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AN ABSORBENT ARTICLE HAVING DUAL CUFFS.

FIELD OF THE INVENTION

5 The present invention relates to absorbent articles such as disposable diapers, and more particularly, to absorbent articles having a gasketing cuff and a barrier cuff which improve the containment characteristics of the article.

BACKGROUND OF THE INVENTION

10 The major function of absorbent articles such as disposable diapers and adult incontinent briefs, is to absorb and contain body exudates. Such articles are also intended to prevent body exudates from soiling, wetting, or otherwise contaminating clothing or other articles, such as bedding, that come in contact with the wearer. The most common mode of failure for such
15 products occurs when body exudates leak out of the gaps between the article and the wearer's leg or waist to adjacent clothing because they are not immediately absorbed within the article. This is most evident with loose fecal material which is not easily absorbed by the absorbent article and tends to "float" on the top
20 surface of the absorbent article.

Contemporary disposable diapers, such as those disclosed in U. S. Patent 3,860,003 issued to Kenneth Barclay Buell on January 14, 1975, have a topsheet, a backsheet, an absorbent core, and elasticized leg flaps to improve both wearing comfort and the ability to contain body exudates. These elasticized leg flaps prove effective generally to prevent wicking and overflow from the fluid laden diaper to clothing contacting the edges of the diaper in that the elasticized leg flaps present a fluid impervious barrier between the edge of the diaper and the contacting clothing, and in addition, provide a gasketing action about the legs of the wearer. Despite the effectiveness of such structures, however, body exudates, especially loose fecal material, can leak through the elasticized leg flaps and soil the wearer's clothing because the diaper does not constrain the free flow of such material nor provide a structure to hold it within the diaper so that as such material freely floats on the top surface of the topsheet, it tends to work its way past the elasticized leg flaps.

Therefore, it is an object of the present invention to provide an absorbent article which has improved containment characteristics.

It is an additional object of the present invention to provide an absorbent article having a barrier cuff which acts as a restraint against the leakage of body exudates.

It is a further object of the present invention to provide an absorbent article having an elastically contractible gasketing cuff and a barrier cuff so as to provide a dual restraint against the leakage of body exudates, thereby improving the containment characteristics of the absorbent article, especially in regard to loose fecal material.

It is also an object of the invention to provide an absorbent article having a barrier cuff that is raised above the top surface of the topsheet when the article is fitted on the wearer such that a channel is formed which constrains and holds body exudates within the article.

SUMMARY OF THE INVENTION

According to the present invention, there is provided an integral disposable diaper having front and back waist regions and a crotch region therebetween, said diaper having a liquid pervious topsheet, a liquid impervious backsheet associated with said topsheet and an absorbent core disposed between said topsheet and said backsheet, said absorbent body having laterally extending end edges and generally longitudinally extending side edges, said topsheet and said backsheet extending laterally outwardly of the longitudinal side edges of the absorbent body and being united to form flexible side flaps, each flap being formed with a longitudinally extending elastic member secured thereto in an elastically contractible condition in at least the crotch region to form a first, elastically contractible gasketing cuff, said diaper also being formed with a second elastically contractible, longitudinally extending cuff disposed adjacent each said gasketing cuff, each said second cuff having a distal edge and a proximal edge, each said proximal edge being disposed laterally inboard of its adjacent gasketing cuff and each said distal edge being free from attachment in at least the crotch region; wherein

- a) the proximal edge of each said second cuff in the crotch region of the diaper is disposed in and joined to said side flap laterally outwardly of the adjacent longitudinal side edge of said absorbent core;
- b) means are provided to maintain each said distal edge disposed laterally inwardly of its respective proximal edge; and
- c) spacing means are provided for spacing each said distal edge away from the surface of said topsheet whereby each said second cuff is caused to form a barrier to lateral outward movement of loose faecal material on said topsheet.

When a diaper embodiment of the present invention is applied to a wearer, the barrier cuff rides up along the inner thigh and the perineum of the wearer in the crotch region and along the buttocks in the back waist region. Leakage prevention is enhanced because body exudates which are not immediately absorbed by the absorbent core, typically loose fecal material, contact the barrier cuff and are contained and held within the channel so that they do not leak out of the diaper at the gaps between the diaper and the legs or waist of the wearer. Additionally, should such exudates flow beyond the barrier cuff, leakage is further enhanced by the gasketing cuff because it forms an additional fluid impervious barrier about the leg or waist of the wearer.

BRIEF DESCRIPTION OF THE DRAWINGS

While the specification concludes with claims particularly pointing out and distinctly claiming the subject matter which is regarded as forming the present invention, it is believed that the invention will be better understood from the following descriptions which are taken in conjunction with the accompanying drawings in which like designations are used to designate substantially identical elements, and in which:

Figure 1 is a plan view of a disposable diaper embodiment of the present invention having portions cut away to reveal underlying structure.

Figure 2 is a fragmentary sectional view taken along section line 2-2 of Figure 1.

Figure 3 is a fragmentary sectional view taken along section line 3-3 of Figure 1.

Figure 4 is a perspective view of the disposable diaper embodiment of Figure 1.

Figure 5 is a fragmentary coronal view showing the diaper of Figure 1 in place on a wearer.

Figure 6 is a fragmentary sectional view of an alternative embodiment of the present invention.

