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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 : A61F 13/15

A1

(11) International Publication Number: **WO 00/28929**

(43) International Publication Date: 25 May 2000 (25.05.00)

(21) International Application Number: PCT/US99/26823

(22) International Filing Date: 12 November 1999 (12.11.99)

(30) Priority Data:
09/195,267 18 November 1998 (18.11.98) US

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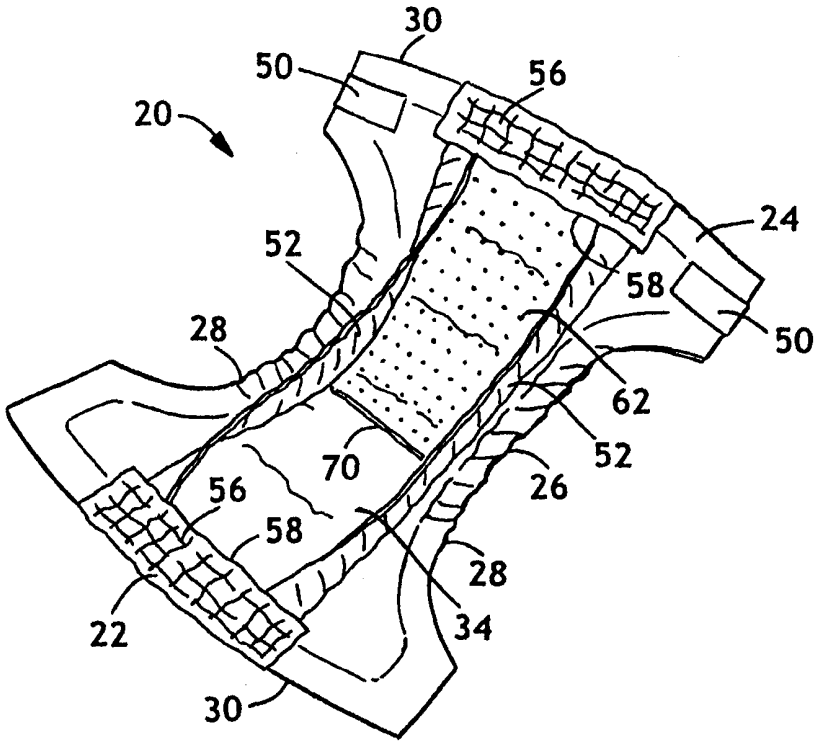
(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published
With international search report.
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: ABSORBENT ARTICLE HAVING AN APERTURED LINER

(57) Abstract

An absorbent article having a liquid permeable topsheet layer, a backsheet layer and an absorbent structure positioned therebetween. The absorbent article has a front waist section, a rear waist section and an intermediate section interconnecting the two waist sections. An apertured liner at least partially defines a rear portion of the bodyside surface of the article and may include a bodyside apertured film layer. The topsheet layer at least partially defines a front portion of the bodyside surface and may be a fibrous material. The apertured liner defines a fecal target zone and enhances the ability of the absorbent article to contain low viscosity fecal materials and separate such materials from the skin of the wearer. The apertured liner may be formed by attaching an apertured film layer to a low density hydrophilic fibrous material. An absorbent body may also be attached to the underside of the apertured liner. A portion or all of the apertured liner may overlay the topsheet layer and the absorbent body can be positioned between the apertured liner and the topsheet layer. Attaching the apertured liner in an overlapping relation with the topsheet layer facilitates the manufacture of the absorbent article.



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ABSORBENT ARTICLE HAVING AN APERTURED LINER

Background of the Invention

Field of the Invention

The present invention relates to absorbent articles for absorbing and containing bodily exudates. More particularly, the present invention relates to disposable absorbent articles, such as disposable diapers, training pants, and adult incontinence garments, which are designed to contain bodily exudates which may include low viscosity fecal materials.

Description of the Related Art

Absorbent articles, such as disposable diapers, often employ an absorbent core located between a liquid permeable topsheet positioned adjacent the wearer's body and a liquid impermeable backsheet defining the exterior surface of the garment. Liquid exudates, such as urine, penetrate the topsheet and are absorbed by the core while the liquid impermeable backsheet helps to maintain a clean and dry exterior surface.

Conventional absorbent garments are also generally used to contain and absorb solid and semi-solid exudates such as fecal materials which may vary significantly in viscosity. Absorbent garments have typically included elasticized waistbands and leg cuffs to inhibit the leakage of both liquid and solid exudates. Conventional absorbent garments may also include secondary containment or barrier flaps at the leg or waist sections of the article to further inhibit leakage.

Some conventional absorbent garments have also included a void space with a large opening for receiving solid waste materials. Recently developed absorbent garments have also been designed to include a topsheet having apertures to provide an enhanced ability to contain low viscosity materials as exemplified by U.S. Patent No. 5,342,338.

Summary of the Invention

The present invention provides an improved disposable absorbent article which can be efficiently manufactured and provides an enhanced ability to contain and absorb low viscosity fecal materials whereby the contact between the fecal materials and skin of the wearer is reduced.

In one form thereof, the present invention is an absorbent article which comprises, i.e., which includes but is not limited to, a chassis having a front waist section, a rear waist section and an intermediate section interconnecting the front and rear waist sections. The chassis includes a backsheet layer, a liquid permeable topsheet layer and a primary absorbent structure disposed between the backsheet and topsheet layers. A bodyside surface of the article is positionable adjacent the wearer when the article is in use. The absorbent article also includes an apertured liner attached to the article whereby the apertured liner at least partially defines a rear portion of the bodyside surface of the article and the topsheet layer at least partially defines a front portion of the bodyside surface of the article.

In some embodiments, where the apertured liner and topsheet layer are separate components, either the entirety or a portion of the apertured liner may overlap the topsheet layer. Alternative embodiments may include a topsheet layer having an integral apertured liner. An intervening layer may also be disposed between the underlying primary absorbent structure and apertured liner to inhibit the outward migration of particulates found in the primary absorbent structure.

The apertured liner may comprise an apertured film layer or a laminate having a bodyside apertured layer attached to a low density fibrous layer.

Some embodiments of the present invention may also include an absorbent body disposed between the apertured liner and the topsheet layer. The absorbent body may have outer perimeter edges, i.e., perimetrical edges, which are substantially coextensive with the perimeterical edges of the apertured liner whereby a laminate of the two materials may be efficiently cut and attached to the topsheet layer of the absorbent article.

The present invention provides numerous advantages. One such advantage is that the apertures of the apertured liner disposed in the rear portion of the bodyside surface allow both liquid and particulate fecal materials to be trapped and contained below the bodyside surface of the apertured liner. The amount of fecal materials in contact with the skin of the wearer is thereby reduced, resulting in improved comfort and skin health.

Another advantage of the present invention is that some embodiments of the invention include an apertured liner having a bodyside apertured film overlaying a more absorbent material. This configuration can result in a cleaner and drier appearance for a soiled garment and reduced contact between the skin of the wearer and the fecal materials.

These results are obtainable because apertured films are generally hydrophobic thereby reducing or eliminating the fecal fluids which may be absorbed by the bodyside layer of the apertured liner and the staining associated with such absorption. Additionally, the smooth surface provided by the apertured film layer reduces the amount of visible fecal materials which are trapped in small surface irregularities on the bodyside surface of the apertured liner. The fibrous absorbent material disposed below the apertured film layer provides a mechanism for absorbing and containing fecal materials which pass through the apertured film layer. All of these functions have a tendency to reduce the amount of fecal materials present at the bodyside surface and thereby improve the performance and appearance of the apertured liner.

An additional advantage of the present invention is that it provides a bodyside surface which in its front portion includes a liquid permeable topsheet and in its rear portion includes an apertured liner. This configuration allows the topsheet layer and apertured liner of the present invention to be independently optimized for their different respective functions. Thus, specific zones of the bodyside surface of the absorbent article may have different physical properties to enhance the overall performance of the article.

For example, a fibrous, relatively hydrophilic topsheet layer can be combined with an apertured liner formed with a hydrophobic apertured film. It has been observed that caregivers often utilize the front portion of the topsheet as a "first wipe" to remove fecal materials from the skin of the wearer when removing soiled absorbent garments. Hydrophilic fibrous materials allow urine to rapidly pass therethrough and often form an effective "first wipe" material due, in part, to the fibrous texture of the material. Apertured

films, on the other hand, are generally hydrophobic and relatively resistant to fecal staining but may not provide a highly effective "first wipe." Thus, the present invention allows the advantages of both of these different types of materials to be combined in a single absorbent article by utilizing the different materials at different locations on the bodyside surface.

Another advantage of the present invention is that it provides an absorbent article configuration which may be efficiently manufactured. For example, some embodiments of the present invention may be manufactured by attaching an apertured liner in overlapping relation to the topsheet layer of a disposable absorbent garment chassis. One advantage of this configuration is that it may be readily implemented by making only relatively minor changes to pre-existing disposable article assembling machinery and allows an apertured liner to be readily attached to an absorbent article chassis having a conventional topsheet layer.

