

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
14 May 2009 (14.05.2009)

PCT

(10) International Publication Number
WO 2009/060384 A1

(51) International Patent Classification:

A61F 13/15 (2006.01)

(21) International Application Number:

PCT/IB2008/054593

(22) International Filing Date:

4 November 2008 (04.11.2008)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

60/986,153 7 November 2007 (07.11.2007) US

12/182,386 30 July 2008 (30.07.2008) US

(71) Applicant (for all designated States except US): **THE PROCTER & GAMBLE COMPANY** [US/US]; One Procter & Gamble Plaza, Cincinnati, Ohio 45202 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **LAWSON, Kathleen, Marie** [US/US]; 8007 Pepper Pike, West Chester, Ohio 45069 (US). **HUNDORF, Harald, Hermann** [DE/DE]; Koenigstrasse 78, D-53115 Bonn (DE).

BERUDA, Holger [DE/DE]; Berliner Strasse 14, 65824 Schwalbach, Hessen (DE). **BLESSING, Horst** [DE/US]; 3563 Mooney Avenue, Cincinnati, Ohio 45208 (US). **DZIEZOK, Peter** [DE/DE]; Auf Der Schlicht 56A, 65239 Hochheim, Hessen (DE). **KRAUSE, Axel** [DE/DE]; Reinoldweg 13, 50374 Erfstadt (DE). **SCHMIDT, Matthias** [DE/DE]; Charlotte-Rosenthal-Str. 21, D-65510 Idstein, Hessen (DE). **STELZIG, Lutz** [DE/DE]; Battenbergerweg 33, D-60489 Frankfurt Am Main (DE).

(74) Common Representative: **THE PROCTER & GAMBLE COMPANY**; c/o Eileen L. Hughett Global Patent, Services 299 East Sixth Street Sycamore, Building, 4th Floor, Cincinnati, Ohio 45202 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW,

[Continued on next page]

(54) Title: ABSORBENT ARTICLE HAVING IMPROVED SOFTNESS

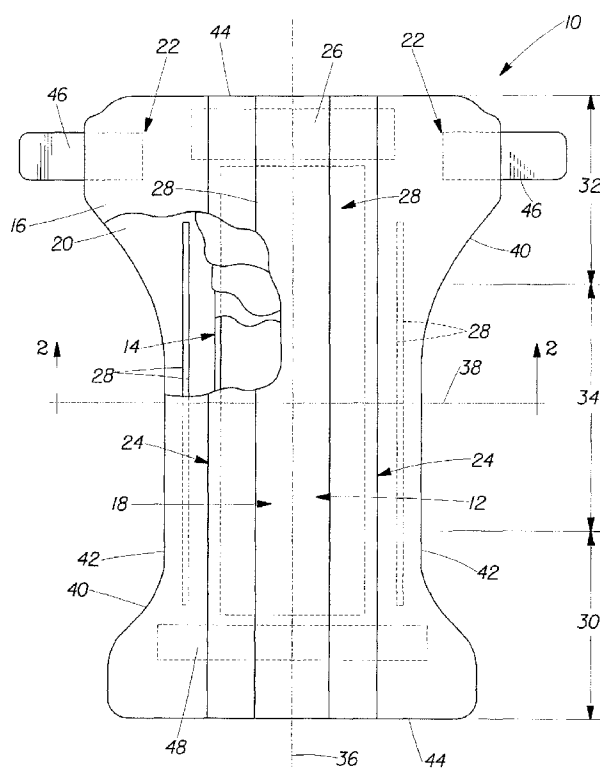


Fig. 1

(57) Abstract: Disposable absorbent article comprising a chassis comprising a topsheet, a backsheet, and an absorbent core wherein the article has improved softness.

WO 2009/060384 A1



MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT,
RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ,
TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM,
ZW.

FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL,
NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG,
CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,

Published:

- *with international search report*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

ABSORBENT ARTICLE HAVING IMPROVED SOFTNESS

FIELD OF THE INVENTION

The present invention generally relates to an absorbent article, and more particularly to a disposable absorbent article with absorbent particulate polymer material, such as a diaper.