Figure 7 is a fragmentary sectional view of the alternative embodiment of Figure 6 of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

As used herein, the term "integral disposable absorbent article" refers to articles which absorb and contain body exudates and more specifically refers to articles which are placed against

or in proximity to the body of the wearer to absorb and contain the various exudates discharged from the body, and which are intended to be discarded after a single use (i.e., they are not intended to be laundered or otherwise restored or reused), and which are unitary in that they do not require separate manipulative parts like a separate holder and liner. A preferred embodiment of the integral disposable absorbent article of the present invention, diaper 20, is shown in Figure 1. As used herein, the term "diaper" refers to a garment generally worn by infants and incontinent persons that is worn about the lower torso of the wearer. It should be understood, however, that the present invention is also applicable to other integral disposable articles such as incontinent briefs and the like.

Figure 1 is a plan view of the diaper 20 of the present invention in its flat-out, uncontracted state (i.e., with all elastic induced contraction pulled out) with portions of the structure being torn away to more clearly show the construction of the diaper 20 and with the portion of the diaper 20 which contacts the wearer facing the viewer. The diaper 20 is shown in Figure 1 to have a front waist region 22, a back waist region 24, a crotch region 26 and a periphery 28 which is defined by the outer edges of the diaper in which the longitudinal edges are designated 30 and the end edges are designated 32. The diaper 20 additionally has a lateral centerline which is designated 34 and a longitudinal centerline which is designated 36.

The diaper 20 comprises a liquid pervious topsheet 38, the top surface of the topsheet 38 being designated 40; a liquid impervious backsheet 42; an absorbent core 44 having side edges 46 and comprising an absorbent layer 48 and first and second tissue layers 50 and 52, respectively; a pair of tape-tab fasteners 54; gasketing cuffs 56 each comprising a side flap 58 and a flap elastic member 60; barrier cuffs 62 each having a proximal edge 64, a distal edge 66, an inboard surface 68, an outboard surface 70, a first end 72 and a second end 74; and spacing means 76 such as spacing elastic member 77 for spacing the distal edge 66

away from the topsheet top surface 40. The diaper 20 additionally comprises adhesive means 78 such as a glue bead 79 for securing closed the first and second ends 72 and 74 of each barrier cuff 62. The areas in which the adhesive means 78 are disposed are designated front closure zone 80 and back closure zone 82. While the topsheet 38, the absorbent core 44, the backsheet 42, and the elastically contractible gasketing cuffs 56 may be assembled in a variety of well known configurations, a preferred diaper configuration is described generally in U. S. Patent 3,860,003 entitled "Contractable Side Portions for Disposable Diaper", which issued to K. B. Buell on January 14, 1975.

Figure 1 shows a preferred embodiment of the diaper 20 in which the topsheet 38 and the backsheet 42 are coextensive and have length and width dimensions generally larger than those of the absorbent core 44. The topsheet 38 is associated with and superposed on the backsheet 42 to thereby form the periphery 28 of the diaper 20. The periphery 28 defines the outer periphery or, in other words, the edges of the diaper 20. The periphery 28 comprises the end edges 32 and the longitudinal edges 30.

The diaper 20 has front and back waist regions 22 and 24 extending, respectively, from the end edges 32 of the diaper periphery 28 toward the lateral centerline 34 of the diaper 20 a distance from $1/4$ to $1/3$ the length of the diaper 20. The waist regions comprise those portions of the diaper 20 which, when worn, encircle the waist of the wearer. The crotch region 26 is that portion of the diaper 20 between the waist regions 22 and 24, and comprises that portion of the diaper 20 which, when worn, is positioned between the legs of the wearer and covers the lower torso of the wearer.

Figure 2 is a fragmentary sectional view taken along line 2-2 of Figure 1 and depicts the diaper construction in the front waist region 22 of the diaper 20. (It should be understood that the diaper construction in the back waist region 24 is identical to the

construction in the front waist region 22.) The absorbent core comprises the absorbent layer 48 that is shown as being completely enveloped by the first and second tissue layers 50 and 52. The absorbent core 44 is disposed between the topsheet 38 and the backsheet 42; both the topsheet 38 and the backsheet 42 extend beyond the longitudinal edge 46 of the absorbent core 44 to define the side flap 58. The juxtaposed areas of the topsheet 38 and the backsheet 42 are adhesively secured together by adhesive 88. In a preferred embodiment, the flap elastic members 60 do not extend into the front waist region 22 so that the gasketing cuff 56 is not formed in this region. The barrier cuff 62 is shown as being a separate element secured to the topsheet 38; the proximal edge 64 being formed by securing the element to the topsheet 38 by adhesive 92. The inboard surface 68 of the barrier cuff 62 is secured to the topsheet top surface 40 by adhesive means 78. Therefore, the distal edge 66 is closed. (i.e., it is not spaced away from the topsheet top surface 40). It should be noted that the spacing elastic member 77 is not disposed in this region because the distal edge 66 is not designed to be spaced away from the topsheet top surface 40 in the waist regions. Therefore, the barrier cuff 62 is not open nor ready to constrain the flow of body exudates in this region.

