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DESCRIPTION

ABSORBENT ARTICLE

TECHNICAL FIELD

The present invention relates to disposable absorbent articles, such as diapers, sanitary napkins, incontinence protectors and pantidiapers, capable of dynamically fitting the wearer's body and of surely preventing the leakage of the wearer's excrements.

BACKGROUND ART

The term "absorbent article" used herein signifies an article capable of absorbing and sealing exudates and, more specifically, signifies an article capable of absorbing the wearer's excrements from the wearer's body or from around the wearer's body and of sealing the absorbed excrements. The term "disposable" used herein signifies a state of being designed to be thrown away after use and being intended not to be washed, not to to be restored to its original condition and not to be used repeatedly. Although the term "diaper" used herein signifies an absorbent article for covering the lower trunk of a baby or an incontinent person, the present invention is applicable to other disposable absorbent articles, such as incontinence protecting briefs,

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incontinence protecting garments, diaper covers, diaper liners, sanitary garments and such.

Diapers, incontinence protecting briefs, pantidiapers, diaper covers are absorbent articles that cover or are wrapped around a portion of the wearer's body to absorb and hold the wearer's excrements.

Principal functions of an absorbent article, such as a disposable diaper or a pair of incontinence protecting briefs are to absorb the wearer's excrements by its absorbent core and to prevent soiling or wetting the wearer's clothes or other articles in contact with the wearer, such as bedding.

A generally used disposable diaper comprises an absorbent structure comprising a top sheet, a back sheet and an absorbent core, and side flaps each comprising a usually unstretchable back sheet and an unstretchable top sheet and extended along the longitudinal side edges of the absorbent structure to form elastic leg openings, respectively. Each side flap has a cuff serving as a barrier that inhibits the leakage of liquids through gaps at the edges of the diaper into the clothes, and sealing gaps between the wearer's legs and the diaper so that the least unavoidable gaps are formed. The side flaps are effective in preventing the infiltration of liquids from the wet diaper into the clothes touching the edges of the diaper.

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The disposable diaper is provided with stretchable leg cuffs to secure the liquid holding performance of the disposable diaper. The stretchable leg cuffs that suppress the leakage of excrements through gaps between the wearer's legs and the diaper are called by different designations, such as leg bands, side flaps and barrier cuffs.

A disposable diaper disclosed in U.S. Pat. No. 3,860,003 has contractile leg openings each defined by a side flap and at least one elastic member forming a stretchable cuff (gasket cuff) in combination.

A disposable diaper disclosed in U.S. Pat. No. 4,909,803 is provided with standing elastic flaps (barrier cuffs) to improve leg holding performance.

A disposable diaper disclosed in U.S. Pat. No. 4,695,278 is provided with double cuffs each comprising a gasket cuff and a barrier cuff.

Most disposable absorbent articles, such as diapers, are provided with either of two types of leg cuffs. i.e., a gasket cuff and a barrier cuff, or both the two types of leg cuffs. The gasket cuff makes a portion of the disposable absorbent article forming a leg opening hold closely to the wearer's leg to prevent the leakage of excrements through the leg opening. For example, a diaper disclosed in U.S. Pat. No. 3,860,003 is provided with elastically stretchable side flaps. Diapers disclosed in U.S. Pat. Nos. 4,333,782

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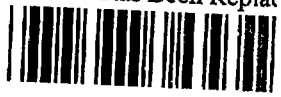

and 4,450,026 are provided with elastic film ribbons incorporated into the edges of the diaper.

Barrier cuffs are used for improving the excrement holding performance of a disposable absorbent article. For example, a disposable garment disclosed in U.S. Pat. No. 4,704,115 is provided with side edge leakageproof grooves that do not surround the wearer's thighs during use to prevent turning-over or unfolding. A disposable article disclosed in U.S. Pat. No. 4,808,178 is provided with absorbent, impermeable leakageproof flaps.

Furthermore, a disposable absorbent article disclosed in U.S. Pat. No. 4,795,452 is provided with cuff members each provided with a cantilever flap and an impermeable seal, serving as a barrier wall for retarding the flow of excrements, and exerting a function of a gasket for the leg. A disposable absorbent article disclosed in U.S. Pat. No. 4,795,454 is provided with a spacing means disposed on the distal edge, and a seal formed on the proximal edge.