BACKGROUND OF THE INVENTION

Disposable absorbent articles include disposable diapers, disposable feminine hygiene products, and disposable incontinence undergarments. A disposable absorbent article can receive and contain bodily waste while being worn by a wearer. Such articles can be made with various materials in a number of configurations. Multiple attempts have been made to provide them with an overall good fit and with a high absorbent capacity. Modern diapers make use of absorbent materials, which allow for storage of large amounts of liquid in thinner absorbent articles.

U.S. Patent Publication No. 2004/0162536 discloses an absorbent core for an absorbent article that provides an improved immobilization of absorbent polymer material when the article is fully or partially urine loaded. The absorbent core is useful for providing an absorbent article having increased wearing comfort.

U.S. Patent Publication No. 2004/0167486 discloses an absorbent core for an absorbent article that provides increased wearing comfort to the article and makes it thin and dry.

While the aforementioned applications describe an absorbent article having an improved fit and a thinner appearance, a need still exists for a mechanism to provide improved softness to thinner absorbent articles.

SUMMARY OF THE INVENTION

The present invention is directed to a disposable absorbent article comprising a chassis including a topsheet and a backsheet and a substantially cellulose free absorbent core located between the topsheet and the backsheet and including first and second absorbent layers, the first absorbent layer including a first substrate and the second absorbent layer including a second substrate, the first and second absorbent layers further including superabsorbent particulate polymer material deposited on the first and second substrates and thermoplastic adhesive material covering the absorbent particulate polymer material on the respective first and second substrates, the first and second absorbent layers combined together such that at least a portion of the

thermoplastic adhesive material of the first absorbent layer contacts at least a portion of the thermoplastic adhesive material of the second absorbent layer, the absorbent particulate polymer material is disposed between the first and second substrates in an absorbent particulate polymer material area, and the absorbent particulate polymer material is substantially continuously distributed across the absorbent particulate polymer material area. In one embodiment, the backsheet comprises a hydroenhanced nonwoven. In one embodiment, the nonwoven comprises a surface coating. In one embodiment, the backsheet comprises a hydroenhanced nonwoven web having a fiber surface modifying agent on the web. The nonwoven of the present invention may have a basis weight of at least about 22gsm. The article may have an in-bag compression of less than about 50%.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a plan view of a diaper in accordance with an embodiment of the present invention.

Fig. 2 is a cross sectional view of the diaper shown in Fig. 1 taken along the sectional line 2-2 of Fig. 1.

Fig. 3 is a partial cross sectional view of an absorbent core layer in accordance with an embodiment of this invention.

Fig. 4 is a partial cross sectional view of an absorbent core layer in accordance with another embodiment of this invention.

Fig. 5 is a partial sectional view of an absorbent core comprising a combination of the first and second absorbent core layers.

Fig. 6 is a partial sectional view of an absorbent core comprising a combination of the first and second absorbent core layers.

DETAILED DESCRIPTION OF THE INVENTION

"Absorbent article" refers to devices that absorb and contain body exudates, and, more specifically, refers to devices that are placed against or in proximity to the body of the wearer to absorb and contain the various exudates discharged from the body. Absorbent articles may include diapers, training pants, adult incontinence undergarments, feminine hygiene products, breast pads, care mats, bibs, wound dressing products, and the like. As used herein, the term "body fluids" or "body exudates" includes, but is not limited to, urine, blood, vaginal discharges, breast milk, sweat and fecal matter.

“Absorbent core” means a structure typically disposed between a topsheet and backsheet of an absorbent article for absorbing and containing liquid received by the absorbent article and may comprise one or more substrates, absorbent polymer material disposed on the one or more substrates, and a thermoplastic adhesive material/composition on the absorbent particulate polymer material and at least a portion of the one or more substrates for immobilizing the absorbent particulate polymer material on the one or more substrates. In a multilayer absorbent core, the absorbent core may also include a cover layer. The one or more substrates and the cover layer may comprise a nonwoven. Further, the absorbent core is substantially cellulose free. The absorbent core does not include an acquisition system, a topsheet, or a backsheet of the absorbent article. In a certain embodiment, the absorbent core would consist essentially of the one or more substrates, the absorbent polymer material, the thermoplastic adhesive material/composition, and optionally the cover layer.