Brief Description of the Drawings

The invention will be more fully understood and further advantages will become apparent when reference is made to the following detailed description of the invention and the accompanying drawings, in which:

Fig. 1 is a top plan view of an absorbent garment according to one embodiment of the present invention;

Fig. 2 is a sectional view taken along line 2—2 of Fig. 1;

Fig. 3 is a perspective view of the absorbent garment of Fig. 1;

Fig. 4 is a partially cutaway top plan view of an alternative absorbent garment in accordance with the present invention;

Fig. 5 is a sectional view taken along line 5—5 of Fig. 4;

Fig. 6 is a partially cutaway schematic perspective view of an apertured liner and attached absorbent body;

Fig. 7 is a schematic perspective view of a process for assembling an apertured liner, topsheet layer and surge layer; and

Fig. 8 is a schematic perspective view of an alternative process for assembling an apertured liner, topsheet layer and surge layer.

Corresponding reference characters indicate corresponding parts throughout the several views. Although embodiments of the present invention are represented in the drawings, the drawings are not necessarily to scale and certain features may be exaggerated. The disclosed embodiments are set forth to exemplify the invention. The disclosed embodiments are not intended to be an exhaustive illustration of the invention or to be construed as limiting the scope of the invention to the precise forms disclosed.

Detailed Description of the Invention

The following detailed description will be made in the context of a disposable diaper which is adapted to be worn by infants about the lower torso. It is readily apparent, however, that the absorbent article of the present invention would also be suitable for other absorbent articles, such as incontinence garments, training pants, and other similar articles which are used to absorb or contain urine and fecal materials.

With reference to Figs. 1-3, an absorbent article in the form of a disposable diaper 20 is illustrated. The disposable diaper 20 includes a front waist section 22, a rear waist section 24 and an intermediate section 26 which interconnects the front and rear waist sections. The lateral edges of intermediate section 26 are defined by a pair of laterally opposed side edges 28 while the edges of the front 22 and rear 24 waist sections are defined by a pair of longitudinally opposed end edges 30.

The front 22 and rear 24 waist sections include the general portions of the absorbent article which are constructed to extend substantially over the wearer's front and rear abdominal regions, respectively, during use. The intermediate section 26 includes the general portion of the diaper 20 which is constructed to extend through the wearer's crotch region between the legs. The opposed side edges 28 define leg openings for the diaper and are generally curvilinear or contoured to closely fit the legs of the wearer. The

opposed end edges 30 define a waist opening for the diaper 20 and are typically straight but may also be curvilinear.

Fig. 1 is a representative plan view of the diaper 20 in a flat, uncontracted state with the surface of the diaper which contacts the wearer, *i.e.*, the bodyside surface 21, facing the viewer. Fig. 2 is a representative sectional view of the diaper 20 taken through a rear portion of the intermediate section 26.

The diaper 20 includes a substantially liquid impermeable backsheet 32, a porous, liquid permeable topsheet 34 positioned in facing relation with the backsheet 32, and an absorbent structure 36, such as an absorbent pad, located between the backsheet 32 and the topsheet 34. In the garment illustrated in Figs. 1-3, the absorbent structure 36 includes both a primary absorbent body 35 and a surge layer 60. The diaper 20 also defines a lateral axis 38 and a longitudinal axis 40. The lateral and longitudinal axes are also referred to herein as the lateral and longitudinal directions.

An apertured liner 62 is also attached to the diaper chassis. In the illustrated embodiments, apertured liner 62 overlaps the topsheet 34 in an overlaying manner and defines the bodyside surface in the fecal target area of the diaper. The fecal target area of the diaper is the area which immediately surrounds the point on the bodyside surface which is positioned opposite the wearer's anus. The fecal target area is generally located in the rear portion of the bodyside surface 21 but may also extend slightly into the front portion of the bodyside surface.

The illustrated liner 62 is shown in a schematic cross-sectional perspective view in Fig. 6 and includes an apertured layer 64 and an absorbent low density fibrous layer 66. The low density fibrous layer 66 is bonded to the underside of apertured layer 64 whereby the apertured layer 64 forms the bodyside surface of the apertured liner 62. The absorbent layer 66 is not necessary, however, and the apertured liner 62 may alternatively consist of only the apertured layer 64.

In the illustrated embodiments, the apertured liner 62 and topsheet 34 are two separate component parts. In other words, apertured liner 62 and topsheet 34 are not a single integral piece of material and must be separately attached to the diaper, as, for example, by attaching them together. In some alternative embodiments of the present invention,

however, it is possible to form an apertured liner 62 by selectively treating a portion of the topsheet 34, such as by surface treating and/or forming apertures in a portion of topsheet 34, rather than using separate apertured liners 62 and topsheets 34.

In the illustrated embodiment, the apertured layer 64 is a hydrophobic polyethylene film. More specifically, the illustrated apertured layer 64 consists of 95.8% (by weight) low density polyethylene, i.e., LDPE, and 4.2% TiO_2. One such film is available from Edison Plastics under the tradename XP3134A and consists of 94% Rexene (an LDPE having a 5.5 melt index and a density of 0.923 g/cc) and 6% Ampacet (a TiO_2 concentrate consisting of 70% TiO_2 and 30% LDPE).

Apertures may be provided in the layer 64 with a pin roll or other suitable means well known in the art. The illustrated apertured layer 64 has an open area of 28%. Thus, in a diaper 20, the apertures in the apertured layer 64 define an open area which is approximately 28% of the bodyside surface portion defined by the apertured layer 64. Alternative amounts of open area, ranging from approximately 20% to 60%, may also be effectively employed with apertured layer 64. The opening area of the apertures present in the apertured layer 64 may range from an approximate equivalent circular diameter of from about 400 to 3000 microns or, alternatively, from about 400 to 1300 microns. The apertures present in the illustrated embodiment have an opening area which is equivalent to the area of a circular opening with a diameter of approximately 700 microns. The pin roll manufacturing process used to form the illustrated apertures often introduces some variation in the size and shape of the individual apertures. For example, originally circular apertures may often become slightly oval due to subsequent drawing of the material.

In alternative embodiments, the size and/or shape of the apertures may be selectively varied. A single embodiment could include two or more discrete groups of differently sized or shaped apertures. For example, the apertured layer 64 could include a certain percentage of relatively small apertures with the remainder of the apertures consisting of relatively larger apertures where the smaller apertures are similar in size and shape with one another and the larger apertures are also similar in size and shape with one another. Alternatively, the apertures could vary more continuously in size or shape. The different apertures could be segregated, homogenously placed, form a pattern, or be randomly placed on the apertured layer 64.

Alternative materials which may be used to form apertured layer 64 include thermoplastic films with open areas and nonwoven fibrous materials. Foam materials, particularly closed cell foam materials which have a "skin" may also be effectively employed as the apertured layer 64. An apertured thin foam material will typically have a "soft" feel which is an advantageous property for a bodyside surface material.

Additional alternative materials for apertured layer 64 include thermoplastic netting which contains highly permeable regions of defined size. Such netting is produced by Nalle Plastics Inc., having offices in Austin, Texas, under the tradename Naltex. Biplanar filtration netting produced by AET Specialty Net and Profile, having offices in Salem, Massachusetts may also be used.

The apertured layer 64 may also be treated to reduce adhesion and staining of fecal materials as, for example, by imparting a protein resistance to the material or by enhancing or imparting hydrophobic properties to the material. Such treatments include treatment with fluorocarbons, silicones, PLEURONICS (a triblock copolymer of ethylene oxide, propylene oxide, and ethylene oxide produced by BASF of Germany), surfactants and other treatments containing ethylene oxide, and other surface treatments well known in the art.

Fibrous materials, such as non-woven fabrics, are more likely to require the enhancement of their hydrophobic properties with surface treatments than film materials which are naturally hydrophobic. The resistance of a fibrous material to wetting or penetration of a liquid depends upon a number of factors including the chemical nature, geometry, fiber surface roughness and capillary spacing of the material.

Another advantage to the use of a film to form the apertured layer 64 is that a film presents a relatively smooth surface. The relatively smooth surface of a film is unlikely to trap fecal materials in localized surface irregularities. A fibrous material, in contrast, has a surface formed by individual fibers and, thus, has a textured surface with many localized peaks and valleys which can collect fecal materials. If fecal materials are trapped in localized pits or depressions on a bodyside surface, the fecal materials are likely to remain in contact with the skin of the wearer and remain visible. Thus, the smooth surface of a film can have beneficial skin health and stain reduction affects. The surface texture provided by a fibrous material, however, is an advantage for a material which is

used as a "first wipe" to remove fecal materials from the skin of a wearer and which must "grip" or absorb the fecal materials to remove them from the skin.

Containing the fecal materials below the bodyside surface defined by apertured layer 64 provides a generally cleaner and drier bodyside liner than conventional non-apertured hydrophilic bodyside liner materials which may absorb fecal fluids and tend to retain fecal matter on top of the bodyside surface of the diaper.

It should be recognized that although relatively hydrophobic materials may be used to provide advantageous apertured liners because of the significant water content of low viscosity fecal materials, such fecal materials are comprised of more than water. Although the other constituents of the fecal materials may or may not have an affinity for the various hydrophobic materials which may be used to form the apertured layer 64, hydrophobic materials will not have an affinity for one primary constituent, i.e., water, which will be present in the fecal materials. It is also thought that the hydraulic gradient created by positioning a hydrophilic material adjacent a hydrophobic material may possibly have a minor influence in pulling fecal fluids through the apertures in layer 64.

