondary fastening components may be formed by bonding, sealing, or otherwise attaching the opposing waist regions together adjacent to their common side edges, e.g., if it is desired to configure the disposable absorbent article as a pair of training pants and to provide the refastenable side seam in the form of a cinching feature. For example, the secondary fastening components may be located such that the fit around the waist of the intended size of wearer is relatively loose to provide a desired degree of access for the inspection of the interior of the article. The refastenable primary fastening components may then be used to cinch the overlapping waist region to achieve the desired fit on the wearer. Whenever it is desired to inspect the interior of the article, the primary fastening component may be unfastened and subsequently refastened after the inspection is completed. Additionally, the secondary fastening component that is formed by bonding, sealing, or otherwise attaching the waist regions together may be frangible, such that it can be unfastened to detach the waist regions from each other, e.g., to enlarge the size of the waist opening and/or for the removal of the article after use. In such an embodiment, the refastenable primary fastening component may still be used to fasten the waist regions together and may still be opened for the inspection of the interior of the article and/or for the removal of the article after use.

[0116] Several forms of refastenable side seams, the fastening components forming them, and the materials that are suitable for forming them are described in U.S. Patent Application Publication U.S. 2003/0060794 published on 27 Mar. 2003 in the name of Olson. Processes for forming refastenable side fasteners and for protecting them during manufacturing and packaging are described in U.S. Pat. No.

6,428,526 issued on 6 Aug. 2002 in the name of Heindel et al. Among several alternatives, such side seams, fastening components, materials, and processes may be used to produce the disposable absorbent articles of the present invention.

[0117] The disclosures of all patents, patent applications, and any patents which issue thereon, as well as any corresponding published foreign patent applications, and all publications listed and/or referenced in this application, are hereby incorporated herein by reference. It is expressly not admitted, however, that any of the documents or any combination of the documents incorporated herein by reference teaches or discloses the present invention.

[0118] While particular embodiments and/or individual features 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. Further, it should be apparent that all combinations of such embodiments and features are possible and can result in preferred executions of the invention. Therefore, the appended claims are intended to cover all such changes and modifications that are within the scope of this invention.

What is claimed is:

1. A disposable absorbent article for wearing about a lower torso of a wearer and having a longitudinal axis, two laterally opposed article side edges extending between a laterally extending first waist edge in a first waist region and a laterally extending second waist edge in a longitudinally opposing second waist region, and a crotch region between the waist regions, the disposable absorbent article comprising:

- a backsheet;
- a topsheet attached to the backsheet and having a body-facing surface;
- an absorbent core disposed intermediate the backsheet and the topsheet;
- at least one wetness sensation member including a water-permeable body-facing layer covering a portion of the absorbent core and a flow control layer disposed between the water-permeable body-facing layer and the absorbent core in a face-to-face arrangement with the water-permeable body-facing layer and having two laterally opposed flow control layer side edges, at least a portion of each of the two flow control layer side edges being disposed laterally inwardly of the article side edges; and
- at least one refastenable side seam at which the opposing waist regions are fastened together at or adjacent to one of the article side edges to form a leg opening, the refastenable side seam comprising at least a primary fastening component disposed in one of the waist regions and being capable of fastening to the opposing waist region,

wherein urine deposited by the wearer onto the wetness sensation member can penetrate through the water-permeable body-facing layer in a z-direction away from the wearer to the flow control layer and the flow control layer retards the passage of the urine through the wetness sensation member in the z-direction and sup-



ports the movement of the urine in an x-y plane such that the wearers awareness of urination is enhanced.

2. The disposable absorbent article of claim 1 wherein the primary fastening component is a mechanical fastener.

3. The disposable absorbent article of claim 1 wherein the refastenable side seam comprises at least one discrete mating fastening component with which the primary fastening component is adapted to engage.

4. The disposable absorbent article of claim 1 wherein the refastenable side seam is adapted to fasten the opposing waist regions together in an overlapped configuration and comprises at least one secondary fastening component adapted to fasten respective overlapped portions of the opposing waist regions together adjacent to the primary fastening component.

5. The disposable absorbent article of claim 4 wherein the primary fastening component is a mechanical fastener and the secondary fastening component is an adhesive.

6. The disposable absorbent article of claim 1 further comprising a visible highlighting indicating a presence of the wetness sensation member in the disposable absorbent article and being visible at least when viewing the body-facing surface. Of the topsheet to facilitate an opportunity for urinary toilet training of the wearer.