“Absorbent polymer material,” “absorbent gelling material,” “AGM,” “superabsorbent,” and “superabsorbent material” are used herein interchangeably and refer to cross linked polymeric materials that can absorb at least 5 times their weight of an aqueous 0.9% saline solution as measured using the Centrifuge Retention Capacity test (Edana 441.2-01).

“Absorbent particulate polymer material” is used herein to refer to an absorbent polymer material which is in particulate form so as to be flowable in the dry state.

“Absorbent particulate polymer material area” as used herein refers to the area of the core wherein the first substrate 64 and second substrate 72 are separated by a multiplicity of superabsorbent particles. There may be some extraneous superabsorbent particles outside of this area between the first substrate 64 and second substrate 72.

“Airfelt” is used herein to refer to comminuted wood pulp, which is a form of cellulosic fiber.

“Comprise,” “comprising,” and “comprises” are open ended terms, each specifies the presence of what follows, e.g., a component, but does not preclude the presence of other features, e.g., elements, steps, components known in the art, or disclosed herein.

“Consisting essentially of” is used herein to limit the scope of subject matter, such as that in a claim, to the specified materials or steps and those that do not materially affect the basic and novel characteristics of the subject matter.

“Disposable” is used in its ordinary sense to mean an article that is disposed or discarded after a limited number of usage events over varying lengths of time, for example, less than about 20 events, less than about 10 events, less than about 5 events, or less than about 2 events.

"Diaper" refers to an absorbent article generally worn by infants and incontinent persons about the lower torso so as to encircle the waist and legs of the wearer and that is specifically adapted to receive and contain urinary and fecal waste. As used herein, term "diaper" also includes "pants" which is defined below.

"Fiber" and "filament" are used interchangeably.

A "nonwoven" is a manufactured sheet, web or batt of directionally or randomly orientated fibers, bonded by friction, and/or cohesion and/or adhesion, excluding paper and products which are woven, knitted, tufted, stitch-bonded incorporating binding yarns or filaments, or felted by wet-milling, whether or not additionally needled. The fibers may be of natural or man-made origin and may be staple or continuous filaments or be formed in situ. Commercially available fibers have diameters ranging from less than about 0.001 mm to more than about 0.2 mm and they come in several different forms: short fibers (known as staple, or chopped), continuous single fibers (filaments or monofilaments), untwisted bundles of continuous filaments (tow), and twisted bundles of continuous filaments (yarn). Nonwoven fabrics can be formed by many processes such as meltblowing, spunbonding, solvent spinning, electrospinning, and carding. The basis weight of nonwoven fabrics is usually expressed in grams per square meter (gsm).

"Pant" or "training pant", as used herein, refer to disposable garments having a waist opening and leg openings designed for infant or adult wearers. A pant may be placed in position on the wearer by inserting the wearer's legs into the leg openings and sliding the pant into position about a wearer's lower torso. A pant may be preformed by any suitable technique including, but not limited to, joining together portions of the article using refastenable and/or non-refastenable bonds (e.g., seam, weld, adhesive, cohesive bond, fastener, etc.). A pant may be preformed anywhere along the circumference of the article (e.g., side fastened, front waist fastened). While the terms "pant" or "pants" are used herein, pants are also commonly referred to as "closed diapers," "prefastened diapers," "pull-on diapers," "training pants," and "diaper-pants". Suitable pants are disclosed in U.S. Patent No. 5,246,433, issued to Hasse, et al. on September 21, 1993; U.S. Patent No. 5,569,234, issued to Buell et al. on October 29, 1996; U.S. Patent No. 6,120,487, issued to Ashton on September 19, 2000; U.S. Patent No. 6,120,489, issued to Johnson et al. on September 19, 2000; U.S. Patent No. 4,940,464, issued to Van Gompel et al. on July 10, 1990; U.S. Patent No. 5,092,861, issued to Nomura et al. on March 3, 1992; U.S. Patent Publication No. 2003/0233082 A1, entitled "Highly Flexible And Low Deformation Fastening Device", filed on

June 13, 2002; U.S. Patent No. 5,897,545, issued to Kline et al. on April 27, 1999; U.S. Patent No. 5,957,908, issued to Kline et al on September 28, 1999.