Although the cuff members of a disposable absorbent article are very effective leakageproof measures, leg cuffs, which touches the wearer's skin, must be soft to the touch as well as effective in leakageproof performance.

DISCLOSURE OF THE INVENTION

Accordingly, it is an object of the present invention

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to provide an absorbent article two improved important functions, i.e., softness to the touch and leakageproof capability.

An absorbent article in accordance with the present invention having a front waist portion, a back waist portion and a crotch portion comprises an outer cover layer, an absorbent core held in the outer cover layer, and cuff members disposed on the opposite sides of the absorbent core so as to extend along and the longitudinal edges of the absorbent core, respectively. Each cuff member is provided with a barrier cuff having a fixed end fixedly positioned near to the corresponding longitudinal edge of the absorbent core, and a free end capable of being contracted by at least one elastic element. The barrier cuff is formed of a multilayer liquidproof sheet, has a plurality of hollow portions successively arranged between the fixed end and the free end, and the elastic element is disposed on the edge, on the side of the free end, of at least the hollow portion nearest the free end.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a plan view of a disposable diaper as an example of an absorbent article in accordance with the present invention; and

Fig. 2 is an enlarged perspective view, partly in

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section, of an essential portion of a barrier cuff.

BEST MODE FOR CARRYING OUT THE INVENTION

Fig. 1 is a plan view of a disposable diaper as an example of an absorbent article in accordance with the present invention. In Fig. 1, a disposable diaper 20 is partly broken away, contractile portions thereof are stretched out to facilitate the understanding of the structure thereof and laid with its inner surface to be contiguous with or in contact with the wearer facing up.

Referring to Fig. 1, the disposable diaper 20 has a front waist portion 21, a back waist portion 23 and a crotch portion 25, and comprises an absorbent pad 22 having the shape of a rectangle, a sandglass, the character T or an asymmetric or, preferably, symmetric modified sandglass, a pair of side panels 24 extending outward from portions of the absorbent pad 22 in the front waist portion and the back waist portion, leg cuffs 30 to surround the wearer's legs, respectively, and fastening members 60 connected to portions of the side panels 24 in the back waist portion 23, respectively.

As shown in Fig, 2, the absorbent pad 22 comprises a liquid-permeable top sheet 27, a liquid-impermeable back sheet 28, and an absorbent core 29 sandwiched between the top sheet 27 and the back sheet 28.

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As shown in Fig. 1, the top sheet 27 and the back sheet 28 of the absorbent pad 22 are greater than the absorbent core 29 in length and width. The marginal portions of the top sheet 27 and the back sheet 28 extend outward beyond the edges 29a of the absorbent core 29 so as to form the periphery of the disposable diaper. The top sheet 27, the back sheet 28 and the absorbent core 29 are assembled in a known desirable shape, such as a shape mentioned in U.S. Pat. No. 3,860,003.

The absorbent pad 22 of the disposable diaper 20 comprises at least the absorbent core 29 and, preferably, an outside cover comprising the top sheet 27 and the back sheet 28. When the absorbent core 29 is formed of a holder and a liner, which are separate members, the disposable diaper 20 is comprises the holder and the liner. For example, the liner comprises the top sheet 27, the back sheet 28 and a composite absorbent member, such as the absorbent core 29, and the holder comprises a single or a plurality of layers of a material. Such a disposable diaper 20 comprises a structure of another shape added to a single absorbent member to form a composite diaper structure.

Generally, the absorbent core 29 is compressive and pliable, does not stimulate the wearer's skin, and capable of liquid excrements, such as the wearer's urine and such. The absorbent core 29 formed of crushed wood pulp, generally

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called air felt, in a size and a shape among various sizes and shapes. As shown in Fig. 1, the absorbent core 29 has an outer surface on the side of garments, an inner surface on the side of the wearers body, longitudinal side edges 29a and transverse side edges 29b.