7. The disposable absorbent article of claim 6 wherein the visible highlighting comprises at least one area of the flow control layer of the wetness sensation member including a graphic visibly differing in coloration from the topsheet.

8. The disposable absorbent article of claim 6 wherein the visible highlighting is associatively correlated with the concept of urinary toilet training.

9. A disposable absorbent article for wearing about a lower torso of a wearer and having a longitudinal axis, two laterally opposed article side edges extending between a laterally extending first waist edge in a first waist region and a laterally extending second waist edge in a longitudinally opposing second waist region, and a crotch region between the waist regions, the disposable absorbent article comprising:

a backsheet;

a topsheet attached to the backsheet and having a body-facing surface;

an absorbent core disposed intermediate the backsheet and the topsheet;

at least one wetness sensation member comprising a water-permeable portion of the topsheet covering a portion of the absorbent core and a flow control layer disposed between the water-permeable portion of the topsheet and the absorbent core in a face-to-face arrangement with the water-permeable portion of the topsheet and having two laterally opposed flow control layer side edges, at least a portion of each of the two flow control layer side edges being disposed laterally inwardly of the article side edges; and

at least one refastenable side seam at which the opposing waist regions are fastened together at or adjacent to one of the article side edges to form a leg opening, the refastenable side seam comprising at least a primary fastening component disposed in one of the waist regions and being capable of fastening to the opposing waist region,

wherein urine deposited by the wearer onto the wetness sensation member can penetrate through the water-permeable portion of the topsheet in a z-direction away from the wearer to the flow control layer and the flow control layer retards the passage of the urine through the wetness sensation member in the z-direction and supports the movement of the urine in an x-y plane such that the wearer's awareness of urination is enhanced.

10. The disposable absorbent article of claim 9 further comprising a visible highlighting indicating a presence of the wetness sensation member in the disposable absorbent article and being visible at least when viewing the body-facing surface of the topsheet to facilitate an opportunity for urinary toilet training of the wearer.

11. The disposable absorbent article of claim 9 comprising a plurality of the wetness sensation members disposed parallel to and spaced apart from the longitudinal axis and spaced apart from one another.

12. The disposable absorbent article of claim 11 wherein the topsheet comprises two longitudinally extending oppositely facing Z-folds parallel to the longitudinal axis and the flow control layer of each of the respective wetness sensation members is disposed within a respective one of the two Z-folds.

13. The disposable absorbent article of claim 12 wherein the two Z-folds further comprise two longitudinally extending elastic members disposed along the two flow control layers.

14. A disposable absorbent article for wearing about a lower torso of a wearer and having a longitudinal axis, two laterally opposed article side edges extending between a laterally extending first waist edge in a first waist region and a laterally extending second waist edge in a longitudinally opposing second waist region, and a crotch region between the waist regions, the disposable absorbent article comprising:

a backsheet;

a topsheet attached to the backsheet;

an absorbent core disposed intermediate the backsheet and the topsheet;

at least one wetness sensation member including a water-permeable body-facing layer covering a portion of the absorbent core and a flow control layer disposed between the water-permeable body-facing layer and the absorbent core in a face-to-face arrangement with the water-permeable body-facing layer, no portion of the water-permeable body-facing layer extending longitudinally or transversely beyond the flow control layer; and

at least one refastenable side seam at which the opposing waist regions are fastened together at or adjacent to one of the article side edges to form a leg opening, the refastenable side seam comprising at least a primary fastening component disposed in one of the waist regions and being capable of fastening to the opposing waist region,

wherein urine deposited by the wearer onto the wetness sensation member can penetrate through the water-permeable body-facing layer in a z-direction away from the wearer to the flow control layer and the flow control layer retards the passage of the urine through the

wetness sensation member in the z-direction and supports the movement of the urine in an x-y plane such that the wearer's awareness of urination is enhanced.

15. The disposable absorbent article of claim 14 comprising a plurality of the wetness sensation members disposed parallel to and spaced apart from the longitudinal axis, no portion of the water-permeable body-facing layer of each of the respective wetness sensation members extending longitudinally or transversely beyond the respective flow control layer.

16. The disposable absorbent article of claim 14 further comprising a visible highlighting indicating a presence of the wetness sensation member in the disposable absorbent article and being visible at least when viewing the body-facing surface of the topsheet to facilitate an opportunity for urinary toilet training of the wearer.