Figure 3 is a fragmentary sectional view taken along line 3-3 of Figure 1 and depicts the diaper construction in the crotch region 26 of the diaper 20 as it is shaped before being applied to the wearer (i.e., the diaper 20 is subjected to elastic contraction). The absorbent core 44 comprises the absorbent layer 48 that is shown as being completely enveloped by the first and second tissue layers 50 and 52. The absorbent core 44 is disposed between the topsheet 38 and the backsheet 42; both the topsheet 38 and the backsheet 42 extend beyond the longitudinal edge 46 of the absorbent core 44 to define the side flap 58. The juxtaposed areas of the topsheet 38 and the backsheet 42 are adhesively secured together by adhesive 88. The topsheet 38 and the backsheet 42 also enclose the flap elastic members 60 adjacent the longitudinal edge 30 in the periphery 28. The flap elastic

members 60 are secured in the topsheet-backsheet formed side flap 58 by elastic attachment means 90. The elastically contractible gasketing cuff 56 is thereby formed by the side flap 58 and the flap elastic members 60. The barrier cuff 62 is shown as being formed by securing an element to the topsheet 38 between the flap elastic members 60 and the side edge 46 of the absorbent core 44. The proximal edge 64 of the barrier cuff 62 is formed by securing the barrier cuff element to the topsheet 38 by adhesive 92. The spacing elastic members 77 are enclosed in a tunnel that is formed when an end of the barrier cuff element is folded back upon itself; the spacing elastic members 77 being secured in the barrier cuff 62 by elastic attachments means 94. The distal edge 66 of the barrier cuff is spaced away from the topsheet top surface 40 by the elastic gathering action of the spacing elastic members 77; a channel 96 thereby being formed by at least the proximal edge 64, the distal edge 66 and the inboard surface 68 of the barrier cuff 62. The channel 96 is shown as being ready to restrain, contain and hold body exudates until the diaper 20 is removed from the wearer.

The topsheet 38 is compliant, soft feeling, and non-irritating to the wearer's skin. Further, the topsheet 38 is liquid pervious permitting fluids to readily penetrate through its thickness. A suitable topsheet may be manufactured from a wide range of materials, such as porous foams, reticulated foams, apertured plastic films, natural fibers (e.g., wood or cotton fibers), synthetic fibers (e.g., polyester or polypropylene fibers) or from a combination of natural and synthetic fibers. Preferably, it is made of a hydrophobic material to isolate the wearer's skin from fluids in the absorbent core 44.

A particularly preferred topsheet 38 comprises staple length polypropylene fibers of approximately 0.16 Tex, such as Hercules Type 151 polypropylene marketed by Hercules, Inc. of Wilmington, Delaware. As used herein, the term "staple length fibers" refers to those fibers having a length of at least 15.9 mm (0.625 inches).

There are a number of manufacturing techniques which may be used to manufacture the topsheet 38. For example, the topsheet 38 may be woven, non-woven, spunbonded, carded, or the like. A preferred topsheet 38 is carded, and thermally bonded by means well known to those skilled in the fabrics art. Preferably, the topsheet 38 has a weight from 18 to 25 grams per square meter, a minimum dry tensile strength of at least 400 grams per centimeter in the machine direction and a wet tensile strength of at least 55 grams per centimeter in the cross machine direction.

The absorbent core 44 may be any means which is generally compressible, conformable, non-irritating to the wearer's skin, capable of absorbing and retaining fluids and certain body exudates. A preferred absorbent core 44 has first and second opposed faces and comprises an absorbent layer 48 and first and second tissue layers 50 and 52, respectively. The first and second tissue layers 50 and 52 overlay the major surfaces of the absorbent layer 48 to form the first and second opposed faces of the absorbent core.

The absorbent layer 48 may be manufactured in a wide variety of sizes and shapes (e.g., rectangular, hourglass, etc.) and from a wide variety of liquid absorbent materials commonly used in disposable diapers and other absorbent articles, such as comminuted wood pulp which is generally referred to as airfelt. Examples of other suitable absorbent materials include creped cellulose wadding, absorbent foams, absorbent sponges, super absorbent polymers, or any equivalent material or combination of materials. The total absorbent capacity of the absorbent layer 48 should, however, be compatible with the design exudate loading in the intended use of the diaper 20. Further, the size and absorbent capacity of the absorbent layer 48 may be varied to accommodate wearers ranging from infants through adults.

A preferred embodiment of the diaper 20 shown in Figure 1 has an hourglass shaped absorbent layer 48 and is intended to be

worn by infants ranging in weight from 5 kgs to 12 kgs (12 pounds to 26 pounds). The airfelt used in the absorbent layer 48 weighs from about 30 grams to about 56 grams, has a generally uniform caliper, and has an absorbent capacity of from 8 grams to 16 grams of water per gram of absorbent material. It should be understood, however, that the size, shape, configuration, and total absorbent capacity of the absorbent layer 48 may be varied to accommodate wearers ranging from infants through adults. Therefore, the dimensions, shape, and configuration of the absorbent layer 48 may be varied (e.g., the absorbent layer may have a varying caliper, or a hydrophilic gradient, or may contain superabsorbent materials). The absorbent layer is preferably, therefore, a batt of airfelt 32 cm wide (lateral dimension), 45 cm long (longitudinal dimension) and approximately 7 cm across the narrowest part of the crotch region.

The first and second tissue layers 50 and 52 improve the tensile strength of the absorbent core 44 and reduce the tendency of the absorbent layer 48 to split, lump or ball when wetted. The first and second tissue layers 50 and 52 also help to improve lateral wicking of the absorbed exudates, thereby providing a more even distribution of the exudates throughout the absorbent layer 48. While a number of materials and manufacturing techniques may be used to manufacture the first and second tissue layers 50 and 52, satisfactory results have been obtained with sheets of tissue paper having a basis weight of 16 grams per square meter (10 lbs. per 3000 square feet) and having an air permeability of 30.5 cubic meters per minute per square meter (100 cubic feet per minute per square foot) at a pressure differential of 12.8 millimeters of water (1/2 inch). While the first and second tissue layers 50 and 52 are preferably coterminous with the absorbent layer 48, they may have different dimensions, a different configuration, or they may be omitted entirely.