The apertured layer 64 may be used by itself or include a low density fibrous layer 66 laminated thereto or positioned thereunder. In the embodiment illustrated in Fig. 6, a low density fibrous layer 66 is laminated to the underside of apertured layer 64. The illustrated low density fibrous layer 66 is a through-air-bonded bicomponent non-woven carded web with a basis weight of about 23.7 g/m^2 (0.7 osy) and a density of 0.03 g/cc in an uncompressed condition. The low density fibrous layer 66 has 100% binder fibers wherein the fibers have a polypropylene core and a concentric LLDPE sheath with a 50/50 core/sheath ratio. The fibers are 6 to 10 denier per filament (dpf) and are treated with a 0.5% by weight wettable finish. Such a material may be obtained from Chisso of Japan under the tradename ESC fiber with HR6 finish.

The low density fibrous layer 66 may also be formed with a variety of other materials such as fibers formed with polyester, rayon, pulp, nylon, polypropylene, polyethylene, or combinations or blends thereof. Particularly advantageous materials for use as the low density fibrous layer 66 are resilient fibrous webs that maintain enough void volume under load to provide the void volume for containing the anticipated fecal insult. The total void volume available may differ for different garments depending upon the intended wearer

and anticipated loading. For example, garments intended for use with adults would have a larger total void volume than garments intended for use with infants.

The illustrated low density fibrous layer 66 is bonded to the apertured layer 64 using heat and pressure to form discrete bonded areas 65. It is also possible to use other well known means of laminating layers together to join layers 64 and 66 or to attach the layers 64 and 66 to the diaper 20 without first joining the layers. The bonded surface area comprises between 8-12% of the total surface area of the apertured liner 62 in the illustrated embodiment but the bonded surface area is not limited to this range. It is also possible for bonds 65 to be configured to convey information or to form a decorative pattern.

The polyethylene material forming the illustrated apertured layer 64 is hydrophobic and thus does not absorb the fecal fluid or experience the staining associated with such absorption. The apertures in the layer 64 allow the passage of fecal materials therethrough while the hydrophilic qualities of the low density fibrous layer 66 allows this layer to absorb fecal fluid and the low density of layer 66 leaves sufficient void space for receiving significant quantities of fecal materials. Resilient fibrous materials can be advantageously used to form the layer 66 underlying the apertured layer 64.

A more substantial absorbent body 68 may also be positioned between the apertured liner 62 and the topsheet 34 to provide an increased capacity for absorbing and retaining fecal materials. The absorbent body 68 is completely overlain by the apertured liner 62.

If no topsheet 34 is present below the apertured liner 62, the absorbent body 68, if present, is positioned between the apertured liner 62 and the absorbent structure 36. In alternative embodiments where no absorbent body 68 is used, the apertured liner 62 (including only an apertured layer 64 or both an apertured layer 64 and a low density fibrous layer 66) may be positioned directly over the absorbent structure 36. In the embodiment illustrated in Figs. 1-3 and 6, the absorbent body 68 is adhered to the underside of apertured liner 62.

In the illustrated embodiments, absorbent body 68 is a non-compressively dried cellulosic web. More specifically, the illustrated absorbent body 68 is an uncreped through-air-dried, bleached chemi-thermo-mechanical-pulp with a basis weight of approximately 40-45 g/m^2

and a density of approximately 0.3 g/cc. The absorbent body 68 has a three-dimensional surface with an overall surface depth of approximately 0.10 millimeter or greater.

The web which is used to form absorbent body 68 may also include a wet strength agent and at least 10 dry weight percent high yield pulp fibers. Virgin high yield pulp fibers and virgin high yield softwood pulp fibers may be advantageously employed to form such a web. "High yield pulp fibers" are papermaking fibers produced by pulping processes which provide a yield of approximately 65 percent or greater. Such pulping processes include bleached chemi-thermo-mechanical pulp, thermo-mechanical pulp, thermo-mechanical chemical pulp, high yield sulfite pulps and high yield kraft pulps. These processes leave the resulting fibers with high levels of lignin. High yield fibers are well known for their stiffness (in both their wet and dry states) relative to typical chemically pulped fibers. The lignin resists the softening effect of water and helps the resulting web to maintain its stiffness and shape after wetting.

The basis weight of the webs can be approximately 10 gsm or greater and, more specifically, may range from approximately 20 to 80 gsm, from approximately 30 to 60 gsm, or from approximately 30 to 50 gsm. In the illustrated embodiment, the basis weight of absorbent body 68 is approximately 44 gsm. The fiber composition of the web can have from about 10 to 100 percent wood pulp fibers and, more specifically, may contain about 70 percent to 90 percent wood pulp fibers or greater. Additionally, it is advantageous that softwood fibers comprise about 70 to 90 percent or greater of the fiber composition.

Three main factors involved in the production of cellulosic webs having the desired properties for absorbent body 68 are 1) a high bulk (low density) three dimensional structure obtained without significant compression during drying and advantageously obtained without creping; 2) high yield pulp fibers, advantageously comprising at least 10% of the web fibers; and 3) the use of one or more wet strength resins or agents such that the wet to dry geometric mean tensile strength ratio is about 0.1 or greater. Wet strength agents are used to make the bonds between the fibers resistant to disruption in the wet state. Such wet strength agents are well known in the art and are commercially available from a wide variety of sources. Such agents include polyamide-polyamine-epichlorohydrin (PAE) type resins, polyamide-epichlorohydrin resins, aminoplast resins obtained by reaction of formaldehyde with melamine or urea. U.S. Serial No. 08/912,906

entitled Wet-Resilient Webs and Disposable Articles Made Therewith, filed August 15, 1997 in the name of Chen et al., and having an attorney docket number of 11,700.3, describes suitable wet strength agents and a method of producing cellulosic webs suitable for use as absorbent body 68 in greater detail and is hereby incorporated by reference.

Cellulosic webs made in accordance with the three factors described above will generally have both low density and high wet resiliency properties, showing great resistance to wet collapse. Such webs also have favorable absorbency characteristics, such as high intake rates, high in-plane permeability, high absorption capacity and rapid in-plane distribution of liquids.

Other absorbent materials, or combinations of materials, may also be used to form absorbent body 68. Examples of such alternative materials include nonwoven webs having approximately 70% oriented rayon fibers as well as the absorbent materials previously described as being suitable for absorbent structure 36 or low density layer 66. These alternative materials include superabsorbent materials which can be used as either a substitute or supplement for the absorbent capacity of the absorbent body 68.

Additional features, such as flaps and barriers (not illustrated), may be used to separate the urine and fecal insult areas on the diaper. The use of such features can serve to minimize the possibility of the absorbent body 68 becoming pre-saturated with urine and prevent the movement of fecal materials into an area where the bodyside surface is defined by the topsheet layer 34 instead of the apertured liner 62.

The absorbent body 68 and apertured liner 62 may be adhesively, or otherwise, secured together prior to attaching the absorbent body 68 and apertured liner 62 to the diaper chassis. The absorbent body 68 may have an outer perimeter which is substantially coextensive with the apertured liner 62 or the outer edges of apertured liner 62 may extend substantially beyond the perimeter of the absorbent body 68. The use of an absorbent body 68 and an apertured liner 62 having substantially coextensive outer perimeters allows the absorbent body 68 and apertured liner 62 to be simultaneously cut from a laminate previously formed by attaching the absorbent body 68 to the apertured liner 62. The absorbent body 68/apertured liner 62 laminate may then be attached to the disposable garment chassis in an efficient manufacturing process.

The apertured liner 62 is positioned on the bodyside surface 21 of the diaper 20 to receive fecal insults. Thus, the apertured liner 62 is positioned to define at least a portion of the rear portion of bodyside surface 21, i.e., that portion of bodyside surface 21 disposed rearwardly of lateral axis 38. Lateral axis 38 is positioned at the midpoint of the leg openings defined by laterally opposed side edges 28 and divides the bodyside surface 21 into a front portion and a rear portion.

The outer perimeter of apertured liner 62 is defined by front edge 70, two laterally opposed side edges 72 and a rear edge 74. The apertured liner 62 illustrated in Figs. 1-3 is configured to have a front edge 70 which is positioned near the longitudinal midpoint of the intermediate section corresponding to axis 38. More specifically, the front edge 70 illustrated in Figs. 1-3 is disposed approximately one inch (2.54 cm) forward of the lateral axis 38.

The apertured liner 62 extends rearwardly from its front edge 70 to its rear edge 74. The rear edge 74 may be advantageously disposed approximately 0.5 inches (2.3 cm) forward of the rear diaper longitudinal end edge 30. This positioning of the rear edge 74 allows the rear barrier element 56 to conceal the rear edge 74. The rear edge 74 may also be alternatively positioned. For example, the rear edge 74 of the apertured liner 62 may coincide with the rear edge 30 of the diaper 20.

The side edges 72 of the apertured liner 62 can be advantageously disposed laterally inward of a pair of optional containment flaps 52. When present, the flaps 52 generally conceal the side edges 72 from view prior to placement of diaper 20 on a wearer.