17. A package comprising a plurality of disposable absorbent articles for wearing about a lower torso of a wearer, each of the disposable absorbent articles having a longitudinal axis, two laterally opposed article side edges extending between a laterally extending first waist edge in a first waist region and a laterally extending second waist edge in a longitudinally opposing second waist region, and a crotch region between the waist regions, and comprising:

a backsheet;

a topsheet attached to the backsheet and having a body-facing surface;

an absorbent core disposed intermediate the backsheet and the topsheet;

at least one wetness sensation member including a water-permeable body-facing layer covering a portion of the absorbent core and a flow control layer disposed between the water-permeable body-facing layer and the absorbent core in a face-to-face arrangement with the water-permeable body-facing layer and having two laterally opposed flow control layer side edges, at least a portion of each of the two flow control layer side edges being disposed laterally inwardly of the article side edges; and

at least one refastenable side seam at which the opposing waist regions are fastened together at or adjacent to one of the article side edges to form a leg opening, the refastenable side seam comprising at least a primary fastening component disposed in one of the waist regions and being capable of fastening to the opposing waist region,

wherein urine deposited by the wearer onto the wetness sensation member can penetrate through the water-permeable body-facing layer in a z-direction away from the wearer to the flow control layer and the flow control layer retards the passage of the urine through the wetness sensation member in the z-direction and supports the movement of the urine in an x-y plane such that the wearer's awareness of urination is enhanced.

18. The package of claim 17 wherein each of the disposable absorbent articles is configured such that the refastenable side seam is fastened.

19. The package of claim 17 wherein each of the disposable absorbent articles further comprises a visible highlighting indicating a presence of the wetness sensation member in the disposable absorbent article and being visible at least

when viewing the body-facing surface of the topsheet to facilitate an opportunity for urinary toilet timing of the wearer.

20. The package of claim 17 wherein each of the disposable absorbent articles further comprises at least one secondary fastening component adapted to fasten respective portions of the opposing waist regions together adjacent to the primary fastening component, the secondary fastening component being fastened and the primary fastening component being open.

21. A disposable absorbent article for wearing about a lower torso of a wearer and having a longitudinal axis, two laterally opposed article side edges extending between a laterally extending first waist edge in a first waist region and a laterally extending second waist edge in a longitudinally opposing second waist region, and a crotch region between the waist regions, the disposable absorbent article comprising:

a backsheet;

a topsheet attached to the backsheet and having a body-facing surface;

an absorbent core disposed intermediate the backsheet and the topsheet;

at least one wetness sensation member including a flow control layer disposed between a water-permeable body-facing layer and the absorbent core; and

at least one refastenable side seam at which the opposing waist regions are fastened together at or adjacent to one of the article side edges to form a leg opening, the refastenable side seam comprising at least a primary fastening component disposed in one of the waist regions and being capable of fastening to the opposing waist region,

wherein urine deposited by the wearer onto the wetness sensation member can penetrate through the water-permeable body-facing layer in a z-direction away from the wearer to the flow control layer and the flow control layer retards the passage of the urine through the wetness sensation member in the z-direction.

22. The disposable absorbent article of claim 21 wherein the primary fastening component is a mechanical fastener.

23. The disposable absorbent article of claim 21 wherein the refastenable side seam comprises at least one discrete mating fastening component with which the primary fastening component is adapted to engage.

24. The disposable absorbent article of claim 21 wherein the refastenable side seam is adapted to fasten the opposing waist regions together in an overlapped configuration and comprises at least one secondary fastening component adapted to fasten respective overlapped portions of the opposing waist regions together adjacent to the primary fastening component.

25. The disposable absorbent article of claim 24 wherein the primary fastening component is a mechanical fastener and the secondary fastening component is an adhesive.

26. The disposable absorbent article of claim 21 further comprising a visible highlighting indicating a presence of the wetness sensation member in the disposable absorbent article and being visible at least when viewing the body-facing surface of the topsheet to facilitate an opportunity for urinary toilet training of the wearer.

27. The disposable absorbent article of claim 21 comprising a plurality of the wetness sensation members disposed parallel to and spaced apart from the longitudinal axis and spaced apart from one another.

28. A disposable absorbent article for wearing about a lower torso of a wearer and having a longitudinal axis, a body-facing surface, two laterally opposed article side edges extending between a laterally extending first waist edge in a first waist region and a laterally extending second waist edge in a longitudinally opposing second waist region, and a crotch region between the waist regions, the disposable absorbent article comprising:

- a backsheet;
- a topsheet attached to the backsheet;
- at least one flow control layer;
- an absorbent core disposed intermediate the backsheet and the topsheet, at least a portion of the absorbent core being disposed between the flow control layer and the backsheet; and
- at least one refastenable side seam at which the opposing waist regions are fastened together at or adjacent to one of the article side edges to form a leg opening, the refastenable side seam comprising at least a primary fastening component disposed in one of the waist regions and being capable of fastening to the opposing waist region,

wherein the flow control layer retards flow in a z direction of urine deposited by the wearer into the disposable absorbent article.