The absorbent core 44 is superimposed on the backsheet 42 and is preferably attached thereto by attachments means (not shown) such as those well known in the art. For example, the absorbent core 44 may be secured to the backsheet 42 by a uniform continuous layer of adhesive, a patterned layer of adhesive, or an array of separate lines or spots of adhesive. An adhesive which has been found to be satisfactory is manufactured by Eastman Chemical Products Company of Kingsport, Tennessee and marketed under the tradename Eastobond A-3.

The backsheet 42 is impervious to liquids and is preferably manufactured from a thin plastic film, although other flexible liquid impervious materials may also be used. The backsheet 42 prevents the exudates absorbed and contained in the absorbent core 44 from wetting articles which contact the diaper 20 such as bedsheets and undergarments. Preferably, the backsheet 42 is a polyethylene film having a thickness of from 0.012 mm (0.5 mil) to 0.051 mm (2.0 mils), although other flexible, liquid impervious materials may be used. As used herein, the term "flexible" refers to materials which are compliant and which will readily conform to the general shape and contours of the human body.

A suitable polyethylene film is manufactured by Monsanto Chemical Corporation and marketed in the trade as Film No. 8020. The backsheet 42 is preferably embossed and/or matte finished to provide a more clothlike appearance. Further, the backsheet 42 may permit vapors to escape from the absorbent core 44 while still preventing exudates from passing through the backsheet 42.

The size of the backsheet 42 is dictated by the size of absorbent core 44 and the exact diaper design selected. In a preferred embodiment, the backsheet 42 has a modified hourglass shape extending beyond the absorbent core 44 a minimum distance of at least 1.3 cm to 2.5 cm (0.5 to 1.0 inch) around the entire diaper periphery 23.

The topsheet 38 and the backsheet 42 are associated together in any suitable manner. As used herein, the term "associated" encompasses configurations whereby the topsheet 38 is directly joined to the backsheet 42 by affixing the topsheet 38 directly to the backsheet 42, and configurations whereby the topsheet 38 is indirectly joined to the backsheet 42 by affixing the topsheet 38 to intermediate members which in turn are affixed to the backsheet 42. In a preferred embodiment, the topsheet 38 and the backsheet 42 are joined directly to each other in the diaper periphery 28 by attachment means such as adhesive 88 or any other attachment means as known in the art. For example, a uniform continuous layer of adhesive, a patterned layer of adhesive, or an array of separate lines or spots of adhesive may be used.

Tape tab fasteners 54 are typically applied to the back waist region 24 of the diaper 20 to provide a fastening means to hold the diaper on the wearer. The tape tab fasteners 54 can be any of those well known in the art, such as the fastening tape disclosed in U. S. Patent 3,848,594 issued to K. B. Buell on November 19, 1974.

These tape tab fasteners 54 or other diaper fastening means, such as pins, are typically applied near the top edge of a diaper in its "in-use" configuration.

The elastically contractible gasketing cuffs 56 are disposed adjacent each longitudinal edge 30 of the diaper so that the

gasketing cuffs 56 tend to draw and hold the diaper 20 against the legs of the wearer. Optionally, a gasketing cuff 56 may be disposed adjacent either or both of the end edges 32 of the diaper 20 to provide a waistcuff.

While the gasketing cuffs 56 may comprise any of several means as are well known in the diaper art, a particularly preferred gasketing cuff construction comprises a flexible side flap 58 and a flap elastic member 60, as is described in detail in the hereinbefore referenced U. S. Patent 3,860,003. In addition, a method and apparatus suitable for

manufacturing a disposable diaper having elastically contractible gasketing cuffs 56 are described in U. S. Patent 4,081,301 entitled "Method and Apparatus for Continuously Attaching Discrete, Stretched Elastic Strands to Predetermined Isolated Portions of Disposable Absorbent Articles" which issued to K. B. Buell on March 28, 1978.

The side flap 58 should be highly flexible and thus contractible so that the flap elastic members 60 may gather the side flap 58 to provide a gasketing cuff 56 about the legs or waist of the wearer. The side flaps 58 are that portion of the diaper 20 between the periphery 22 and the longitudinal edges 46 of the absorbent core 44. Thus in a preferred embodiment of the present invention as shown in Figure 1, the side flaps 58 are formed from the extension of the backsheet 42 and the topsheet 38 from and along the side edges 46 of the absorbent core 44 of the diaper 20 in at least the crotch region 26.

The flap elastic members 60 are secured to the side flaps 58 in an elastically contractible condition so that in a normally unrestrained configuration, the flap elastic members 60 effectively contract or gather the side flaps 58. The flap elastic members 60 can be secured to the side flaps 58 in an elastically contractible condition in at least two ways. For example, the flap elastic members 60 may be stretched and secured to the side flaps 58 while the side flaps 58 are in an uncontracted condition. Alternatively, the side flaps 58 may be contracted, for example by pleating, and the flap elastic members 60 secured to the contracted side flaps 58 while the flap elastic members 60 are in their unrelaxed or unstretched condition.

