

EXTENSIBLE ABSORBENT ARTICLE HAVING LESS EXTENSIBLE BARRIERS

FIELD OF THE INVENTION

The present invention relates to absorbent articles such as diapers, sanitary napkins, panty liners, and incontinence pads. More particularly, the present invention relates to absorbent articles, such as sanitary napkins, that are extensible which are provided with less extensible lips that serve as barriers to the flow of liquids.

BACKGROUND OF THE INVENTION

Absorbent articles such as sanitary napkins, pantliners, and incontinence pads are devices that are typically worn in the crotch region of an undergarment. These devices are designed to absorb and retain liquid and other discharges from the human body and to prevent body and clothing soiling. Improving the performance of such absorbent articles, particularly the leakage performance of the same, continues to be a formidable undertaking, although a number of improvements have been made in both their materials and structures.

For instance, disposable absorbent articles have previously been provided with elastic members to improve the side leakage performance of such products. For example, U.S. Patent 3,860,003, issued to Buell on January 14, 1975, discloses elasticized disposable absorbent articles wherein an elastic member is positioned in the side flap of the product between the topsheet

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It is, therefore, an object of the present invention to provide an extensible absorbent article, such as a sanitary napkin, that is provided with barriers to the flow of liquids.

It is another object of the present invention to provide an extensible absorbent article, such as a sanitary napkin, that is provided with barriers that are less extensible than the sanitary napkin and will change from a relatively flat disposition to a more upright disposition when the sanitary napkin is extended.

These and other objects of the present invention will be more readily apparent when considered in reference to the following description and when taken in conjunction with the accompanying drawings.

SUMMARY OF THE INVENTION

The present invention provides an absorbent article, such as a sanitary napkin. The sanitary napkin of the present invention has at least some extensible components. The sanitary napkin is provided with less extensible barriers to the flow of liquids.

The sanitary napkin has a first end region, a second end region, a central region disposed between the first and second end regions, and a pair of longitudinal side edges and a pair of end edges which form the perimeter of the sanitary napkin. The sanitary napkin, in a preferred embodiment, has a central region that is narrower than the first and second end regions (for example, the sanitary napkin may be hourglass-shaped or dog bone shaped). The sanitary napkin preferably comprises an extensible liquid pervious topsheet; an extensible liquid impervious backsheet joined to the topsheet; an extensible absorbent core positioned between the topsheet and the backsheet; and less extensible liquid impervious lips that serve as barriers to the flow of liquids. In this preferred embodiment, the lips comprise narrow strips of film that overlay the topsheet along the

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FIG. 2 is a cross sectional view of the sanitary napkin taken along line 2-2 of Fig. 1 (with the size of the barriers greatly enlarged for purposes of illustration).

FIG. 3 is a bottom plan view of the sanitary napkin shown in FIG. 1.

FIG. 4 is a perspective view of the sanitary napkin shown in FIG. 1 after the napkin is extended (with only one barrier shown for simplicity).

FIG. 5 is a schematic sectional view taken along line 5-5 of the sanitary napkin shown in FIG. 4 (shown with a simplified arrangement of layers and with both barriers in place).

FIG. 6 is a top plan view showing the extensibility of the sanitary napkin (without the barriers for simplicity).

FIG. 7 is a table which shows preferred relationships between the magnitude of stretching forces applied to the sanitary napkin and the amount the sanitary napkin stretches in response to such forces.

DETAILED DESCRIPTION OF THE INVENTION

FIGS. 1-3 show a preferred embodiment of a disposable absorbent article of the present invention. The present invention relates to extensible absorbent articles, such as diapers, sanitary napkins, panty liners, and incontinence pads, which are provided with less extensible barriers to the flow of liquids.

In the preferred embodiment illustrated, the absorbent article is a sanitary napkin designated 20. The term "sanitary napkin", as used herein, refers to an article which is worn by females adjacent to the pudendal region that is intended to absorb and contain the various exudates which are discharged from the



contained in U.S. Patent 4,690,680 issued to Higgins on September 1, 1987.

The sanitary napkin 20 can be of any thickness, including relatively thick, relatively thin, or even very thin. The embodiment of the sanitary napkin 20 shown in Figures 1-3 of the drawings is intended to be an example of a relatively thin sanitary napkin, preferably an "ultra-thin" sanitary napkin. It should be understood, however, when viewing these figures the number of layers of material shown cause the sanitary napkin 20 to appear much thicker than it actually is. An "ultra-thin" sanitary napkin 20 as described in U.S. Patents 4,950,264 and 5,009,653 issued to Osborn preferably has a caliper of less than about 3 millimeters. The thin sanitary napkin 20 shown should also be preferably relatively flexible, so that it is comfortable for the wearer.