The absorbent core 29 is formed in a shape and a structure among various shapes and structures. The absorbent core 29 may be formed of an appropriate absorbent material other than crushed wood pulp, such as creped cellulose wadding, melt-blown polymer fibers including conform, chemically hardened and denatured, or crosslinked cellulose fibers, tissues including a tissue laps and a tissue laminate, an absorbent foam material, absorbent sponge, an absorbent polymer, an absorbent gel, a material equivalent to any of the those materials or a combination of those materials. The absorbent core 29 may be formed in any suitable shape and any suitable structure. For example, the absorbent core 29 includes various caliper regions, hydrophilic gradients, super-absorbent gradients, or regions of a low average density and a low average basis weight, and has a single-layer or a multilayer structure. The general absorbing capacity of the absorbent core 29 must correspond to the liquid load of the diaper and must meet the expected use of the diaper. The size and the absorbing ability of the absorbent core 29 are determined according the wearer's

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age, i.e., according to conditions specifying the wearer in the range of infants to adults. Absorbent structures for the absorbent core are mentioned in, for example, U.S. Pat. Nos. 4,888,231 and 4,834,735.

The back sheet 28 is contiguous with the outer surface of the absorbent core 29 and is joined to the absorbent core 29 with a technically known sticking means, not shown. For example, the back sheet 28 is stuck on the absorbent core 29 by a uniform, continuous layer of an adhesive, a patterned layer of an adhesive, or separate lines, spiral lines or rows of dots of an adhesive. The most suitable adhesive is an adhesive such as available from H.B. Fuller Co., St. Paul, Minn. and identified as HL-1258. Preferably, the sticking means includes a mesh structure of an open pattern of an adhesive fibers such as disclosed in U.S. Pat. Nos. 4,573,986, 3,911,173, 4,785,996 and 4,842,666.

Available bonding means are technically known ones including a heat bonding means, a compression bonding, an ultrasonic bonding means, a dynamic mechanical bonding means or a combination of some of those known bonding means.

The back sheet 28 is impermeable to liquids, such as urine. Although a thin plastic film is a preferable material for forming the back sheet 28, the back sheet 28 may be formed of other flexible material impermeable to liquids. In this specification, the term "flexible material"

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signifies a material which is soft and easily conformable to the wearer's shape and outlines. The back sheet 28 prevents a bed sheet and underwear touching the disposable diaper from being wetted with the liquids absorbed by the absorbent core 29. Accordingly, the back sheet 28 may be formed of a woven or nonwoven fabric, a thermoflexible laminate film polyethylene or polypropylene, or a composite material, such as a nonwoven fabric coated with a film. Preferably, the back sheet 28 is a thermoplastic film of a thickness in the range of about 0.012 to about 0.051 mm.

Particularly preferable materials for forming the back sheet 28 include a blown film identified as RR8220 a cast film identified as RR5475 and available from Tredegar Industries Inc., In Terre Haute.

Preferably, the back sheet 28 is finished in a fabric-like appearance by embossing and/or matting. The back sheet 28 may pass vapors from the absorbent core 29 while inhibiting the passage of excrements.

The top sheet 27 is contiguous with the inner surface of the absorbent core 29. Preferably, the top sheet 27 is bonded to the back sheet 28 by a known bonding means, not shown. A suitable bonding means will be described in connection with the bonding of the back sheet 28 and the absorbent core.

The term "bonding" used herein signifies directly

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sticking an element to another element or indirectly attaching an element to another element by sticking the element to an intermediate member stuck to another element. In one aspect of the present invention, respective portions of the top sheet 27 and the back sheet 28 forming the periphery of the diaper are directly bonded together by a bonding means or the top sheet 27 and the back sheet 28 are bonded indirectly together by directly bonding the top sheet 27 and the back sheet 28 to the absorbent core 29.

The top sheet 27 is pliable, gives a soft touch and does not stimulate the wearer's skin. The top sheet 27 is liquid-permeable and allows liquids, such as urine, to pass across its thickness. There are a large variety of materials for forming the top sheet 27; suitable materials for forming the top sheet 27, for example, are porous foams, meshed foams, perforated plastic films, woven or nonwoven fabrics of natural fibers, such as wood fibers or cotton fibers, of synthetic fibers, such as polyester or polypropylene fibers or of a blend of natural fibers and synthetic fibers. Preferably, the top sheet 27 is formed of a hydrophobic material to isolate the wearer's skin from the liquids absorbed by the absorbent core 29. There are a large variety of techniques applicable to fabricating the top sheet 27.