In the embodiment illustrated in Figure 1, the flap elastic members 60 extend essentially the entire length of the side flaps 58 in the crotch region 26 of the diaper 20. Alternatively, the elastic members 60 may extend the entire length of diaper 20, or any other length suitable to provide an elastically contractible

gasketing cuff. The length of the flap elastic members 60 is dictated by the diaper's design.

5 In the diaper 20 of Figure 3, the flap elastic members 60 are associated with the side flaps 58 by securing them to the side flaps 58 with elastic attachments means 90. The elastic attachment means 90 should be flexible and of sufficient adhesiveness to hold the flap elastic member in its stretched condition. The elastic attachment means 90 herein are preferably glue beads made of hot melt adhesives such as marketed by Findley Adhesives Incorporated, Elm Grove, Wisconsin as Findley Adhesives 581. A more detailed description of the manner in which the flap elastic members 60 may be positioned and secured to the diaper 20 can be found in U. S. Patent 4,253,461 issued to Strickland and Visscher on March 3, 1981, and U. S. Patent 4,081,301 issued to Buell.

20 One flap elastic member 60 which has been found to be suitable is an elastic strand having a cross section of 0.18 mm by 1.5 mm and made from natural rubber as available from Easthampton Rubber Thread Company of Stewart, Virginia, under the trademark L-1900 Rubber Compound. Other suitable flap elastic members 60 can be made from natural rubber, such as elastic tape sold under the trademark Fulflex 9211 by Fulflex Company of Scotland, North Carolina. The flap elastic member 60 may also comprise any heat shrinkable elastic material as is well known in the art. Other suitable flap elastic members 60 may comprise a wide variety of materials as are well known in the art including elastomeric films, polyurethane films, elastomeric foams, and formed elastic scrim.

30 In addition, the flap elastic members 60 may take a multitude of configurations. For example, the width of the flap elastic members 60 may be varied from 0.25 mm (0.01 inches) to 25 mm (1.0 inch) or more; the flap elastic members 60 may comprise a single strand of elastic material or may comprise

several parallel or non-parallel strands of elastic material; or the flap elastic members 60 may be rectilinear or curvilinear. Still further, the flap elastic members 60 may be affixed to the diaper 20 in any of several ways which are well known in the art. For example, the flap elastic members 60 may be ultrasonically bonded, heat/pressure sealed into the diaper 20 using a variety of bonding patterns or the elastic members 60 may simply be glued to the diaper 20.

Each barrier cuff 62 is a flexible member having a proximal edge 64, a distal edge 66, an inboard surface 68 and an outboard surface 70. As used herein, the term flexible refers to materials which are compliant and will readily conform to the general shape and contours of the body. In addition, if the spacing means 76 comprise spacing elastic members 77, the barrier cuff 62 must be contractible so that the distal edge 66 may be sufficiently spaced away from the topsheet top surface 40 so that a channel 96 is formed to restrain, contain and hold body exudates within the article. The barrier cuff 62 may be manufactured from a wide variety of materials such as polypropylene, polyester, rayon, nylon, foams, plastic films, formed films, and elastic foams. A number of manufacturing techniques may be used to manufacture the barrier cuff. For example, the barrier cuff 62 may be woven, non-woven, spunbonded, carded, or the like. A particularly preferred barrier cuff 62 comprises a polypropylene material containing no finish or surfactant to render it liquid impermeable. A particularly preferred polypropylene material is manufactured by Crown Zellerbach Company as Celestra.

As shown in Figures 1 and 3, the barrier cuff 62, and more particularly the proximal edge 64, is disposed inboard of and preferably adjacent to the gasketing cuff 56. The term "inboard" is defined as the direction toward the centerline (34 or 36 respectively) of the diaper that is parallel to the respective edge of the diaper 20 along which the particular gasketing cuff 56 is disposed. The barrier cuff 62 is disposed inboard of the gasketing cuff 56 so that exudates, especially loose fecal material

which is not easily absorbed and tends to float along the topsheet top surface 40, will contact the barrier cuff 62 before it can contact the gasketing cuff 56. The barrier cuff 62 is located adjacent the gasketing cuff 56 to provide a more effective dual restraint against the flow of body exudates. The barrier cuff 62 is disposed between the flap elastic member 60 of the gasketing cuff 56 and the longitudinal centerline 36 of the diaper 20 so that, in the crotch region 26, the barrier cuff 62 is disposed between the flap elastic member 60 and the side edge 46 of the absorbent core 44.

The proximal edge 64 and the distal edge 66 are in spaced relation to each other and define the width of the barrier cuff 62. The proximal and distal edges 64 and 66, respectively, may be in a parallel, nonparallel, rectilinear or curvilinear relationship. In addition, the barrier cuff 62 may have a variety of different cross sectional areas including circular, square, rectangular or any other shape such as shown in Figure 3. Preferably, the proximal edge 64 is spaced from the distal edge 66 in a parallel and rectilinear relationship to provide a barrier cuff 62 having uniform widths. Each barrier cuff 62 preferably has a width of at least 5 mm, and preferably from 10 mm to about 25 mm.