The apertured liner 62 can be attached to the topsheet 34 whereby the topsheet 34 underlays the entirety of the apertured liner 62, underlays only a portion of the apertured liner 62 or does not underlay any portion of the apertured liner 62. In the illustrated embodiments, the entirety of the apertured liner 62 overlays the topsheet layer 34, in other words, there is no opening in the topsheet layer 34 below the apertured liner 62 in the illustrated embodiments.

Topsheet layers 34 which do not include an opening under the apertured liner 62 can be used to form the entirety of the bodyside surface if an apertured liner 62 is not attached to overlay the topsheet layer 34. In other words, one embodiment of the present invention

can be formed by attaching an apertured liner 62 to overlay a portion of a topsheet layer 34 of a conventionally configured absorbent article. This allows the apertured liner 62 to be easily integrated into, or selectively attached to, a diaper having an otherwise functionally complete chassis. This can allow a single manufacturing line to efficiently and selectively produce absorbent articles with and without an absorbent apertured liner 62 by selectively attaching or not-attaching an apertured liner 62 to the otherwise similar absorbent articles.

It is thought that the apertures in the apertured liner allow a greater quantity of fecal materials and larger sized fecal particulates to pass through the apertured liner than through a conventional spunbond bodyside liner. For absorbent structures 36 which include small loose particulates, such as superabsorbent materials, the openings, or apertures, extending through the apertured liner also increase the potential for outward migration of such loose particulates to the bodyside surface 21 of the article.

Not all absorbent structures 36 will include loose particulates capable of migrating through the apertures in liner 64. An intervening layer of material can be used with absorbent structures 36 containing such loose particulates. Placing an intervening layer of material, such as topsheet 34, between the apertured layer 64 of liner 62 and the absorbent structure 36 helps to prevent the particles forming absorbent structure 36 from migrating through the apertures in layer 64 to the bodyside surface of the absorbent article. This screen-like function can alternatively be performed partially or entirely by the low density fibrous layer 66 or the absorbent body 68. Tissue wrap may also be utilized as an intervening layer between the apertured layer 64 and the absorbent structure 36 to inhibit the outward migration of absorbent structure particulates.

The intervening layer advantageously has smaller apertures extending therethrough than the apertures extending through the apertured layer 64 to inhibit the outward migration of particulates, such as superabsorbent material particulates. The intervening layer may also inhibit the outward migration of particulates even if it has openings as large or larger than the apertures in layer 64, provided the intervening layer has a sufficient thickness or other properties, such as an affinity for the absorbent material particulates, which inhibit the outward migration of such particulates.

The topsheet 34 which forms at least a portion of the bodyside surface is advantageously formed with a material which is compliant, soft feeling, and nonirritating to the wearer's skin. Further, the topsheet 34 may be less hydrophilic than the absorbent structure 36, to present a relatively dry surface to the wearer, and is sufficiently porous to be liquid permeable, permitting liquid to readily penetrate through its thickness. A suitable topsheet 34 may be manufactured from a wide selection of web materials, such as porous foams, reticulated foams, apertured plastic films, natural fibers (for example, wood or cotton fibers), synthetic fibers (for example, polyester or polypropylene fibers), or a combination of natural and synthetic fibers. The topsheet 34, or a portion thereof, may also be treated to impart a greater degree of either hydrophobicity or hydrophilicity to the selected material. The topsheet 34 is suitably employed to help isolate the wearer's skin from liquids held in the absorbent structure 36.

In the embodiment of the present invention illustrated in Fig. 1, the topsheet 34 comprises a nonwoven, spunbond, polypropylene fabric composed of about 2.8-3.2 denier fibers formed into a web having a basis weight of about 20 grams per square meter (g/m^2) and a density of about 0.13 gram per cubic centimeter (g/cc). The fabric may be surface treated with a surfactant to improve its hydrophilic properties in a manner which is well known in the art.

The backsheet 32 may suitably be composed of a material which is either liquid permeable or liquid impermeable. It is generally preferred that the backsheet 32 be formed from a material which is substantially impermeable to liquids. The backsheet 32 may optionally be composed of a micro-porous "breathable" material which permits vapors to escape from the absorbent body 36 while still preventing liquid exudates from passing through the backsheet 32.

A typical backsheet can be manufactured from a thin plastic film or other flexible liquid-impermeable material such as a polyethylene film having a thickness of from about 0.012 millimeter (0.5 mil) to about 0.051 millimeter (2.0 mils). The backsheet 32 may be given a more clothlike feeling by using a polyolefin film having a nonwoven web laminated to the outer surface thereof, such as a spunbond web of polyolefin fibers.

For example, the backsheet may be formed with a stretch-thinned polypropylene film having a thickness of about 0.015 millimeter (0.6 mil). The polypropylene film may also

have a spunbond web of polypropylene fibers thermally laminated thereto. The fibers forming the spunbond web may have a thickness of about 1.5 to 2.5 denier per filament with the nonwoven spunbond web having a basis weight of about 17 g/m^2 (0.5 ounce per square yard--osy).

The primary absorbent body 35 of the absorbent structure 36, may suitably comprise a matrix of hydrophilic fibers, such as a web of cellulosic fluff, mixed with particles of a high-absorbency material well known in the art and commonly referred to as superabsorbent materials. In a particular embodiment, the primary absorbent body 35 comprises a matrix of wood pulp fluff and superabsorbent hydrogel-forming particles. The wood pulp fluff may be exchanged with synthetic, polymeric, meltblown fibers or with a combination of meltblown fibers and natural fibers.

The superabsorbent particles may be substantially homogeneously mixed with the hydrophilic fibers or may be nonuniformly mixed. The fluff and superabsorbent particles may also be selectively placed into desired zones of the primary absorbent body 35 to better contain and absorb body exudates. The concentration of the superabsorbent particles may also vary through the thickness of the primary absorbent body 35. Alternatively, the primary absorbent body 35 may comprise a laminate of fibrous webs and superabsorbent material or other suitable means of maintaining a superabsorbent material in a localized area.

The superabsorbent material may be in any of a wide variety of geometric forms. As a general rule, it is preferred that the superabsorbent material be in the form of discrete particles. However, the superabsorbent material may also be in the form of fibers, flakes, rods, spheres, needles, or the like. The superabsorbent material may be present in an amount ranging from about 5 to about 90 weight percent based on total weight of the absorbent body.

The primary absorbent body 35 may have any of a number of shapes. For example, the absorbent core may be rectangular, I-shaped, or T-shaped. It is generally preferred that the primary absorbent body 35 be narrower in the crotch area than in the front or rear portions of the diaper 20. The size and the absorbent capacity of the primary absorbent body 35 should be compatible with the size of the intended wearer and the liquid loading imparted by the intended use of the absorbent article.

The size and absorbent capacity of the primary absorbent body 35 may also be adjusted to account for the absorbent capacity and placement of the apertured liner 62 and underlying absorbent body 68 which are schematically illustrated in Figure 6. The apertured liner 62 and absorbent body 68 are generally disposed in the rear portion of the bodyside surface 21 and are discussed in greater detail below.

Optionally, a substantially hydrophilic tissue wrapsheet may be employed to help maintain the integrity of the primary absorbent body 35 which may consist of an airlaid fibrous structure. The tissue wrapsheet is typically placed about the absorbent body over at least the two major facing surfaces thereof and composed of an absorbent cellulosic material, such as creped wadding or a high wet-strength tissue. In one aspect of the invention, the tissue wrapsheet can be configured to provide a wicking layer which helps to rapidly distribute liquid over the mass of absorbent fibers comprising the absorbent body. In another aspect of the invention, the wrapsheet material on one side of the absorbent fibrous mass may be bonded to the wrapsheet located on the opposite side of the fibrous mass.

Marginal portions of the diaper 20, such as marginal sections of the backsheet 32 and topsheet 34, may extend past the terminal edges of the absorbent structure 36. In the illustrated diaper 20, the backsheet 32 extends outwardly beyond the terminal marginal edges of the absorbent body 36 to form side margins 42 and end margins 44 of the diaper 20. The topsheet 34 is generally coextensive with the backsheet 32 but may optionally cover an area which is larger or smaller than the area of the backsheet 32, as desired.

The diaper 20 may be of various suitable shapes. For example, the diaper may have an overall rectangular shape, T-shape or an approximately hour-glass shape. In the illustrated embodiments, the diaper 20 has a generally I-shape. Examples of diaper configurations suitable for use in connection with the instant application and other diaper components suitable for use on diapers are described in U.S. Patent 4,798,603 issued January 17, 1989, to Meyer et al.; U.S. 5,176,668 issued January 5, 1993, to Bernardin; U.S. 5,176,672 issued January 5, 1993, to Bruemmer et al.; U.S. 5,192,606 issued March 9, 1993, to Proxmire et al.; and U.S. 5,509,915 issued April 23, 1996, to Hanson et al.; the disclosures of which are herein incorporated by reference.