“Substantially cellulose free” is used herein to describe an article, such as an absorbent core, that contains less than 10% by weight cellulosic fibers, less than 5% cellulosic fibers, less than 1% cellulosic fibers, no cellulosic fibers, or no more than an immaterial amount of cellulosic fibers. An immaterial amount of cellulosic material would not materially affect the thinness, flexibility, or absorbency of an absorbent core.

“Substantially continuously distributed” as used herein indicates that within the absorbent particulate polymer material area, the first substrate 64 and second substrate 72 are separated by a multiplicity of superabsorbent particles. It is recognized that there may be minor incidental contact areas between the first substrate 64 and second substrate 72 within the absorbent particulate polymer material area. Incidental contact areas between the first substrate 64 and second substrate 72 may be intentional or unintentional (e.g. manufacturing artifacts) but do not form geometries such as pillows, pockets, tubes, quilted patterns and the like.

“Thermoplastic adhesive material” as used herein is understood to comprise a polymer composition from which fibers are formed and applied to the superabsorbent material with the intent to immobilize the superabsorbent material in both the dry and wet state. The thermoplastic adhesive material of the present invention forms a fibrous network over the superabsorbent material.

“Thickness” and “caliper” are used herein interchangeably.

Embodiments of the present invention include disposable absorbent articles having improved softness. Absorbent cores are becoming increasingly thinner as technology advances, and the overall absorbent article is also becoming thinner. Typically, thicker absorbent articles exhibit both technical and perceived softness benefits as compared to thinner ones. The present invention is directed to thinner absorbent articles that have softness that is parity to thicker absorbent articles. Improved softness of thinner absorbent articles is achieved through mechanisms including, but not limited to, hydroenhanced nonwovens, higher basis weight nonwovens, surface treated nonwovens, and less bag compression. Utilizing the mechanisms described in the present invention provide adequate softness, even when the article comprises a thinner absorbent core.

Fig. 1 is a plan view of a diaper 10 according to a certain embodiment of the present invention. The diaper 10 is shown in its flat out, uncontracted state (i.e., without elastic induced contraction) and portions of the diaper 10 are cut away to more clearly show the underlying

structure of the diaper 10. A portion of the diaper 10 that contacts a wearer is facing the viewer in Fig. 1. The diaper 10 generally may comprise a chassis 12 and an absorbent core 14 disposed in the chassis.

The chassis 12 of the diaper 10 in Fig. 1 may comprise the main body of the diaper 10. The chassis 12 may comprise an outer covering 16 including a topsheet 18, which may be liquid pervious, and/or a backsheet 20, which may be liquid impervious. The absorbent core 14 may be encased between the topsheet 18 and the backsheet 20. The chassis 12 may also include side panels 22, elasticized leg cuffs 24, and an elastic waist feature 26.

The leg cuffs 24 and the elastic waist feature 26 may each typically comprise elastic members 28. One end portion of the diaper 10 may be configured as a first waist region 30 of the diaper 10. An opposite end portion of the diaper 10 may be configured as a second waist region 32 of the diaper 10. An intermediate portion of the diaper 10 may be configured as a crotch region 34, which extends longitudinally between the first and second waist regions 30 and 32. The waist regions 30 and 32 may include elastic elements such that they gather about the waist of the wearer to provide improved fit and containment (elastic waist feature 26). The crotch region 34 is that portion of the diaper 10 which, when the diaper 10 is worn, is generally positioned between the wearer's legs.

The diaper 10 is depicted in Fig. 1 with its longitudinal axis 36 and its transverse axis 38. The periphery 40 of the diaper 10 is defined by the outer edges of the diaper 10 in which the longitudinal edges 42 run generally parallel to the longitudinal axis 36 of the diaper 10 and the end edges 44 run between the longitudinal edges 42 generally parallel to the transverse axis 38 of the diaper 10. The chassis 12 may also comprise a fastening system, which may include at least one fastening member 46 and at least one stored landing zone 48.