A preferred embodiment of the diaper 20 shown in Figure 1 is provided with the barrier cuff 62 joined to the topsheet 38. The term "joined" includes any means for affixing the barrier cuff 62 to the diaper 20, and includes embodiments wherein the barrier cuff 62 is a separate element having the proximal edge 64 directly or indirectly attached to the topsheet 38 (i.e., integral) or embodiments wherein the barrier cuff 62 is made from the same element or material as the topsheet 38 so that the proximal edge 64 is a continuous and undivided element of the topsheet (i.e., unitary). The barrier cuff 62 is joined to the side flap 58 in the crotch region and may be joined to the topsheet 38, the backsheet 42, the absorbent core 44 at or adjacent its longitudinal edge 46, or any combination of these or other elements of the diaper 20. In a preferred diaper 20, the barrier cuffs 62 are

integral with the topsheet 38. The integral barrier cuff 62 is preferably formed by a single strip of material which is secured to the topsheet by adhesive 92, the distal edge 66 being formed by folding an end of the material back upon itself.

5 The distal edge 66 is disposed inboard of the proximal edge 64 to present a more effective barrier against the flow of exudates. The distal edges 66 are maintained inboard of the proximal edges 64 by the adhesive means 78 so as to obviate their inversion.

10 The distal edge 66 is not secured to any other element in at least the crotch region 26 of the diaper 20 so that it may be spaced away from the top surface 40 of the topsheet 38,

15 to allow the barrier cuff 62 to form a channel 96 to enhance the containment of the article. As used herein, "spaced" includes embodiments wherein the distal edges 66 may assume one or more positions relative to the top surface 40 of the topsheet 38 including at some times assuming a position adjacent the top surface 40 of the topsheet 38. The distance between the distal edge 66 to the top surface 40 of the topsheet 38 is measured along a line drawn from the distal edge 66 to the closest part of the topsheet 38 when the distal edge 66 is positioned so as to be spaced away from the topsheet as far as possible. (i.e., in the elastically contracted position). Preferably, the distal edge 66 is spaced away from the topsheet 38 by a height of at least about 2 mm, and more preferably of from 5 mm (1/5") to 10 mm (2/5").

25 The channel 96 is formed at least along the proximal and distal edges 64 and 66 and the inboard surface 68 of the barrier cuff 62. The channel 96 forms a barrier to the flow of exudates as they tend to move or float across the topsheet 38. Thus the

channel 96 holds and contains exudates until the diaper 20 can be removed.

5 The barrier cuffs 62 may additionally be provided with absorbent means secured to or within the barrier cuff 62. The absorbent means absorb and contain exudates which contact the barrier cuff 62. The absorbent means may be any means which is capable of absorbing and retaining fluids and may have any size, shape, configuration or absorbent capacity. The absorbent means may be positioned to the barrier cuff 62 along the inboard surface 68 or within the barrier cuff 62. Preferably, the absorbent means is a layer of airfelt secured within the tunnel formed by the integral barrier cuff and secured along the entire length and width of the inboard surface 68 of the barrier cuff 62.

15 In addition, the barrier cuff 62 may be rendered liquid impermeable so as to prevent the strikethrough of body exudates. A liquid impermeable barrier cuff 62 retards the movement of liquid through the barrier cuff 62, thereby making it more leakage resistant. The barrier cuff 62 may be rendered liquid impermeable in any manner well known in the art such as selectively treating the barrier cuff, untreating the barrier cuff, or by securing a separate material to the barrier cuff.

20 The spacing means 76 for spacing the distal edge 66 away from the topsheet top surface 40 is any member which gathers, contract, stiffens, shortens or otherwise acts on the barrier cuff 62 so as to cause a channel 96 to be formed along the barrier cuff 62 to provide a constraint against the leakage of exudates.

30 As shown in Figure 1, the spacing means 76 preferably comprise spacing elastic member 77 secured adjacent the distal edge 66 inside of the barrier cuff 62. The spacing elastic member 77 is preferably secured to the barrier cuff 62 in an elastically contractible condition so that in a normally unrestrained configuration, the spacing elastic member 77 effectively contracts or gathers the barrier cuff 62. The spacing elastic member 77

can be secured to the barrier cuff 62 in an elastically contractible condition in at least two ways as is discussed in the above referenced U. S. Patent 3,860,003 issued to K. B. Buell. In addition, the length of the spacing elastic member 77 in general is dictated by the diaper design. In the embodiment illustrated in Figure 1, the spacing elastic member 77 extends essentially the entire length of the barrier cuff 36 in the crotch region 26, although other lengths are cognizable.

As shown in Figure 3, the spacing elastic member 77 is associated with the barrier cuff 62 by securing it within the barrier cuff with elastic attachment means 94. While the spacing elastic members 77 may be secured to the barrier cuff 62 adjacent only the ends of the elastic spacing member 77, it is preferable to secure the entire length of the spacing elastic member 77 to the barrier cuff 62. The elastic attachment means 94 herein are preferably glue beads made of hot melt adhesive such as marketed by Findley Adhesives Incorporated, Elmgrove, Wisconsin, as Findley Adhesives 581. A more detailed description of the manner in which the spacing elastic members 77 may be positioned and secured to the barrier cuff 62 can be found in U. S. Patent 4,081,301, issued to Buell on March 28, 1978, and in U. S. Patent 4,253,461 issued to Strickland and Visscher on March 3, 1981.

It should also be noted that one or more spacing elastic members 77 can be used to elasticize each barrier cuff 62.