FIG. 2 shows the individual components of the sanitary napkin 20 of the present invention. The sanitary napkin 20 shown in FIG. 2 generally comprises at least four primary components. These include a liquid pervious topsheet 38, a liquid impervious backsheet 40, an absorbent core 42 positioned between the topsheet 38 and the backsheet 40, and at least one barrier, and preferably, a pair of barriers 44, to the flow of liquids along the side edges 22 of the sanitary napkin. The preferred embodiment shown in Figs. 1-3 also comprises a less extensible element 216 located in the central region 32 that deflects in response to stretching (and preferably lifts to provide improved body contact). The sanitary napkin to which the barriers are affixed may be one of those described in PCT Publication Nos. WO 93/01785 and 93/01786, and be comprised of one or more extensible components, and more preferably, is comprised of all extensible components (with the exception of the less extensible element), and has an overall extensibility.

The extensibility of the sanitary napkin 20 is shown in a simplified fashion in Fig. 6. The term "extensible", as used

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associated with wearing the sanitary napkin in a pair of panties. Preferably, the sanitary napkin is capable of such extension under forces of between about 50 - 100 grams to about 1,000 - 1,500 grams, more preferably under forces of between about 250 grams and about 800 grams. Other preferred amounts of extensibility are set forth in Table 1 (Fig. 7). It is to be understood that all of the limits and ranges specified herein include all narrower ranges, limits, and amounts that are within the specified limits and ranges. The sanitary napkin of the present invention can also be provided with any of the other features of the sanitary napkins described in the above publications including, a structure that provides a "force wall" to prevent elongation past a certain amount without substantial increases in the amount of force applied to the sanitary napkin.

The individual components of the sanitary napkin 20 of the present invention will now be looked at in greater detail with reference to FIGS. 1-3.

The topsheet 38 comprises a first liquid pervious component. When the sanitary napkin 20 is in use, the topsheet 38 is in close proximity to the skin of the user. The topsheet 38 is preferably as compliant, soft feeling, and non-irritating to the user's skin as possible. The topsheet 38 should further exhibit good strikethrough and a reduced tendency to rewet, permitting bodily discharges to rapidly penetrate it and flow toward the core 42, but not allowing such discharges to flow back through the topsheet 38 to the skin of the wearer.

The topsheet 38 has two sides (or faces or surfaces), including a body-facing side 38A and a garment-facing side (or core-facing side) 38B. The body-facing side 38A of the topsheet 38 generally forms at least a portion of the body-contacting surface ("body surface") 20A of the sanitary napkin 20. The topsheet 38 has two longitudinal edges 38C and two end edges 38D.

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that are able to open when the topsheet is stretched. Such a process can be performed on many of the topsheet materials described above. In one preferred embodiment of the present invention, the topsheet 38 is made in accordance with U.S. Patent 4,463,045 and ring rolled to provide it with a degree of longitudinal extensibility. Such a topsheet is described in U.S. Patent Application Serial No. 07/936,195 entitled "Polymeric Web Having Deformed Sections Which Provide A Substantially Increased Elasticity To The Web", filed in the name of John J. Curro, et al. on August 25, 1992.

Suitable processes for ring rolling or "pre-corrugating" are described in U.S. Patent 4,107,364 issued to Sisson on August 15, 1978, U.S. Patent 4,834,741 issued to Sabee on May 30, 1989 and in co-pending, commonly assigned U.S. Patent Application Serial No. 07/662,536 filed by Gerald M. Weber et al. on February 28, 1991, U.S. Patent Application Serial No. 07/662,537 filed by Kenneth B. Buell et al. on February 28, 1991, and U.S. Patent Application Serial No. 07/662,543 filed by Gerald M. Weber et al. on February 28, 1991.

The fold lines in the corrugations of a ring rolled topsheet should run in the transverse direction so the topsheet is longitudinally extensible. In other embodiments, the fold lines could run in the longitudinal direction, both directions, and/or other directions. The topsheet 38 will be extensible in directions perpendicular to the fold lines.