The diaper 10 may also include such other features as are known in the art including front and rear ear panels, waist cap features, elastics and the like to provide better fit, containment and aesthetic characteristics. Such additional features are well known in the art and are e.g., described in U.S. Pat. No. 3,860,003 and U.S. Pat. No. 5,151,092.

In order to keep the diaper 10 in place about the wearer, at least a portion of the first waist region 30 may be attached by the fastening member 46 to at least a portion of the second waist region 32 to form leg opening(s) and an article waist. When fastened, the fastening system carries a tensile load around the article waist. The fastening system may allow an article user to hold one element of the fastening system, such as the fastening member 46, and connect the first waist

region 30 to the second waist region 32 in at least two places. This may be achieved through manipulation of bond strengths between the fastening device elements.

According to certain embodiments, the diaper 10 may be provided with a re-closable fastening system or may alternatively be provided in the form of a pant-type diaper. When the absorbent article is a diaper, it may comprise a re-closable fastening system joined to the chassis for securing the diaper to a wearer. When the absorbent article is a pant-type diaper, the article may comprise at least two side panels joined to the chassis and to each other to form a pant. The fastening system and any component thereof may include any material suitable for such a use, including but not limited to plastics, films, foams, nonwoven, woven, paper, laminates, fiber reinforced plastics and the like, or combinations thereof. In certain embodiments, the materials making up the fastening device may be flexible. In certain embodiments, the fastening device may comprise cotton or cotton-like materials for additional softness or consumer perception of softness. The flexibility may allow the fastening system to conform to the shape of the body and thus, reduce the likelihood that the fastening system will irritate or injure the wearer's skin.

For unitary absorbent articles, the chassis 12 and absorbent core 14 may form the main structure of the diaper 10 with other features added to form the composite diaper structure. While the topsheet 18, the backsheet 20, and the absorbent core 14 may be assembled in a variety of well-known configurations, preferred diaper configurations are described generally in U.S. Pat. No. 5,554,145 entitled "Absorbent Article With Multiple Zone Structural Elastic-Like Film Web Extensible Waist Feature" issued to Roe et al. on Sep. 10, 1996; U.S. Pat. No. 5,569,234 entitled "Disposable Pull-On Pant" issued to Buell et al. on Oct. 29, 1996; and U.S. Pat. No. 6,004,306 entitled "Absorbent Article With Multi-Directional Extensible Side Panels" issued to Robles et al. on Dec. 21, 1999.

The topsheet 18 in Fig. 1 may be fully or partially elasticized or may be foreshortened to provide a void space between the topsheet 18 and the absorbent core 14. Exemplary structures including elasticized or foreshortened topsheets are described in more detail in U.S. Pat. No. 5,037,416 entitled "Disposable Absorbent Article Having Elastically Extensible Topsheet" issued to Allen et al. on Aug. 6, 1991; and U.S. Pat. No. 5,269,775 entitled "Trisection Topsheets for Disposable Absorbent Articles and Disposable Absorbent Articles Having Such Trisection Topsheets" issued to Freeland et al. on Dec. 14, 1993.

The backsheet 20 may be joined with the topsheet 18. The backsheet 20 may prevent the exudates absorbed by the absorbent core 14 and contained within the diaper 10 from soiling other external articles that may contact the diaper 10, such as bed sheets and undergarments. In certain

embodiments, the backsheet 20 may be substantially impervious to liquids (e.g., urine) and comprise a laminate of a nonwoven and a thin plastic film such as a thermoplastic film having a thickness of about 0.012 mm (0.5 mil) to about 0.051 mm (2.0 mils). Suitable backsheet films include those manufactured by Tredegar Industries Inc. of Terre Haute, Ind. and sold under the trade names X15306, X10962, and X10964. Other suitable backsheet materials may include breathable materials that permit vapors to escape from the diaper 10 while still preventing liquid exudates from passing through the backsheet 20. Exemplary breathable materials may include materials such as woven webs, nonwoven webs, composite materials such as film-coated nonwoven webs, and microporous films such as manufactured by Mitsui Toatsu Co., of Japan under the designation ESPOIR NO and by EXXON Chemical Co., of Bay City, Tex., under the designation EXXAIRE. Suitable breathable composite materials comprising polymer blends are available from Clopay Corporation, Cincinnati, Ohio under the name HYTREL blend P18-3097. Such breathable composite materials are described in greater detail in PCT Application No. WO 95/16746, published on Jun. 22, 1995 in the name of E. I. DuPont. Other breathable backsheets including nonwoven webs and apertured formed films are described in U.S. Pat. No. 5,571,096 issued to Dobrin et al. on Nov. 5, 1996.