The top sheet 27 is formed out of spunbonded fibers,

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arded fibers, wet-laid fibers, melt-blown fibers, hydroentangled fibers or a web composed of some of those fibers. Preferably, the top sheet 27 is a web produced by heat bonding the fibers of a carded web by a means well-known to persons skilled in the art. Preferably, the top sheet 27 is a web of polypropylene staple fibers, such as a textile web available from Velatec Inc., a subsidiary company to International Paper Co., Wallpole, Mass. and identified as P-8.

The general construction of the barrier cuff embodying the present invention will be described prior to the detailed description of the barrier cuff.

The disposable diaper has at least one leg cuff placed in each of the longitudinal edges. The term "leg cuff" signifies a barrier cuff, a gasket cuff, a combination of a barrier cuff and a gasket cuff, and modifications of those cuffs

The term "gasket cuff" used in this specification signifies a portion of the diaper flush with the top sheet 27 and provided with a means for making an optional portion of the diaper wrap closely around the wearer's leg. The term "barrier cuff" signifies a leg cuff provided with a means for separating from the top sheet 27.

Preferably, the gasket cuff and a barrier cuff are extended generally longitudinally. Preferably, the dispos-

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able diaper is provided with two gasket cuffs and two barrier cuffs disposed between the two gasket cuffs.

Each gasket cuff comprises a gasket flap and one or a plurality of elastic members. Each barrier cuff comprises a flap portion and a channel portion. The channel portion has a proximal edge, a distal edge, a side edge, and a spacing means for spacing the distal edge of the flap portion from the top sheet. The proximal edge of the channel portion is bonded to the gasket flap by adhesive beads. The distal end of each barrier cuff is fixed to the barrier cuff by a fixing means.

The gasket cuff is elastically contractible and is extended alongside the longitudinal edge of the diaper. Preferably, each gasket cuff is disposed alongside the barrier cuff so as to pull the diaper toward the wearer's leg. The gasket cuff may be extended transversely in one of the waist portions of the diaper so as to serve as a waist cuff.

The gasket cuff is an optional means well-known to persons skilled in the art for sealing gaps between the wearer's leg and the diaper. Preferably, the gasket cuff comprises, as mentioned in U.S. Pat. No. 3,860,003, a flexible gasket flap, and one or a plurality of elastic members.

A method of fabricating a disposable diaper provided

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with elastically contractible gasket cuffs and an apparatus for carrying out the method are disclosed in U.S. Pat. No. 4,081,301.

The gasket flap is flexible and contractible, and the elastic flap member gathers the gasket flap around the wearer's leg or waist. The gasket flap is a component member of the diaper; more specifically, the gasket flap is a longitudinal edge portion between the edge of the diaper and the edge of the absorbent core. The flap portion of the barrier cuff and the back sheet define the gasket flap surrounding the elastic member. In a preferred embodiment, an extension of the back sheet extended outward beyond the side edge of the absorbent core, and an extension of the channel portion of the barrier cuff extended outward beyond the side edge of a portion of the absorbent core in the crotch portion of the diaper define the gasket flap.

Since the elastic member is operatively connected to the gasket flap in an elastically contracted state, the stretched elastic member gathers or contracts the gasket flap effectively. The elastic member can be connected to the gasket flap by at least either of two methods. For example, the gasket flap is stretched and the stretched elastic member is fixed to the stretched gasket flap or the contracted gasket flap is contracted and the unstretched elastic member is connected to the contracted gasket flap.

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Operative connection signifies a mode of connection allowing two or three elements to interact with each other. The elastic member is extended over the substantially entire length of a portion of the gasket flap corresponding to the crotch region of the diaper. When desired, the elastic member may be extended over the entire length of the diaper or an optional length so as to form an elastically contractible gasket cuff. The length of the elastic member is dependent on the specified construction of the diaper.

The elastic member is operatively connected to the gasket flap by the agency of its pressure-sensitive characteristic. In this construction, the elastic member is connected directly to the gasket flap.

The elastic member may be operatively connected to the gasket flap through an elastic connecting member. This construction is effective when the elastic member is formed of a laminate material. Preferably, the elastic connecting member is flexible and has an adhesive property sufficient to bond the elastic connecting member to the elastic member when stretched. The elastic connecting member is formed out of, for example, an elastomer film, a polyurethane film, Lycra, an elastic foam or an elastic foam scrim. Preferably, the elastic connecting member is an adhesive bead of a hot-melt adhesive such as available from Findrear Adhesive Co. of the Elm Group, Wisc. and identified as 581. Alterna-

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tively, the elastic member may be bonded to the diaper in any one of various bonding patterns by ultrasonic bonding or thermal/compression bonding.