In a preferred embodiment, the topsheet 38 is hydrophilic so that liquids will transfer through the topsheet 38 faster than if it was not hydrophilic. This will diminish the likelihood that body exudates will flow off the topsheet rather than being absorbed by the absorbent core. The topsheet can be rendered hydrophilic by treating it with surfactants. Suitable methods of applying surfactants are described in U.S. Patents 4,950,254 and 5,009,653 issued to Osborn.

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The polymeric gelling agents listed above may also be referred to as "absorbent gelling materials" or "superabsorbent materials". Polymeric gelling agents are those materials which, upon contact with liquids such as water or other body liquids, imbibe such liquids and thereby form hydrogels. In this manner, liquids discharged into the absorbent core 42 can be acquired and held by the polymeric gelling agent, thereby providing the articles herein with enhanced absorbent capacity and/or improved liquid retention performance. The polymeric gelling agent which is employed in the absorbent core 42 will generally comprise particles 41 of a substantially water-insoluble, slightly cross-linked, partially neutralized, hydrogel-forming polymer material. The polymeric gelling agent can be in any form, such as in the form of pellets, flakes, or fibers.

In one preferred embodiment shown in Figure 2, the absorbent core 42 is a laminate. The laminate is comprised of a layer of superabsorbent polymer material, such as in the form of particles 41, disposed between two air-laid tissues, first and second tissue layers (or "upper" and "lower" tissue layers) 43 and 47, respectively. The first and second tissue layers 43 and 47 provide containment of the superabsorbent polymer material, improve lateral wicking of the absorbed exudates throughout the absorbent core 42 and provide a degree of absorbency. The tissue layers 43 and 47 can be comprised of a single tissue web which is folded with the superabsorbent material particles 41 between, or two separate sheets of the same (or different) tissue.

A suitable laminate is a superabsorbent laminate known as WATER-LOCK L-535 available from the Grain Processing Corporation of Muscatine, Iowa (WATER-LOCK registered TM by Grain Processing Corporation). Such superabsorbent laminates are disclosed in U.S. Patent 4,467,012, issued to Pedersen et al. on August 21, 1984, U.S. Patent 4,260,443, issued to Lindsay et al. on April 7, 1981, and U.S. Patent 4,578,068 issued to Kramer, et al. on March 25, 1986. The laminate absorbent core 42 can be made extensible by cutting or slitting the same. Figure 1 shows that the absorbent

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The backsheet 40 preferably comprises a thin, flexible, liquid impervious material.

The backsheet 40 may comprise a woven or nonwoven material, polymeric films such as thermoplastic films of polyethylene or polypropylene, or composite materials such as a film-coated nonwoven material. Preferably, the backsheet 40 is a polyethylene film having a thickness of from about 0.012 mm (0.5 mil) to about 0.051 mm (2.0 mils). Exemplary polyethylene films are manufactured by Clopay Corporation of Cincinnati, Ohio, under the designation P18-0401 and by Tredegar Film Products of Terre Haute, Indiana, under the designation XP-39385.

The backsheet 40 is preferably embossed and/or matte finished to provide a more clothlike appearance. Further, the backsheet 40 may permit vapors to escape from the absorbent core 42 (i.e., the backsheet 40 may be breathable) while still preventing exudates from passing through the backsheet 40. Flushable or biodegradable backsheets can also be used, e.g., such as with the pantiliner devices described herein.

The backsheet 40 can be made extensible by performing a mechanical operation, such as pleating, corrugating, or ring rolling the backsheet material. Preferably, however, the backsheet 40 is made extensible by forming it from an elastomeric film such as the film described in U.S. Patent 4,476,180 issued to Wnuk on October 9, 1984. Such a film is obtained from Exxon Chemical Company of Lake Zurich, IL as Exxon film EXX-500 (formerly EXX-7).

Another particularly preferred extensible backsheet 40 is an extensible adhesive film Formula #198-338 manufactured by the Findley Adhesives Company of Wauwatosa, Wisconsin. The Findley adhesive film is a liquid impervious film capable of extending 200 - 300%. The Findley adhesive film is preferred because it is also elastically extensible. The backsheet 40 may comprise extensible laminate structures comprising two or more layers. For

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is both dry and after it has become wet (such as by body exudates).

The less extensible element 216 may be made from any suitable material. The material should be soft, flexible, and absorbent, but rigid enough to bow or buckle. The less extensible element 216 may be made from many of the basic types of absorbent core materials specified herein. These core materials, however, preferably should not be subjected to any process (such as ring rolling, pleating, corrugating, or slitting) to provide the material with extensibility. Figs. 1-3 shown an embodiment in which the less extensible element 216 comprises an unslit superabsorbent laminate. The less extensible element 216 is preferably also designed to provide for buckling such as by folding it to create a medial longitudinally-oriented fold line in the same.