A spacing elastic member 77 which has been found suitable is an elastic strand having a cross section of 0.18 mm by 1.5 mm and made from natural rubber as available from Easthampton Rubber Company of Stewart, Virginia, under the trademark L-1900 Rubber Compound. Other suitable spacing elastic members 77 can be made from natural rubber, such as elastic tape sold under the trademark Fulflex 9211 by Fulflex Company of Scotland, North Carolina. The spacing elastic member 77 may also comprise any heat shrinkable elastic material as is well known in the art. Other suitable elastic materials may comprise a wide variety of

materials as are well known in the art include elastomeric films, polyurethane films, elastomeric foams and formed elastic scrim.

5 In addition, the spacing elastic members 77 may take a multitude of configurations. For example, the width of the spacing elastic members 77 may be varied; the spacing elastic members may comprise a single strand or several parallel or non-parallel strands of elastic material; or the spacing elastic members 77 may be rectilinear or curvilinear. Still further, the spacing elastic members 77 may be affixed to the barrier cuff 62 in any of several ways which are well known in the art. For example, the spacing elastic members 77 may be ultrasonically bonded or heat sealed into the barrier cuff 62 using a variety of bonding patterns, or the spacing elastic members 77 may simply be glued to the barrier cuffs 62.

15 The spacing means 76 for spacing the distal edge 66 away from the topsheet top surface 40 may alternatively comprise several other elements. For example, the barrier cuff 62 may have stiffening means disposed in or on each barrier cuff 62. The stiffening means must be sufficiently stiff so that the distal edge 66 is spaced away from the topsheet top surface 40. Suitable materials for the stiffening means include foams, nonwoven fabrics, batting, polyethylene film, formed films, spray glues, foamed elastomerics, polyester, polyurethane, or a high loft material as is manufactured by Carolina Formed Fabrics.

25 The spacing means 76 may also comprise means for shortening the length of the distal edge 66 in comparison to the length of the edges of the diaper 20. The distal edge 66 can be shortened by making a fold or pleat in the distal edge 66. This fold or pleat is secured by any of the holding means well known to those of ordinary skill in the art, such as adhesives or heat sealing. Alternatively, a section may be cut out of the distal edge and the edges brought together to form a butt or lapp joint. The distal edge 66 may also be shortened by attaching a length of the distal edge 66 to the topsheet 38 at a position different from

where the distal edge 66 would lie when the diaper 20 is in a flattened out condition. Other shortening techniques as are known in the art may also be used.

5 The adhesive means 78 for securing end portions 72 and 74 of the barrier cuff 62 closed are shown in Figures 1 and 2. The adhesive means 78 provide a more comfortable fit for the wearer and obviate inversion of the distal edges 66 of the barrier cuff 62 during application and use. Inversion is generally defined as the inboard disposed distal edge 66 turning outwardly when the
10 diaper 20 is applied to the wearer. In a preferred embodiment as shown in Figures 1 and 2, such adhesive means 78 are disposed in the front waist region 22 and the back waist region 24 of the diaper in the front closure zone 80 and the back closure zone 82, respectively. The remaining portions of the barrier cuff 62 are
15 not secured closed so that the distal edges 66 are left freely openable. In a preferred embodiment, the front closure zone 80 extends through the entire front waist region 22, while the back closure zone 82 extends through only a portion of the back waist region 24. This construction is preferred so as to create a
20 channel 96 around the buttocks of the wearer to especially prevent leakage of loose fecal material.

The adhesive means 78 are preferably glue beads 79 consisting of hot melt adhesives such as marketed by Findley Adhesives Incorporated, Elmgrove, Wisconsin, as Findley
25 Adhesives 581.

Figure 4 is a sectional view of the diaper 20 in its elastically contracted position prior to being placed on the wearer. The topsheet 38 is shown as the body contacting surface of the diaper 20, the backsheet 42 being disposed away from the body of the
30 wearer. The gasketing cuffs 56 are shown to be gathered or contracted by the flap elastic members (not shown in Figure 4). The diaper 20 is shown as having two barrier cuffs 62 extending adjacent to and inboard of the gasketing cuffs 56. The distal edges 66 are shown to be gathered and contracted by the spacing

elastic members (not shown) in the crotch region 26 so as to provide a longitudinally extending channel 96 along the diaper 20. In addition, the ends 72 and 74 of the barrier cuff 62 are secured closed in the front and back closure zones 80 and 82, respectively, so as to provide comfort for the wearer, to obviate inversion of the barrier cuffs, and for ease of application of the diaper.

The diaper 20 is applied to a wearer, by positioning the back waist region 24 under the wearer's back, and drawing the remainder of the diaper 20 between the wearer's leg so that the front waist region 22 is positioned across the front of the person. The ends of the tape-tab fasteners 54 are then secured preferably to outwardly facing areas of the diaper 20. In this manner, the barrier cuffs 62 should be disposed in the crotch region of the wearer and should provide the dispositions and functions described hereinbefore. Once applied, the distal edges 66 of the barrier cuffs 62 extend through the groin areas and diverge upwardly along both of the buttocks of the wearer. Neither of the barrier cuffs 62 encircle the thighs of the wearer. However, the gasketing cuffs 56 will encircle the thighs and create a gasketing action against the thighs. The ends of the barrier cuff 62 are secured to the topsheet 38 to obviate the inversion of the barrier cuffs, for comfort for the wearer during application and use, and for ease of application.