The elastic member is fixedly held by an elastic connecting member between the gasket cuff and the back sheet 28. Thus, the gasket flap and the elastic member form the elastically contractible gasket cuff.

More specifically, the barrier cuff serves as a barrier for blocking the flow of the excrements along the top sheet and confining the excrements within the diaper.

The barrier cuff is flexible and, preferably, has a channel portion, a flap portion and a spacing means. The term "flexibility" corresponds to pliability and signifies a property of a material easily conformable to the wearer's body, general shape and contour. The channel portion is formed between the proximal edge and the distal edge. The flap portion of the barrier cuff extends on the outer side of the proximal edge of the channel portion. The spacing means makes the barrier cuff stand from the top sheet toward the wearer's crotch.

The barrier cuff may be embodied in any one of various forms to reduce the leakage of the excrements through the leg opening. A disposable diaper disclosed in U.S. Pat. No. 4,909,803 is provided with standing barrier cuffs to improve the excrement leakage preventing performance of portions of

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the diaper around the legs. A disposable diaper disclosed in U.S. Pat. No. 4,695,278 is provided with double cuffs each comprising a gasket cuff and a barrier cuff. A disposable diaper or an incontinence protecting garment disclosed in U.S. Pat. No. 4,704,115 is provided with an edge-leakage guard capable of holding free liquids within the garment.

When the barrier cuff is provided with one or a plurality of spaced elastic members, a contractible channel portion capable of being opened to an extent effective in holding excrements within the diaper can be formed along the barrier cuff.

The barrier cuff may be formed out of a material selected from various materials including polypropylene, polyester, rayon, nylon, foams, plastic films, formed films and elastic foams. Various techniques are applicable to fabricating the barrier cuff. For example, the barrier cuff is formed out of a woven fabric, a nonwoven fabric, a spunbonded web, a carded web or a web similar to a carded web.

It is most preferable to form the barrier cuff of polypropylene not containing any finishing agent to secure liquid-impermeability. A suitable polypropylene material is such as available from Crown Zelerback Co. and identified as Celestra.

In preferred embodiments, the barrier cuff comprises

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the same members or is formed of the same materials as that of the longitudinal gasket cuff.

A barrier cuff 31 employed in a preferred embodiment according to the present invention will be described hereinafter.

Basically, the barrier cuff 31 conforms to the aforesaid structural idea. As shown in Fig. 2, the barrier cuff 31 is formed out of a liquidproof sheet 37 having a fixed end 35 fixed to a portion of a diaper near the longitudinal edge of an absorbent core 29, and a free end 33 capable of being contracted by elastic members. The liquidproof sheet 37 is a multilayer sheet, a two-layer sheet in this embodiment, and has two hollow portions 39 and 41 formed continuously between the free end 33 and the fixed end 35, and divided by a sealed portion 46. Elastic members 43 and 45 are extended along the edges of the hollow portions 39 and 41 on the side of the free end 33, respectively. Although the barrier cuff 31 shown in Fig. 2 has the two hollow portions separated by the single sealed portion 46, the barrier cuff 31 may have three or more hollow portions separated by a plurality of sealed portions. When the barrier cuff 31 has three or more hollow portions, the elastic member may be disposed in each hollow portion or in some of the hollow portions.

The barrier cuff 31 has a layered construction formed

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by folding the single liquidproof sheet 37 toward the top sheet 27 along a portion forming the free end 33. The edge portion of a portion of the liquidproof sheet 37 forming the lower layer is sandwiched between and bonded to the edge portion of a portion of the liquidproof sheet 37 forming the upper layer and the edge portion of the top sheet 27.