To provide improved fit and to help reduce leakage of body exudates from the diaper 20, the side margins 42 and end margins 44 of the diaper may be elasticized with suitable elastic members, such as leg elastic members 46 and waist elastic members 48. For example, the leg elastic members 46 may include single or multiple strands of elastic or elastomeric composites which are constructed to operably gather and shirr the side margins 42 of the diaper 20. The elasticized leg bands provided thereby closely fit around the legs of the wearer and reduce leakage and provide improved comfort and appearance. Similarly, the waist elastic members 48 (not shown in Figs. 1-3) can be employed to elasticize the end margins 44 of the diaper 20. The waist elastics are configured to operably gather and shirr the waistband sections to provide a resilient, comfortably close fit around the waist of the wearer.

The various components of the diapers 20 are integrally assembled together employing various types of suitable attachment means, such as adhesive, sonic bonds, thermal bonds or combinations thereof. As used herein, the "attachment" of one component to another component is intended to encompass both direct attachment and indirect attachment through means of an intervening component unless the attachment of the components is explicitly qualified to refer to either direct or indirect attachment.

In the illustrated embodiments, the topsheet 34 and backsheet 32 are attached to each other and to the absorbent structure 36 with adhesive, such as a hot melt, pressure-sensitive adhesive. The adhesive may be applied as a uniform continuous layer of adhesive, a patterned layer of adhesive, a sprayed pattern of adhesive, or an array of separate lines, swirls or dots of adhesive. Similarly, other diaper components, such as the elastic members 46 and 48, may be assembled into the diaper 20 by employing one or more of the above-identified attachment means.

In the illustrated embodiments, the elastic members 46 and 48 are secured to the diaper 20 in an elastically contractible condition so that in a normal, under strain, configuration the elastic members effectively contract against the diaper 20. For example, the elastic members 46 and 48 may be elongated and secured to the diaper 20 while the diaper is in an uncontracted condition. In Figs. 1 and 2, the elastic members 46 and 48 are illustrated in their uncontracted, stretched condition for the purpose of clarity. Fig. 3 illustrates the diaper 20 with elastic members 46 and 48 in their contracted state.

The diaper 20 also includes a pair of fasteners 50 which are employed to secure the diaper 20 about the waist of a wearer. Suitable fasteners 50 include interlocking materials (such as hook-and-loop or mushroom-and-loop fasteners), adhesive tape fasteners, buttons, pins, snaps, and the like. A cooperating side panel member can be associated with each fastener and may be constructed to be nonelasticized, or to be elastically stretchable at least along the lateral direction 38 of the diaper 20.

The diaper 20 may also include a pair of elasticized, longitudinally extending containment flaps 52. The containment flaps 52 are configured to maintain an upright, perpendicular arrangement in at least a portion of the intermediate section 26. The containment flaps function as a barrier to the lateral flow of body exudates. The illustrated containment flaps 52 include an elastic element 54 near a distal edge of the flaps and are joined to the bodyside surface of the diaper 20 by adhesives, ultrasonic bonding, or other suitable means. Flaps 52 may be either liquid permeable or liquid impermeable. Numerous materials known in the art, including those materials used to form the backsheet 32 or the topsheet 34, may be used to form flaps 52.

The diaper 20 may also include laterally extending front and rear barrier elements 56. The barrier elements 56 are elasticized and are attached in a position which overlays the longitidunal ends of containment flaps 52 as can be seen in Figs. 1 and 3. The barrier elements 56 are attached to the diaper 20 adjacent longitudinal edges 30 and laterally outward of the lateral edges of the barrier elements 56. Longitudinally inward edges 58 of the barrier elements 56, however, are not directly attached to diaper 20.

Attaching the barrier elements 56 so that they overlay the distal edges 54 of the containment flaps 52 helps to bias the distal edges 58 of the barrier elements 56 away from the bodyside surface of the diaper 20. As can be seen in Figs. 2 and 3, the distal edges 54 and 58 are biased away from the bodyside surface of the diaper 20 so that during use of the diaper 20 urine and fecal materials are inhibited from migrating beyond the area bounded by the containment flaps 52 and the barrier elements 56.

The absorbent structure 36 of the diaper 20 may optionally include an additional component in the form of a surge management layer 60 positioned directly below the topsheet 34 and above the primary absorbent body 35 of the absorbent structure. The surge management layer 60 is configured to efficiently hold and rapidly distribute liquid

exudates to the primary absorbent body 35. Surge management layer 60 has a fibrous structure with a greater porosity and lower basis weight than the primary absorbent body 35 to allow for the rapid intake and distribution of liquid exudates. Surge management layers are known in the art and are described in greater detail in U.S. Patent No. 5,364,382 which is hereby incorporated by reference. The rapid distribution of liquid exudates by the surge management layer can prevent the liquid exudates from pooling and collecting on the portion of the diaper positioned against the wearer's skin.

Methods of manufacturing of an absorbent article having an apertured liner are illustrated in relevant part in Figs. 7 and 8 and are discussed below in terms of manufacturing a diaper.

With reference to Fig. 7, the apparatus utilized to manufacture a diaper 20 having an apertured liner includes an unwind 78 for the apertured liner 62. (Apertured liner 62 could comprise a laminate including both an apertured layer 64 and a low density fibrous layer 66 or only an apetured layer 64). An unwind 76 for the absorbent layer 68 is also provided. As the apertured liner 62 and absorbent layer 68 are unwound, the two materials are laminated together. A glue gun 80 applies adhesive to the bottom side (i.e., the side opposite the bodyside surface) of the apertured liner 62 and a nip roll 82 compresses the apertured liner 62 and absorbent layer 68 together with the adhesive material therebetween to thereby form a laminate with the two materials. Alternative lamination methods may also be employed to form a laminate which includes both apertured liner 62 and absorbent layer 68.

Apertures may also be placed in the absorbent body 68 to provide void volume for receiving and containing fecal materials. For example, the liner 62 and absorbent layer 68 may both be apertured together. The forming of apertures through both liner 62 and absorbent layer 68 in a single manufacturing process may be sufficient to attach the apertured liner 62 to the absorbent layer 68 thereby eliminating or diminishing the need for an adhesive.

Apertures may also be formed in the absorbent layer 68 prior to attachment of the apertured liner 62 to the absorbent layer 68 to form apertures in absorbent body 68. When the absorbent body 68 includes apertures, the absorbent body apertures are not required to be in complete registry with the apertures in apertured liner 62. The absorbent

body apertures can separately formed and subsequently positioned in registry, partial registry, or complete non-registry with the apertures in the overlying liner 64. All of the apertures present in a particular embodiment may have a similar registry or the apertures in absorbent body 68 may have different registries which may be present in various percentages and in various spatial distributions.

The topsheet material is provided on a roll and dispensed at the topsheet unwind 84. Similarly, the surge material is dispensed from the surge layer unwind 86. The apertured liner and surge layer materials are attached to opposite sides of the topsheet layer using cut and place modules 88 and 90 which are well known in the art.

In the embodiment illustrated herein, both of the cut and place modules 88 and 90 operate in a similar manner. The modules cut the material to be applied, i.e., either the apertured liner or surge material, and include at least one roller which rotates at a speed which is greater than the feed rate of the material. When the roller in contact with the material to be applied moves at a higher rotational speed than the feed rate of the material, the roller will create a space between a segment of the material which is severed from the feed material due to the differential speeds and thereby allow segments of the material to be attached to another material in a spaced arrangement. An adhesive is applied to either the topsheet layer or the applied material prior to bringing the topsheet layer and the applied material into contact.

Alternative methods of attaching segments of material to the topsheet layer in a spaced relationship may also be employed. Suitable alternative methods are described in U.S. Patent No. 5,716,478 issued on February 10, 1998 to Boothe et al., the disclosure of which is hereby incorporated by reference. As exemplified by this referenced disclosure, cut and place modules may also utilize a plurality of arcuate transfer segments which rotate about a common axis. The transfer segments define less than 360 degrees of a cylindrical surface which allows the segments to rotate relative to each other and thereby permits the rotational speed of each segment to vary. In this manner, a transfer segment may receive a material at a first rotational speed, increase its rotational speed to a second rotational speed, and subsequently transfer the material in a spaced pattern to a web of material which is moving at a speed which is greater than the original speed of the material being attached to the web.

As evident from the configuration of diaper 20, cut and place modules 88 and 90 are arranged to attach the surge layer and apertured liner on opposite sides of the topsheet layer with the apertured liner being attached on the body-facing surface of the topsheet layer.

Registry guides 92 and 94 are utilized to ensure that the surge layer and apertured liner are attached in the desired positions on the topsheet layer. The registry guides monitor the progession of the topsheet layer and may either trim or increase the length of travel of the topsheet to implement slight adjustments in the spacing between adjacent segments of the materials which are applied to the topsheet layer following the registry guides.

A vacuum conveyor 96 is illustrated between the cut and place module 90 used to apply the surge layer and the registry guide 92 which precedes the attachment of the apertured liner.

An alternative manufacturing method is illustrated in Fig. 8 which is similar to that shown in Fig. 7. The most significant difference between the methods illustrated in Figs. 7 and 8 is that the apertured liner 62 is adhered to the absorbent layer 68 prior to assembly of the absorbent article. The apertured liner/absorbent body laminate is provided on a roll at laminate unwind 98. By pre-laminating the apertured liner 62 and the absorbent body 68 off-line, one of the unwinds and one set of adhesive equipment, i.e., a glue gun and nip roll, may be eliminated from the diaper machine and located at a more convenient off-line location. This off-line lamination process can facilitate the utilization of a pre-existing diaper machine for the manufacture of a disposable absorbent garment having an apertured liner by reducing the amount of equipment which must be integrated into the pre-existing diaper machine.