In certain embodiments, the backsheet of the present invention may have a water vapor transmission rate (WVTR) of greater than about 2000 g/24h/m², greater than about 3000 g/24h/m², greater than about 5000 g/24h/m², greater than about 6000 g/24h/m², greater than about 7000 g/24h/m², greater than about 8000 g/24h/m², greater than about 9000 g/24h/m², greater than about 10000 g/24h/m², greater than about 11000 g/24h/m², greater than about 12000 g/24h/m², greater than about 15000 g/24h/m², measured according to WSP 70.5 (08) at 37.8 °C and 60% Relative Humidity.

Suitable non-woven materials useful in the present invention include, but are not limited to SMS material, comprising a spunbonded, a melt-blown and a further spunbonded layer. In certain embodiments, permanently hydrophilic non-wovens, and in particular, nonwovens with durably hydrophilic coatings are desirable. Another suitable embodiment comprises a SMMS-structure. In certain embodiments, the non-wovens are porous.

In certain embodiments, suitable non-woven materials may include, but are not limited to synthetic fibers, such as PE, PET, and PP. As polymers used for nonwoven production may be inherently hydrophobic, they may be coated with hydrophilic coatings. One way to produce nonwovens with durably hydrophilic coatings, is via applying a hydrophilic monomer and a radical polymerization initiator onto the nonwoven, and conducting a polymerization activated via

UV light resulting in monomer chemically bound to the surface of the nonwoven as described in co-pending U.S. Patent Publication No. 2005/0159720. Another way to produce nonwovens with durably hydrophilic coatings is to coat the nonwoven with hydrophilic nanoparticles as described in co-pending applications U.S. Patent No. 7,112,621 to Rohrbaugh et al. and in PCT Application Publication WO 02/064877.

Typically, nanoparticles have a largest dimension of below 750 nm. Nanoparticles with sizes ranging from 2 to 750 nm may be economically produced. An advantage of nanoparticles is that many of them can be easily dispersed in water solution to enable coating application onto the nonwoven, they typically form transparent coatings, and the coatings applied from water solutions are typically sufficiently durable to exposure to water. Nanoparticles can be organic or inorganic, synthetic or natural. Inorganic nanoparticles generally exist as oxides, silicates, and/or, carbonates. Typical examples of suitable nanoparticles are layered clay minerals (e.g., LAPONITE™ from Southern Clay Products, Inc. (USA), and Boehmite alumina (e.g., Disperal P2™ from North American Sasol. Inc.). According to a certain embodiment, a suitable nanoparticle coated non-woven is that disclosed in the co-pending patent application Ser. No. 10/758,066 entitled "Disposable absorbent article comprising a durable hydrophilic core wrap" to Ekaterina Anatolyevna Ponomarenko and Mattias NMN Schmidt.

Further useful non-wovens are described in U.S. Pat. No. 6,645,569 to Cramer et al., U.S. Patent No. 6,863,933 to Cramer et al., U.S. Patent No. 7,112,621 to Rohrbaugh et al., and co-pending patent applications 10/338,603 to Cramer et al. and 10/338,610 to Cramer et al.

In some cases, the nonwoven surface can be pre-treated with high energy treatment (corona, plasma) prior to application of nanoparticle coatings. High energy pre-treatment typically temporarily increases the surface energy of a low surface energy surface (such as PP) and thus enables better wetting of a nonwoven by the nanoparticle dispersion in water.

Notably, permanently hydrophilic non-wovens are also useful in other parts of an absorbent article. For example, topsheets and absorbent core layers comprising permanently hydrophilic non-wovens as described above have been found to work well.