As shown in Fig. 2, the barrier cuff 31 is contiguous with the inner edge of a longitudinally extended gasket cuff 50. Since the edge portion of the portion of the liquidproof sheet 37 forming the lower layer of the barrier cuff 31 underlies the portion of the same forming the upper layer of the barrier cuff 31, excrements, particularly, feces, which cannot be easily absorbed and tend to flow along the top sheet 27 are blocked by a channel formed by the barrier cuff 31. Thus, the barrier cuff 31 serves a double blocking means effective in blocking the flow of excrements. Preferably, the fixed end 35 of the barrier cuff 31 lies between the proximal end of the gasket cuff 50 and the edge 29a of the absorbent core 29 at least in the crotch portion 25.

The distance between the free end 33 and the fixed end 35 of the barrier cuff 31 is the effective width of the barrier cuff 31. The free end 33 and the fixed end 35 of the barrier cuff 31 are parallel or nonparallel to each other, and straight or curved. The sectional shape of the

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barrier cuff 31 may be circular, square, rectangular or of any optional shape. Preferably, the free end 33 and the fixed end 35 of the barrier cuff 31 are straight and parallel to each other so that the standing barrier cuff 31 has a uniform effective width.

The disposition of the free end 33 of the barrier cuff 31 nearer to the absorbent core 29 than the fixed end 35 of the same further enhances the barrier effect of the barrier cuff 31 against the flow of excrements. A portion of the free end 33 of the barrier cuff 31 distant from the crotch portion 25 is fastened to the top sheet 27 by a fastening means, not shown, to prevent the free end 33 from turning over.

Preferably, at least a portion of the free end 33 of the barrier cuff 31 in the crotch portion 25 is not fixed to other component of the diaper so that the same portion of the free end 33 is separated from the top sheet 27. Preferably, the free end 33 is separated from the top sheet 27 so that the barrier cuff 31 forms the channel 55 to increase the capacity of the diaper. A state in which the free end 33 is separated from the top sheet 27 includes the free end 33 being contiguous with the top sheet 27 and the free end 33 being at a position or positions relative to the top sheet 27. The distance between the free end 33 and the top sheet 27 is measured along a line drawn from the free end 33

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to a portion of the top sheet 27 nearest to the free end 33 in a state where the free end 33 is separated from the top sheet 27 by the maximum distance, i.e., where the barrier cuff 31 is elastically contracted.

Preferably, the barrier cuff 31 is hydrophobic or, more preferably, liquid-impermeable to block the passage of excrements therethrough. The liquid-impermeable barrier cuff 31 retards the passage of excrements through the barrier cuff 31, which further enhances the leakageproof performance of the diaper.

A liquid-impermeable property can be imparted to the barrier cuff 31 by selectively processing the barrier cuff 31 by a well-known method, not processing the barrier cuff 31 or by fixedly combining another material to the barrier cuff 31.

The disposable diaper 20 in a preferred embodiment of the present invention, the barrier cuff 31 is connected to the top sheet 27 forming the side flap 56. The connection of the barrier cuff 31 to the top sheet 27 means directly or indirectly attaching the individual barrier cuff 31 to the side flap 56 (united construction) or forming the barrier cuff 31 integrally with the diaper 20 or forming the barrier cuff.31 and the diaper 20 out of the same material (unitary construction). The barrier cuff 31 may be joined to the back sheet 28. In a preferred embodiment, the barrier cuff

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31, the gasket cuff 50 and the side flap 56 are united in an unitary construction. The gasket cuff 50 is provided with an elastic member 51.

Preferably, the barrier cuff 31 and the gasket cuff 50 are formed integrally out of a single strip of different materials, the intermediate segment of the strip is bonded to the side flap 56 by a sealing means, such as an adhesive, to form the fixed end 35 of the barrier cuff 31, and the free end 33 of the barrier cuff 31 is formed by folding the strip.

The barrier cuff 31 and the side flap 56 are united by any suitable method. The barrier cuff 31 and the side flap 56 may be united by directly fixing a portion of the barrier cuff 31 to the top sheet 27 to connect the barrier cuff 31 directly to the side flap 56 or the barrier cuff 31 may be connected indirectly to the side flap 56 by attaching the barrier cuff 31 to an intermediate member and fixing the intermediate member to the top sheet 27.