Other alternative manufacturing methods may also be employed. For example, unwind roll 98 illustrated in Fig. 8 could be used to unwind only apertured liner 64 to manufacture an absorbent article which does not include a low density fibrous layer 66 or an absorbent layer 68. Furthermore, the apertured liner may be attached to the topsheet layer prior to the attachment of the surge layer or the surge layer may be entirely omitted. It is also possible to form or cut an opening, or openings, in the topsheet layer prior to the attachment of the apertured liner over, or under, such openings in the topsheet layer.

In some such alternative methods, the topsheet 34 could include a large opening and the outer edges of the apertured liner 62 could be attached to the topsheet 34 on the side opposite the bodyside surface. Thus, the outer edges of the apertured liner 62 would overlap the topsheet 34 in an underlaying manner but the opening in the topsheet 34 would still permit the apertured liner 62 to define a portion of the bodyside surface 21.

Alternatively, the apertured liner may be formed as an integral portion of the topsheet layer. For example, one portion of the topsheet layer could have apertures formed therein and that portion of the topsheet layer could receive treatment which differs from that of the remainder of the topsheet. Either the apertured portion or the remainder of the topsheet could be treated to differentiate the properties of the two portions of the topsheet. In such a manner, the resulting topsheet could have an apertured portion which is relatively more hydrophobic than the remainder of the topsheet layer.

The illustrated topsheet layer 100 having both a surge material and apertured liner material attached thereto in a spaced arrangement can be fed into any one of the many conventional diaper machine configurations which are well known in the art. In the diaper machine, the topsheet layer 100 is attached to the backsheet layer or other portion of the diaper chassis with the surge material and apertured liner material in proper registry with the diaper chassis and with an absorbent structure disposed between the backsheet layer and topsheet layer. The individual diapers are subsequently separated and packaged.

While this invention has been described in detail, it will be readily apparent to a person of ordinary skill in the art that various changes and modifications can be made without departing from the spirit and general principles of the invention. All of such changes and modifications are contemplated as being within the scope of the present invention as defined by the subjoined claims. Furthermore, this application is intended to cover such departures from the present disclosure as come within known or customary practice in the art to which this invention pertains.

We Claim:

1. An absorbent article having a front edge, a rear edge, an intermediate section disposed between said front and rear edges, and a bodyside surface positionable adjacent a wearer when the article is in use, said article comprising:

a) a backsheet layer;

b) a liquid permeable topsheet layer attached to said backsheet layer;

c) an absorbent structure disposed between said topsheet layer and said backsheet layer; and

d) an apertured liner, said apertured liner and said topsheet layer comprising two separate components attached to said article, said apertured liner and said topsheet layer attached to said article whereby said topsheet layer at least partially defines a front portion of the bodyside surface and said apertured liner at least partially defines a rear portion of the bodyside surface.

2. An absorbent article according to claim 1 wherein at least a portion of said apertured liner overlaps said topsheet layer.

3. An absorbent article according to claim 2 wherein all of said apertured liner overlays said topsheet layer.

4. An absorbent article according to claim 1 further comprising an absorbent body disposed between said apertured liner and said topsheet layer.

5. An absorbent article according to claim 4 wherein said absorbent body has perimetrical edges which are substantially coextensive with perimetrical edges of said apertured liner.

6. An absorbent article according to claim 1 wherein said apertured liner includes an apertured film and said topsheet layer is a fibrous material.

7. An absorbent article according to claim 6 wherein the apertured liner further comprises a fibrous material attached to said apertured film opposite the bodyside surface of said apertured film.

8. An absorbent article according to claim 1 wherein said apertured liner extends longitudinally rearwardly from a front liner edge, said front liner edge disposed longitudinally near a longitudinal midpoint of the intermediate section.

9. An absorbent article according to claim 8 wherein said front liner edge is disposed longitudinally forward of the longitudinal midpoint of the intermediate section and said article further comprises a pair of longitudinally extending containment flaps disposed laterally outwardly of opposed longitudinally extending edges of said apertured liner.

10. An absorbent article having a front edge, a rear edge, an intermediate section disposed between said front and rear edges, and a bodyside surface positionable adjacent a wearer when the article is in use, said article comprising:

a) a backsheet layer;

b) a liquid permeable topsheet layer attached to said backsheet layer;

c) an absorbent structure disposed between the bodyside surface and said backsheet layer; and

d) an apertured liner comprising a laminate having a bodyside apertured film layer underlain by a fibrous layer, said apertured liner attached to said article whereby said topsheet layer at least partially defines a front portion of the bodyside surface and said apertured liner at least partially defines a rear portion of the bodyside surface.

11. An absorbent article according to claim 10 wherein said apertured film layer is thermally bonded to said fibrous layer.

12. An absorbent article according to claim 10 wherein at least a portion of said apertured liner overlaps said topsheet layer.

13. An absorbent article according to claim 10 wherein all of said apertured liner overlays said topsheet layer.

14. An absorbent article according to claim 10 further comprising an absorbent body disposed between said fibrous layer and said absorbent structure, said apertured liner overlaying the entirety of said absorbent body.

15. An absorbent article according to claim 14 wherein said absorbent body has perimetrical edges which are substantially coextensive with perimetrical edges of said apertured liner.

16. An absorbent article according to claim 10 wherein said apertured film layer includes a plurality of apertures having an opening area at least as large as a circular opening with a diameter of approximately 700 microns.

17. An absorbent article according to claim 10 wherein all apertures present in said apertured film layer define a total opening area which is between 20 and 60 percent of the bodyside surface portion defined by said apertured liner.

18. An absorbent article having a front edge, a rear edge, an intermediate section disposed between said front and rear edges, and a bodyside surface positionable adjacent a wearer when the article is in use, said article comprising:

a) a backsheet layer;

b) a liquid permeable topsheet layer attached to said backsheet layer;

c) an absorbent structure disposed between the bodyside surface and said backsheet layer;

d) an apertured liner attached to said article whereby said topsheet layer at least partially defines a front portion of the bodyside surface and said apertured liner at least partially defines a rear portion of the bodyside surface; and

e) an absorbent body disposed between said apertured liner and said absorbent structure, said apertured liner overlaying the entirety of said absorbent body.

19. An absorbent article according to claim 18 wherein said absorbent body has perimetrical edges substantially coextensive with perimetrical edges of said apertured liner.

20. An absorbent article according to claim 18 wherein at least a portion of said apertured liner and at least a portion of said absorbent body overlaps said topsheet layer.

21. An absorbent article according to claim 18 wherein all of said apertured liner and all of said absorbent body overlays said topsheet layer.

22. An absorbent article according to claim 18 wherein said apertured liner comprises an apertured film layer underlain by a fibrous layer.

23. An absorbent article having a front edges, a rear edge, an intermediate section disposed between said front and rear edges, and a bodyside surface positionable adjacent a wearer when the article is in use, said article comprising:

a) a backsheet layer;

b) a liquid permeable topsheet layer attached to said backsheet layer;

c) an absorbent structure disposed between the bodyside surface and said backsheet layer; and

d) an apertured liner attached to said article whereby said topsheet layer at least partially defines a front portion of the bodyside surface and said apertured liner at least partially defines a rear portion of the bodyside surface, said apertured liner including an apertured film layer and said topsheet layer being a fibrous material.

24. An absorbent article according to claim 23 wherein at least a portion of said apertured liner overlaps said topsheet layer.

25. An absorbent article according to claim 23 further comprising an absorbent body disposed between said apertured liner and said absorbent structure, said apertured liner overlaying the entirety of said absorbent body.

26. An absorbent article having a front edge, a rear edge, an intermediate section disposed between said front and rear edges, and a bodyside surface positionable adjacent a wearer when the article is in use, said article comprising:

a) a backsheet layer;

b) a liquid permeable topsheet layer attached to said backsheet layer;

c) an absorbent structure disposed between said topsheet layer and said backsheet layer; and

d) an apertured liner disposed whereby said apertured liner at least partially defines a rear portion of the bodyside surface and said topsheet layer at least partially defines a front portion of the bodyside surface; said apertured liner comprising a plurality of apertures having an opening area at least as large as a circular opening with a diameter of approximately 700 microns.

27. An absorbent article according to claim 26 wherein an open area of said apertured liner defined by apertures therein is between 20 and 60 percent of the bodyside surface portion defined by said apertured liner.

28. An absorbent article according to claim 27 wherein said open area defined by said apertures is approximately 28 percent of the bodyside surface portion defined by said apertured liner.

29. An absorbent article according to claim 26 wherein said apertures each have an individual opening area which is no larger than the area of a circular opening having a diameter of about 3000 microns.

30. An absorbent article according to claim 26 wherein said apertures each have an individual opening area which is no larger than the area of a circular opening having a diameter of about 1300 microns.

31. An absorbent article according to claim 26 wherein said apertured liner is a film and said topsheet layer is a fibrous material.