According to a certain embodiment, the nonwoven may comprise a material that provides good recovery when external pressure is applied and removed. Further, according to a certain embodiment, the nonwoven may comprise a blend of different fibers selected, for example from the types of polymeric fibers described above. In some embodiments, at least a portion of the fibers may exhibit a spiral-crimp which has a helical shape. In some embodiments, the nonwoven may comprise fibers having different degrees or types of crimping, or both. For example, one

embodiment may include a mixture of fibers having about 8 to about 12 crimps per inch (cpi) or about 9 to about 10 cpi, and other fibers having about 4 to about 8 cpi or about 5 to about 7 cpi. Different types of crimps include, but are not limited to a 2D crimp or "flat crimp" and a 3D or spiral-crimp. According to a certain embodiment, the fibers may include bi-component fibers, which are individual fibers each comprising different materials, usually a first and a second polymeric material. It is believed that the use of side-by-side bi-component fibers is beneficial for imparting a spiral-crimp to the fibers.

In order to achieve improved softness of the absorbent article, in one embodiment, nonwovens of the present invention are hydroenhanced. Hydroenhanced nonwovens are described in U.S. Patent No. 6,632,385; U.S. Patent No. 6,803,103; U.S. Patent Publication No. 2006/0057921.

In order to achieve improved softness of the absorbent article, in a certain embodiment, the nonwoven may be treated by a "selfing" mechanism. By "selfing" nonwovens, high densities of loops ($>150 \text{ in}^{-2}$) are formed which protrude from the surface of the nonwoven substrate. Since these loops act as small flexible brushes, they create an additional layer of springy loft, which may enhance softness. Nonwovens treated by a selfing mechanism are described in U.S. Patent Application No. US20040131820A1

In order to achieve improved softness of the absorbent article, in one embodiment, nonwovens of the present invention may include a surface coating. In one embodiment, the surface coating may include a fiber surface modifying agent. Preferred fiber surface modifying agents are described in U.S. Patent No. 6,632,385; U.S. Patent No. 6,803,103; U.S. Patent Publication No. 2006/0057921.

In order to achieve improved softness of the absorbent article, in a certain embodiment, the surface coating may comprise a surfactant coating. One such surfactant coating is available from Fiberweb, under the Tradename Silastol PST.

Any of the nonwovens described herein may be used for the topsheet, backsheet, or any other portion of the absorbent article comprising a nonwoven. In order to achieve improved softness of the absorbent article, the nonwovens of the present invention may have a basis weight of greater than about 20 gsm, greater than about 22gsm, greater than about 24 gsm, greater than about 26 gsm, greater than about 28 gsm, greater than about 30 gsm, greater than about 32 gsm.

The absorbent core 14 in Figs. 1-6 generally is disposed between the topsheet 18 and the backsheet 20 and comprises two layers, a first absorbent layer 60 and a second absorbent layer 62. As best shown in Fig. 3, the first absorbent layer 60 of the absorbent core 14 comprises a

substrate 64, an absorbent particulate polymer material 66 on the substrate 64, and a thermoplastic adhesive material 68 and 76 on the absorbent particulate polymer material 66 and at least portions of the first substrate 64 as an adhesive for covering and immobilizing the absorbent particulate polymer material 66 on the first substrate 64. According to another embodiment illustrated in Fig. 4, the first absorbent layer 60 of the absorbent core 14 may also include a cover layer 70 on the thermoplastic adhesive material 68 and 76.

Likewise, as best illustrated in Fig. 2, the second absorbent layer 62 of the absorbent core 14 may also include a substrate 72, an absorbent particulate polymer material 74 on the second substrate 72, and a thermoplastic adhesive material 68 and 76 on the absorbent particulate polymer material 74 and at least a portion of the second substrate 72 for immobilizing the absorbent particulate polymer material 74 on the second substrate 72. Although not illustrated, the second absorbent layer 62 may also include a cover layer such as the cover layer 70 illustrated in Fig. 4.

The substrate 64 of the first absorbent layer 60 may be referred to as a dusting layer and has a first surface 78 which faces the backsheet 20 of the diaper 10 and a second surface 80 which faces the absorbent particulate polymer material 66. Likewise, the substrate 72 of the second absorbent layer 62 may be referred to as a core cover and has a first surface 82 facing the topsheet 18 of the diaper 10 and a second surface 84 facing the absorbent particulate polymer material 74. The first and second substrates 64 and 72 may be adhered to one another with adhesive about the periphery to form an envelope about the absorbent particulate polymer materials 66 and 74 to hold the absorbent particulate polymer material 66 and 74 within the absorbent core 14.