In a preferred embodiment, the barrier cuff 31 and the side flap 56 are joined together with an adhesive or by an optional connecting means, such as a thermal/compression bonding, ultrasonic bonding or a suitable means well-known to persons skilled in the art. For example, the barrier cuff 31 and the side flap 56 may be joined together by a uniform, continuous adhesive layer, a patterned adhesive

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layer, adhesive lines or rows of adhesive spots. Preferable bonding means is a hot-melt adhesive available from Eastman Chemical Products Co., Kingsport, Tenn. and identified as Eastbond A-3 or such as available from Century Adhesives Co., Columbus, O. and identified as Century 5227.

In a preferred embodiment, the bonding means is a strip of a nonwoven fabric coated with an elastomeric adhesive.

The bonding means for bonding the fixed end 35 of the barrier cuff 31 to the side flap 56 forms a leakageproof seal extending along the fixed end 35 and serving as a barrier against the infiltration of liquids through the top sheet 27 to block the infiltration of liquids from under the barrier cuff 31 into the edges of the diaper.

The elastic members 43 and 45 respectively inserted in the hollow portions 39 and 41 of the barrier cuff 31 keep the free end 33 separated from the top sheet 27. The elastic members 43 and 45 gather, shrink and shorten the barrier cuff 31 or make the barrier cuff 31 stand to form the channel 55, so that the barrier cuff 31 serves as a barrier against the leakage of excrements. The elastic members 43 and 45 are fixed to the barrier cuff 31 in a stretched state and, consequently, the elastic members 43 and 45 in a free state gather and contract the free end 33 effectively.

The arrangement of the elastic member 43 and 45 is

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dependent on the design of the diaper. In the preferred embodiment shown in Fig. 1, the elastic members 43 and 45 (the elastic member 45 is not shown) are extended over the substantially entire length of the portion of the barrier cuff 31 in the crotch portion 25. Most preferably, the elastic members 43 and 45 are extended beyond the crotch portion 25 to the transverse edges of the diaper to separate the barrier cuff 31 effectively from the top sheet 27.

The elastic members 43 and 45 are fixed to the barrier cuff 31 by a separating elastic attaching means to combine the same operatively with the barrier cuff 31. A method of positioning the elastic members 43 and 45 on and fixing the same to the barrier cuff 31 is explained in detail in U.S. Pat. Nos. 4,081,301 and 4,253,461. The number of the elastic members 43 and 45 for making the barrier cuff 31 elastically stretchable is dependent on the number of the hollow portions. The elastic members need not necessarily be incorporated into all the hollow portions.

The most suitable elastic material as the elastic members 43 and 45 is a 0.18 mm × 1.5 mm elastic strand manufactured from natural rubber, available from East Humpton Rubber Co., Stewart, Va. and identified as Rubber Compound L-1900. Another suitable elastic material as the elastic members 43 and 45 is an elastic member manufactured from natural rubber, available from Falflex Co., Middletown,

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R.I. and identified as Fuflex 9411. The elastic members 43 and 45 may contain a thermocontractile elastic substance. Other suitable elastic materials are those well-known to persons skilled in the art such as elastomer films, polyurethane films, elastomer foam films and molded elastic scrims. In a preferred embodiment, the elastic members 43 and 45 and the elastic attaching means are 0.5 mm thick drawn adhesive strips available from Findrear Adhesive Co. of the Elm Group, Wisc. and identified as Findrear Adhesive H2330.

The elastic members 43 and 45 may be formed in any one of various suitable shapes. For example, the elastic members 43 and 45 may have any suitable width, each of the elastic member 43 and 45 may be a single elastic strand or may consist of a plurality of parallel or nonparallel elastic strands, and the elastic member 43 and 45 may be straight or curved.

The fastening means for fastening the free end 33 to the top sheet 27 imparts a sense of a comfortable fit to the wearer and prevents the turn-over of the free end 33 while the diaper is put on the wearer. The turn-over of the free end 33 expresses the turning of the free end 33 from a position in which the free end 33 extends inward to a position in which the free end 33 extends outward.

The fastening means is a hot-melt adhesive such as

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available from Eastman Chemical Products Co., Kingsport, Tenn. and identified as Eastbond A-3 or such as available from Century Adhesives Co., Columbus, O. and identified as Century 5227. The fastening means may be a well-known fastening means, such as ultrasonic bonding or thermal/compression bonding.