29. The disposable absorbent article of claim 28 wherein the primary fastening component is a mechanical fastener.

30. The disposable absorbent article of claim 28 wherein the refastenable side seam comprises at least one discrete mating fastening component with which the primary fastening component is adapted to engage.

31. The disposable absorbent article of claim 28 wherein the refastenable side seam is adapted to fasten the opposing waist regions together in an overlapped configuration and comprises at least one secondary fastening component adapted to fasten respective overlapped portions of the opposing waist regions together adjacent to the primary fastening component.

32. The disposable absorbent article of claim 31 wherein the primary fastening component is a mechanical fastener and the secondary fastening component is an adhesive.

33. The disposable absorbent article of claim 28 further comprising a visible highlighting indicating a presence of the flow control layer in the disposable absorbent article and being visible at least when viewing the body-facing surface.

34. The disposable absorbent article of claim 28 comprising a plurality of the wetness sensation members disposed parallel to and spaced apart from the longitudinal axis and spaced apart from one another.

35. A package comprising a plurality of disposable absorbent articles for wearing about a lower torso of a wearer, each of the disposable absorbent articles having a longitudinal axis, two laterally opposed article side edges extending between a laterally extending first waist edge in a first waist region and a laterally extending second waist edge in a longitudinally opposing second waist region, and a crotch region between the waist regions, and comprising:

- a backsheet;
- a topsheet attached to the backsheet and having a body-facing surface;
- an absorbent core disposed intermediate the backsheet and the topsheet;
- at least one wetness sensation member including a flow control layer disposed between a water-permeable body-facing layer and the absorbent core; and
- at least one refastenable side seam at which the opposing waist regions are fastened together at or adjacent to one of the article side edges to form a leg opening, the refastenable side seam comprising at least a primary fastening component disposed in one of the waist regions and being capable of fastening to the opposing waist region,

wherein urine deposited by the wearer onto the wetness sensation member can penetrate through the water-permeable body-facing layer in a z-direction away from the wearer to the flow control layer and the flow control layer retards the passage of the urine through the wetness sensation member in the z-direction.

36. The package of claim 35 wherein each of the disposable absorbent articles is configured such that the refastenable side seam is fastened.

37. The package of claim 35 wherein each of the disposable absorbent articles further comprises a visible highlighting indicating a presence of the wetness sensation member in the disposable absorbent article and being visible at least when viewing the body-facing surface of the topsheet to facilitate an opportunity for urinary toilet training of the wearer.

38. The package of claim 35 wherein each of the disposable absorbent articles further comprises at least one secondary fastening component adapted to fasten respective portions of the opposing waist regions together adjacent to the primary fastening component, the secondary fastening component being fastened and the primary fastening component being open.

39. A package comprising a plurality of disposable absorbent articles for wearing about a lower torso of a wearer, each of the disposable absorbent articles having a longitudinal axis, a body-facing surface, two laterally opposed article side edges extending between a laterally extending first waist edge in a first waist region and a laterally extending second waist edge in a longitudinally opposing second waist region, and a crotch region between the waist regions, and comprising:

- a backsheet;
- a topsheet attached to the backsheet;
- at least one flow control layer;
- an absorbent core disposed intermediate the backsheet and the topsheet, at least a portion of the absorbent core being disposed between the flow control layer and the backsheet; and
- at least one refastenable side seam at which the opposing waist regions are fastened together at or adjacent to one of the article side edges to form a leg opening, the refastenable side seam comprising at least a primary

fastening component disposed in one of the waist regions and being capable of fastening to the opposing waist region,

wherein the flow control layer retards flow in a z direction of urine deposited by the wearer into the disposable absorbent article.

**40.** The package of claim 39 wherein each of the disposable absorbent articles is configured such that the refastenable side seam is fastened.

**41.** The package of claim 39 wherein each of the disposable absorbent articles further comprises a visible highlighting indicating a presence of the flow control layer in the

disposable absorbent article and being visible at least when viewing the body-facing surface.

**42.** The package of claim 39 wherein each of the disposable absorbent articles further comprises at least one secondary fastening component adapted to fasten respective portions of the opposing waist regions together adjacent to the primary fastening component, the secondary fastening component being fastened and the primary fastening component being open.

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