The less extensible element 216 may be simply placed on top of the core 42 and held in place by fitting snugly against the surrounding components of the sanitary napkin 20. In the embodiment shown in Figs. 1-3, the less extensible element 216 is affixed at a single point 230 on each of its longitudinal side edges.

When the sanitary napkin 20 is elongated, the central region 32 of the napkin narrows. This causes the less extensible element 216 to bow or buckle and form a ridge 218 (shown in Figs. 4 and 5) along the longitudinal centerline L of the sanitary napkin 20.

The barriers 44 shown in Figs. 1-5 comprise narrow strips of material that overlay the topsheet 38. The barriers 44 are preferably placed at least along the longitudinal side edges 22 of the sanitary napkin. The strips 44 each have an outwardly facing side 44A, an inwardly facing side 44B, a pair of edges comprising inner edges 44C', and outer edges 44C'', and a pair of ends 44D. The outer edges 44C'' are disposed farther away from the



The barriers 44 can comprise any suitable liquid impervious or liquid resistant material. The barriers are less extensible than the component (such as the topsheet 38) to which they are attached under the same applied forces. The barriers can be relatively inextensible. Alternatively, the barriers can be extensible but less extensible than the component to which they are attached.

In the preferred embodiment shown in Figs. 1-3, the barriers comprise an extensible, preferably elastically extensible film such as a film made in accordance to U.S. Patent 4,476,180 issued to Wnuk on April 16, 1991. One such film is elastomeric film EXX-500 (formerly EXX-7) obtained from Exxon Chemical Company of Lake Zurich, IL. In a particularly preferred embodiment, the barriers 44 comprise strips of such a film 144 that are provided with soft body-facing surfaces to provide increased comfort for the wearer. Figure 2 shows an example where the strips of film 144 have a soft, preferably highly hydrophobic, nonwoven material 146 laminated to their outwardly-facing sides.

In a particularly preferred embodiment, similar strips can also be affixed along the end edges of the sanitary napkin to form barriers along the entire perimeter of the sanitary napkin. The strips along the side and end edges can be attached to each other to provide a continuous barrier around the entire periphery, or they may be unattached.

The barriers function in the following manner. If the sanitary napkin is unstretched, the strips 44 lay flat against the topsheet 38. When the sanitary napkin is stretched, the unattached portions of the strips 44 change from a flat disposition to a more upright disposition and form inwardly-facing lips (or gaskets) along the longitudinal edges of the sanitary napkin which serve as barriers to the flow of liquids across the topsheet. The raising of the strips is due to the different amounts the attached and unattached edges of the barrier strips extend. Preferably, as shown in Fig. 5, the barriers and the edge



panty. The adhesive can be applied in other suitable configurations. The adhesive fastener 50 can be extensible, inextensible, or it can be applied so that some portions of the pattern are extensible and some portions of inextensible.

If the adhesive is extensible, it preferably extends approximately the same amounts as the sanitary napkin as set forth in Table 1. Suitable extensible adhesives include extensible adhesives, per se, and extensible adhesive/barrier film combinations. Any extensible adhesives known in the art can be used. Suitable extensible adhesive/barrier film combinations include, but are not limited to non-extensible adhesive used on an extensible barrier film material; elastically stretchable adhesive films such as Findley adhesive 198-338; or spray adhesives such as 3M adhesive 1442 on a low modulus elastic film.

Suitable inextensible adhesives may be those adhesives specified as 0.6 mil pass available from Century Adhesive as product number A305-4, or from Anchor Continental, Inc., 3 Sigma Division, of Covington, Ohio, and Fuller H-2238ZP manufactured by the H.B. Fuller Co. Suitable inextensible adhesive fasteners are described in greater detail in U.S. Patent 4,917,697.

The adhesive fastener 50 is preferably covered with a release liner (or cover strip) 52. Any commercially available release liner can be used. In one preferred embodiment, the release liner can be replaced by a wrapper that provides both an individually packaged sanitary napkin and a container for disposing the sanitary napkin after use, such as is described in U.S. Patent 4,556,146 issued to Swanson, et al. on December 3, 1985.