Materials for the liquidproof sheet 37 forming the barrier cuff 31 include a material capable retarding the infiltration of liquids through the liquid proof sheet 37. In view of securing a soft feeling to the touch, nonwoven fabrics are desirable materials for the liquidproof sheet 37. Nonwoven fabrics composed of fibers processed to impart a hydrophobic property thereto has a high liquidproof property and are preferable materials for forming the barrier cuff 31. The layers of the two-layer liquidproof sheet 37 and/or the hollow portions 39 and 41 of the liquidproof sheet 37 may be formed of different materials, respectively. For example, the layer 37T of the liquidproof sheet 37 facing the top sheet 27 is formed out of a hydrophobic nonwoven fabric, and the layer 37B of the same that touches the skin is formed out of a hydrophilic nonwoven fabric. In the liquidproof sheet 37 thus constructed, the hydrophobic layer 37T holds liquids that tend to leak through the edge of the top sheet 27 on the top sheet 27 or in the absorbent core 29, and the hydrophilic layer 37B

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facing the skin holds a very small portion of liquids excreted from the wearer's body onto portions of the absorbent core 29 other than the central portion of the same and reached the periphery of the diaper in the barrier cuff 31. Thus, the liquidproof sheet 37 reduces the possibility of leakage through the edges of the diaper very effectively.

Since there is a possibility that liquids infiltrate into the barrier cuff 31, the hollow portions 39 and 41 may be wadded with an absorbent material, such as tissues or air felt.

Preferably, the disposable diaper has a stretchable waist portion to secure improved comfort in wearing and improved holding performance. The stretchable waist portion is a pliantly stretchable or contractible portion or a section of the disposable diaper intended to hold firmly to the wearer's waist. The stretchable waist portion extends at least longitudinally from at least from the end of the absorbent core on the side of the waist and, in general, forms at least an end edge portion of the diaper. The disposable diaper is provided with two stretchable waist portions in its waist portion. The diaper may be provided with a single waist portion. Whereas the stretchable waist portion or some of the components of the same includes an individual element attached to the diaper, the stretchable waist portion is an extension of other component, preferably

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an extension of the top sheet 27 or the back sheet 28, or extensions of other components, preferably, respective extensions of the back sheet 28 and the top sheet 28. Stretchable waist portion are described in U.S. Pat. No. 4,515,595.

The diaper includes side fastening members 60 for holding a first waist portion and a second waist portion in an overlapping state so that a fastening tension is induced in the diaper to secure the diaper on the wearer. The fastening members 60 may be such as disclosed in, for example, U.S. Pat Nos. 4,846,815, 4,894,060, 4,946,527, 3,848,594 and B1 4,662,845.

CAPABILITY OF EXPLOITATION IN INDUSTRY

The absorbent article in accordance with the present invention is provided with the barrier cuffs each having the plurality of successive hollow portions provided with the elastic members at the edges thereof on the side of the free end of the barrier cuff, respectively. Therefore, even if exuded liquids permeate the liquidproof sheets of the barrier cuffs, the hollow portions intercept the further flow of the liquids and, consequently, the possibility of the liquids infiltrating through the multilayer liquidproof sheets and leaking from the absorbent article is very low. Thus, the barrier cuffs have high leakage preventing effect.

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CLAIMS

1. An absorbent article having a front waist portion, a back waist portion and a crotch portion, comprising: an outer cover layer; an absorbent core held in the outer cover layer; and cuff members disposed on the opposite sides of the absorbent core so as to extend along and the longitudinal edges of the absorbent core, respectively; each cuff member being provided with a barrier cuff having a fixed end fixedly positioned near to the corresponding longitudinal edge of the absorbent core, and a free end capable of being contracted by at least one elastic element; the barrier cuff being formed of a multilayer liquidproof sheet and having a plurality of hollow portions successively arranged between the fixed end and the free end; the elastic element being disposed on the edge, on the side of the free end, of at least the hollow portion nearest the free end.

2. An absorbent article according to claim 1, wherein the barrier cuff has two hollow portions, and the elastic element is disposed on the edge, on the side of the free end, of each hollow portion.

3. An absorbent article according to claim 1, wherein the barrier cuff has three or more hollow portions, and the elastic element is disposed on the edge, on the side of the free end, of the middle hollow portion.

4. An absorbent article according to claim 1, wherein

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the liquid-proof sheet has an inner layer formed out of a nonwoven fabric of fibers processed to impart a hydrophobic property thereto.