Figure 5 is a fragmentary coronal view showing a section of the diaper 20 of Figure 1 in place on a wearer. (A coronal view is a frontal plane that passes through the long axis of the body.) As shown in Figure 5, the gasketing cuffs 56 ride down on the legs and encircle the thighs of the wearer. The barrier cuffs 62 ride up on the legs and run through the crotch region and diverge upwardly over both the buttocks of the wearer. The barrier cuffs 62 do not encircle the thighs of the wearer. The distal edges 66 are spaced away from the top surface 40 of the topsheet 38 and lie against the perineum of the wearer. The barrier cuffs 62 are, therefore, pushed snugly against the

perineum of the wearer in the crotch region 26 of the diaper 20. The size of the channel 96 is enhanced by the resiliency of the absorbent core 44 because the core tends to push itself away from the perineum. This results in the diaper 20 having channels 96 extending along the crotch region of the wearer. Therefore, body exudates are restrained from penetrating beyond the barrier cuffs 62 because the channels 96 form a barrier to the flow of exudates.

Basically, without intending to limit the present invention, the present invention is a diaper that is especially useful and leakage resistant against loose fecal material, the improved containment characteristics being achieved in the following manner. As loose fecal material is discharged onto the topsheet 38, the material flows or floats on the top surface 40 of the topsheet 38. (Hereinafter referred to as surface material). The surface material moves from the point of discharge toward the longitudinal edges 30. Surface material will contact the barrier cuff 62 along the inboard surface 68. In normal use, gravitational forces will tend to cause the surface material to collect in the channel 96 formed by the standing barrier cuff 62; the material being held in the channels 96 until the diaper 20 can be removed. Improved containment is achieved because surface material would have to flow up the channel 96, which direction is substantially directly against the force of gravity when the wearer is in an upright position, in order to penetrate and flow over the distal edges 66 of the barrier cuffs 62. However, should such material flow beyond the barrier cuffs 62, it is retarded from leaking out of the diaper 20 by the gasketing effect achieved by the gasketing cuffs 56, as they draw and gather the side flaps 58 about the legs of the wearer, thereby providing a second and independent effective barrier against leakage so as to further prevent the soiling of adjacent garments.

Figure 6 is a sectional view of an alternative barrier cuff 662 of the diaper 20 of the present invention. A unitary barrier cuff 662 is formed by pleating the entire diaper structure (i.e., the

backsheet 42, the absorbent core 44, and the topsheet 38.) After pleating the structure, the proximal edges 64 of the barrier cuff 662 are secured together by adhesive 98. The barrier cuff 662 may preferably have spacing means such as spacing elastic members 77 secured within the barrier cuff 662 to elasticize the distal edges 66 of the barrier cuff 662 so as to space the distal edges 66 away from the top surface 40 of the topsheet 38.

Figure 7 is another fragmentary sectional view of the alternative embodiment of the present invention shown in Figure 6. A unitary barrier cuff 762 is formed by U-folding or pleating the topsheet spacing means such as barrier cuff 762 of the diaper 20 of the present invention. The topsheet is folded upon itself to form a distal edge 66; a spacing elastic member 77 secured within the tunnel formed in the distal edge 66. The proximal edge 64 is secured by adhesive attachment means 100 such as a glue bead made of hot melt adhesives.

**CLAIMS**

1. An integral disposable diaper having front and back waist regions and a crotch region therebetween, said diaper having a liquid pervious topsheet, a liquid impervious backsheet associated with said topsheet and an absorbent core disposed between said topsheet and said backsheet, said absorbent body having laterally extending end edges and generally longitudinally extending side edges, said topsheet and said backsheet extending laterally outwardly of the longitudinal side edges of the absorbent body and being united to form flexible side flaps, each flap being formed with a longitudinally extending elastic member secured thereto in an elastically contractible condition in at least the crotch region to form a first, elastically contractible gasketing cuff, said diaper also being formed with a second elastically contractible, longitudinally extending cuff disposed adjacent each said gasketing cuff, each said second cuff having a distal edge and a proximal edge, each said proximal edge being disposed laterally inboard of its adjacent gasketing cuff and each said distal edge being free from attachment in at least the crotch region; characterised in that

- a) the proximal edge of each said second cuff in the crotch region of the diaper is disposed in and joined to said side flap laterally outwardly of the adjacent longitudinal side edge of said absorbent core;
- b) means are provided to maintain each said distal edge disposed laterally inwardly of its respective proximal edge; and
- c) spacing means are provided for spacing each said distal edge away from the surface of said topsheet whereby each said second cuff is caused to form a barrier to lateral outward movement of loose faecal material on said topsheet.



2. An integral disposable absorbent article according to claim 1 wherein the means to maintain said distal edge disposed laterally inwardly of said proximal edge comprises adhesive means disposed adjacent each of the ends of said barrier cuff for securing closed a portion of said barrier cuff, a portion of said distal edge in at least the crotch region remaining free from attachment so as to be spaced away from said topsheet.
 3. An integral disposable absorbent article according to either one of claims 1 and 2 wherein said spacing means is a spacing elastic member.
 4. An integral disposable absorbent article according to any of the preceding claims wherein said barrier cuff is unitary with said topsheet.
 5. An integral disposable absorbent article according to any one of claims 1-3 wherein said barrier cuff is integral with said side flap.
 6. An integral disposable absorbent article according to any of the preceding claims wherein said barrier cuff is liquid impermeable.
 7. An integral disposable article according to any of the preceding claims wherein said barrier cuff additionally comprises an absorbent means.
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