The fasteners have be initially described in terms of adhesives for simplicity of description. The types of fasteners are not limited to adhesives, however. Preferred fasteners include but are not limited to adhesive fastening means, such as pressure sensitive adhesives, mechanical fasteners and combinations of adhesives and mechanical fasteners. The sanitary

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at the edges. Roll the edges to seal the edges. Trim to the final shape. Adhere a piece of EX-500 along the side edges of the pad by a heat seal so that the distal edge extends 2 mm over the topsheet toward the center of the core in the narrowest center region of the pad and 5 mm at the widest end regions of the pad. Apply the Fuller HL 2238 panty fastening adhesive (PFA) adhesive to the garment-facing surface of the product in a spiral in the pattern shown in Fig. 3. Spray the topsheet with 0.01 grams Pegospense 200ML surfactant available from Lonza, Inc. Williamsport, Pa.

While a preferred sanitary napkin has been described, numerous other sanitary napkin embodiments are disclosed in the literature. The sanitary napkin could be provided with some or all of the components or features described therein. The sanitary napkin 20 may, for example, also be provided with a pair of flaps, each of which are adjacent to and extend laterally outward from a side edge of the main body portion of the sanitary napkin. (The main body portion is the portion of the sanitary napkin without the flaps.) A number of sanitary napkins having flaps suitable or adaptable for use with the sanitary napkin 20 of the present invention are known. Such flaps are disclosed in U.S. Patent 4,285,343 entitled "Sanitary Napkin", issued to McNair on August 25, 1981; U.S. Patent 4,589,876 entitled "Sanitary Napkin", issued to Van Tilburg on May 20, 1986; U.S. Patent 4,608,047 entitled "Sanitary Napkin Attachment Means", issued to Mattingly on August 26, 1986; U.S. Patent 4,687,478 entitled "Shaped Sanitary Napkin With Flaps", issued to Van Tilburg on August 18, 1987; and in Reexamination Patent B1 4,589,876 issued April 27, 1993. Some particularly preferred types of flaps are described in the following U.S. Patent Applications: Serial No. 07/769,891 entitled "Absorbent Article Having Flaps and Zones of Differential Extensibility" filed in the name of Lavash, et al. on October 1, 1991 (PCT Publication No. WO 93/06805, published April 15, 1993); and in Serial No. 07/906,593 entitled "Absorbent Article Having Unitary Release Material" filed in the name of Lavash, et al. and Serial No. 07/906,629 entitled "Absorbent Article Having Tucked



al. and Feist, et al. on January 3, 1991 (PCT Publication Nos. WO 92/11830 and WO 92/11831, both published July 23, 1992).

The focus of the present invention is on absorbent articles that are intended to be worn in the crotch region of the wearer's undergarments. However, the features of the present invention could also be used in absorbent articles such as diapers. Diapers are absorbent articles worn by infants and incontinent persons that are fastened about the waist of the wearer. Suitable diapers that can be provided with the components described herein are disclosed in U.S. Patent 3,860,003 issued to Buell on January 14, 1975, and U.S. Patent 5,151,092 issued to Buell, et al. on September 29, 1992.

The disclosures of all patents, patent applications (and any patents which issue thereon, as well as any corresponding published foreign patent applications), and publications mentioned throughout this patent application are hereby incorporated by reference herein. It is expressly not admitted, however, that any of the documents incorporated by reference herein teach or disclose the present invention. It is also expressly not admitted that any of the commercially available materials or products described herein teach or disclose the present invention.

While particular embodiments of the present invention have been illustrated and described, it would be obvious to those skilled in the art that various other changes and modifications can be made without departing from the spirit and scope of the invention.

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5. The absorbent article of Claim 1 wherein said backsheet and said absorbent core are also extensible.
6. The absorbent article of Claim 3 further comprising a barrier adjacent each of the end edges.
7. The absorbent article of Claim 1 wherein said barrier comprises a liquid impervious film.
8. The absorbent article of Claim 7 further comprising a soft material covering said liquid impervious film.
9. The absorbent article of Claim 1 having a first end region, a second end region and a central region disposed between said first and second end regions, wherein the central region of the absorbent article is narrower than the edge regions.
10. The absorbent article of Claim 9 having an hour glass shape.
11. The absorbent article of Claim 9 having a dog bone shape.
12. The absorbent article of Claims 1 or 9 having a main body portion comprised of at least portions of said topsheet, backsheet, and absorbent core, said main body portion having said pair of longitudinal side edges and said pair of end edges further comprising a pair of flaps extending outward from the longitudinal edges of said main body portion of said absorbent article.

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