32. An absorbent article according to claim 26 wherein said apertured liner overlaps at least a portion of said topsheet layer.

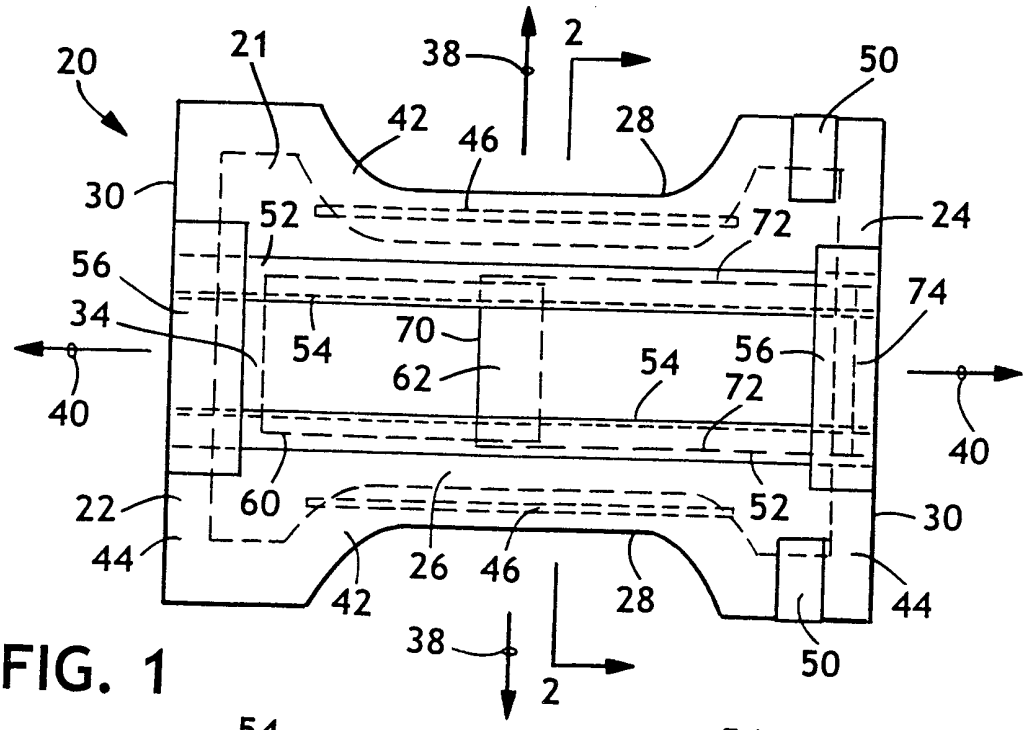

FIG. 1

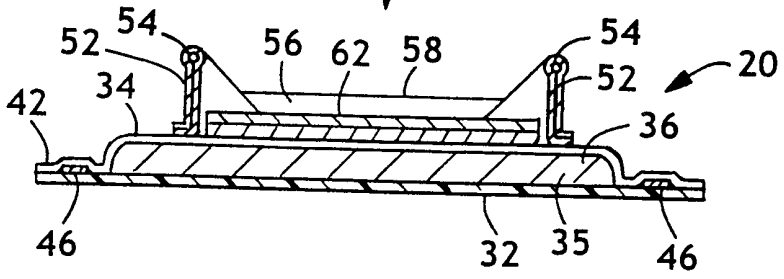

FIG. 2

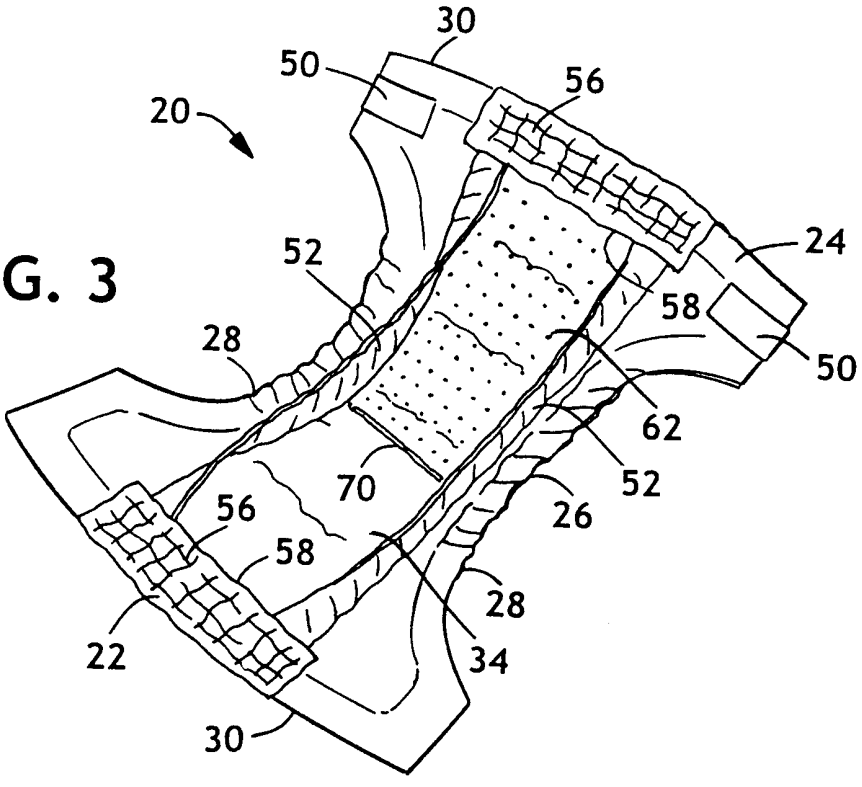

FIG. 3

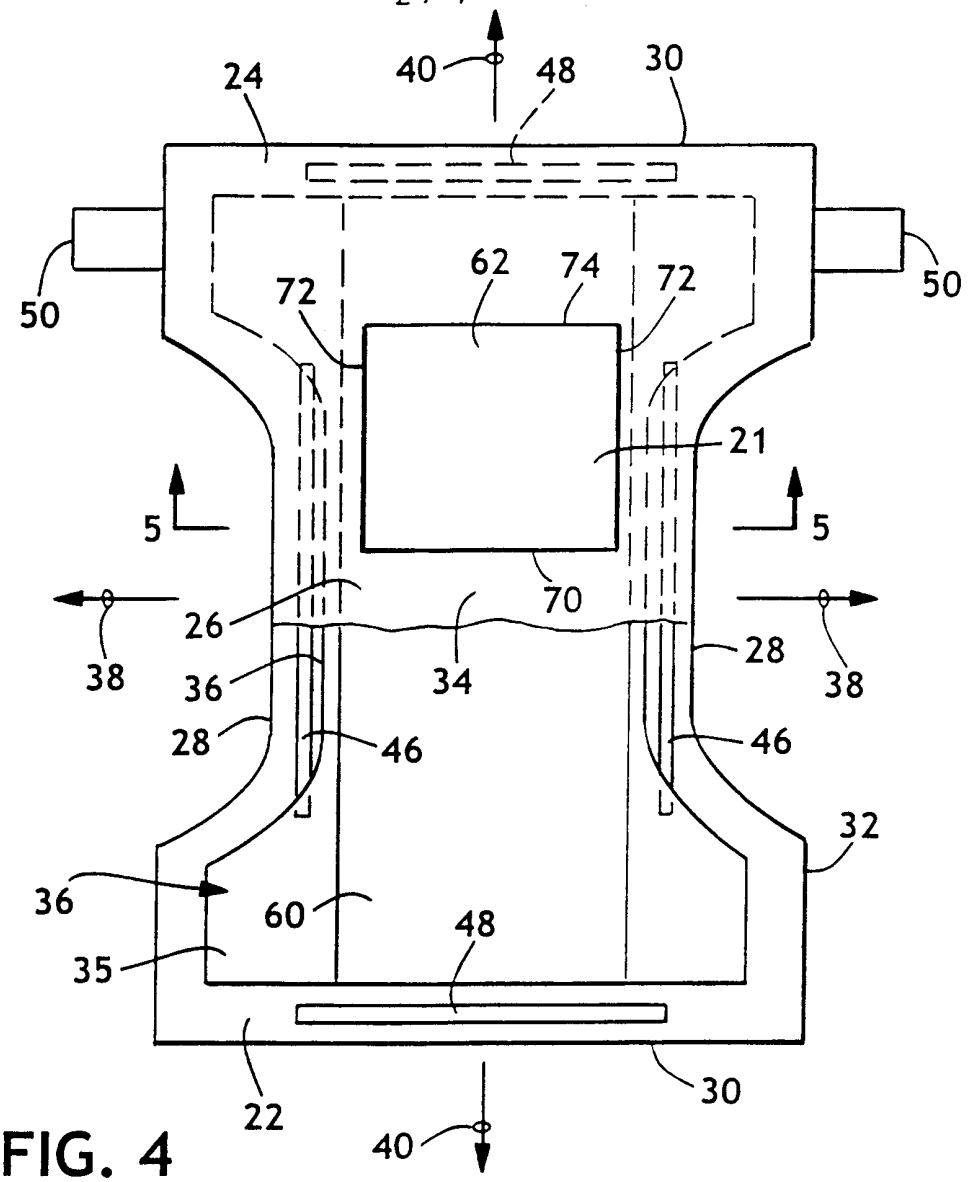

FIG. 4

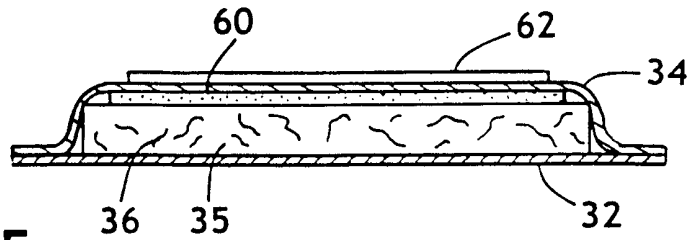

FIG. 5

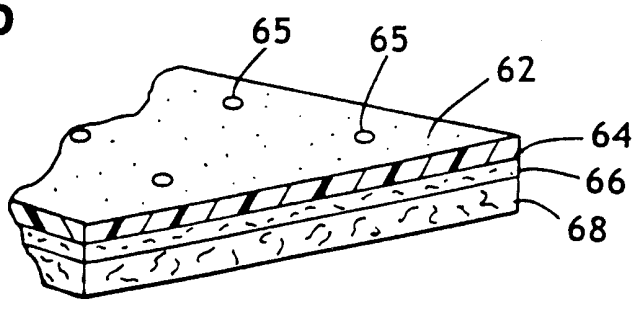

FIG. 6

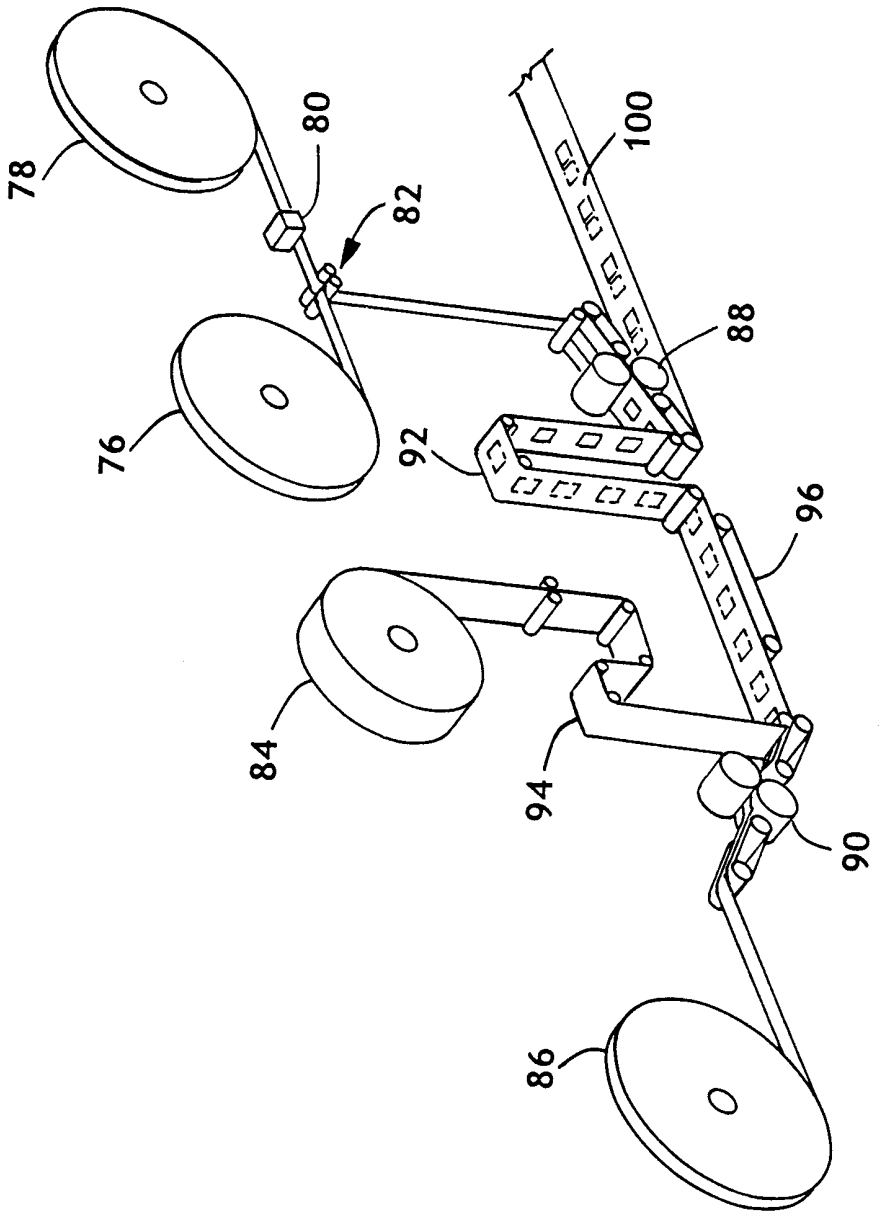

FIG. 7

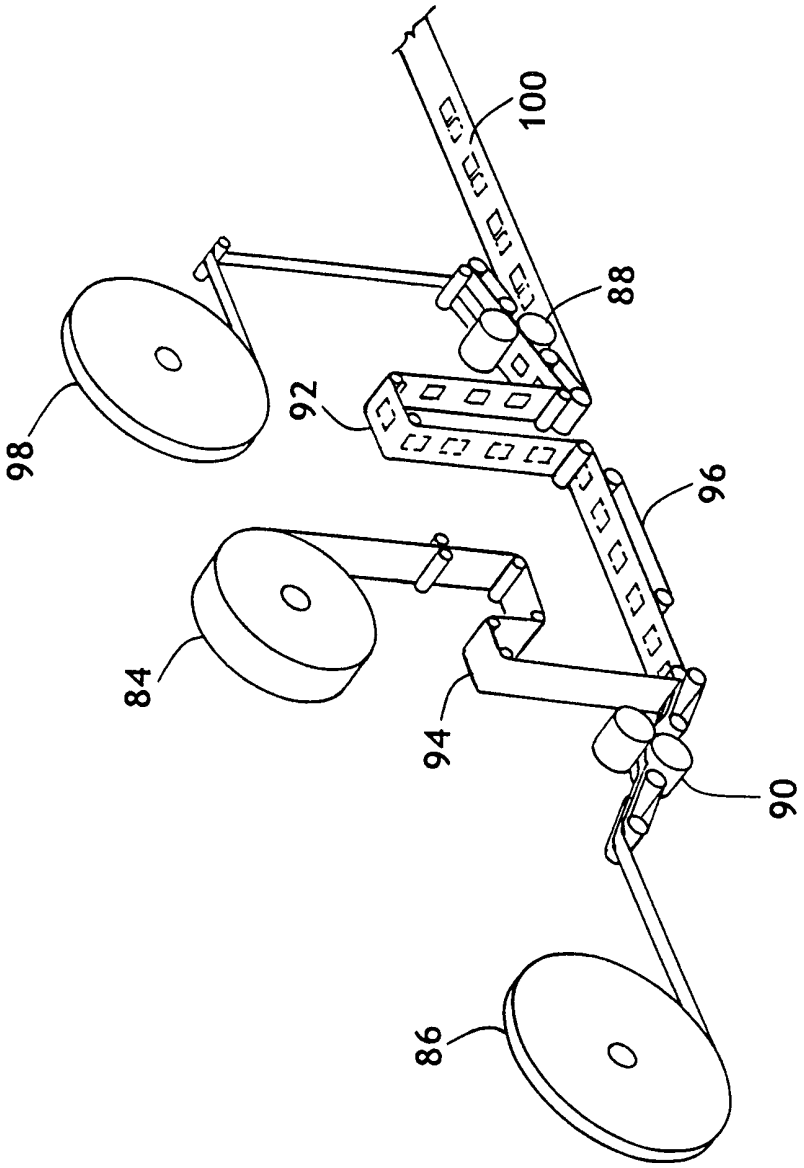

FIG. 8

INTERNATIONAL SEARCH REPORT

Int. ational Application No
PCT/US 99/26823

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A61F13/15

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A61F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 98 16180 A (KIMBERLY CLARK CO) 23 April 1998 (1998-04-23) page 7, line 3 -page 17, line 17; claims; figures	1-8, 10-13, 17,23,24
P,X	US 5 977 430 A (ROE DONALD C ET AL) 2 November 1999 (1999-11-02) column 15, line 9 -column 18, line 16 column 22, line 55 -column 23, line 48; claims; figures	1-32
A	WO 96 08225 A (MÖLNLYCKE) 21 March 1996 (1996-03-21) the whole document	1-6, 8-15, 18-26

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14 March 2000	23/03/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Douskas, K

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INTERNATIONAL SEARCH REPORT

Int. ional Application No
PCT/US 99/26823

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 236 428 A (ZAJACZKOWSKI PETER) 17 August 1993 (1993-08-17) claims; figures	1

1

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INTERNATIONAL SEARCH REPORT

Information on patent family members

Int. ational Application No
PCT/US 99/26823

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		WO 9925294 A	27-05-1999
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US 5236428 A	17-08-1993	NONE	