According to a certain embodiment, the substrates 64 and 72 of the first and second absorbent layers 60 and 62 may be a non-woven material, such as those nonwoven materials described above. In certain embodiments, the non-wovens are porous and in one embodiment has a pore size of about 32 microns.

As illustrated in Figs. 1-6, the absorbent particulate polymer material 66 and 74 is deposited on the respective substrates 64 and 72 of the first and second absorbent layers 60 and 62 in clusters 90 of particles to form a grid pattern comprising land areas 94 and junction areas 96 between the land areas 94. As defined herein, land areas 94 are areas where the thermoplastic adhesive material does not contact the nonwoven substrate or the auxiliary adhesive directly; junction areas 96 are areas where the thermoplastic adhesive material does contact the nonwoven substrate or the auxiliary adhesive directly. The junction areas 96 in the grid pattern contain little or no absorbent particulate polymer material 66 and 74. The land areas 94 and junction areas 96

can have a variety of shapes including, but not limited to, circular, oval, square, rectangular, triangular, and the like.

As best seen in Figs. 5 and 6, the first and second layers 60 and 62 may be combined to form the absorbent core 14. Preferred absorbent articles and cores are described in U.S. Application Serial No. 12/141,122; U.S. Publication No. 2004/0167486A1; U.S. Publication No. 2004/0162536A1.

Signal ingredients may be incorporated into one or more components of the absorbent article. Signal ingredients may include, but are not limited to, vitamins A, E, D, and C, panthenol, niacin, omega 3 oils, cocoa butter, beeswax, cashmere, sweet almond oil, jojoba, oatmeal, aloe, cotton, honey, and silk. These signal ingredients may be added to an absorbent article for the purpose of signaling a benefit to the consumer. As an example, one or more of these signal ingredients may be added to a lotion that is applied to an absorbent article component. The signal ingredient alone, or in a lotion, may be applied to the topsheet, backsheet, or any other component of the absorbent article. The lotion may comprise less than about 0.1% by weight, less than about 0.01% by weight, less than about 0.006% by weight, less than about 0.005% by weight, less than about 0.004% by weight, less than about 0.003% by weight, less than about 0.002% by weight, and less than about 0.001% by weight of the signal ingredient.

Additionally, the signal ingredient may, in combination with other absorbent article features, result in an unexpected synergy for communicating a benefit to the consumer. As an example, consumers may respond unexpectedly more favorably to an absorbent article that is thin and soft in combination with a communication that lotion in the diaper comprises vitamin E than they would respond to either communication on its own.

An example of a diaper lotion comprising vitamin E as a signal ingredient may include the following formula:

PET/StOH Mix (ratio=1.41)	94.0% to 99.8% (by weight)
Aloe Extract	0.1% to 3.0% (by weight)
Vitamin E	0.001% to 0.1% (by weight)

Further, vitamin E may be used in its natural form or esters of natural vitamin E may be used (e.g., vitamin E acetate). US Pub Nos. 2002/0143304; 2004/0175343; 2003/0077307; US Patent Nos. 5,643,588; 5,635,191; 5,607,760; 6,861,571; and WO Application Nos. 00/69481; and 98/24391 disclose various absorbent article lotions that signal ingredients may be added to.

Another way to achieve improved softness of the absorbent article is through a lower in-bag compression. Lower compression rates result in a softer feeling absorbent article. Preferred

in-bag compression percentages of the present invention are less than about 54%, less than about 52%, less than about 50%, less than about 49%, less than about 48%, less than about 47%, less than about 46%. In order to determine in-bag compression percentage, the following test method is used:

I. DETERMINE FREE STACK HEIGHT

Equipment

- Universal Diaper Packaging Tester (UDPT), including a vertical sliding plate for adding weights. It is counter-balanced by a suspended weight to assure that no downward force is added from the vertical sliding plate assembly to the diaper package at all times. The UDPT is available from Matsushita Industry Co. LTD, 7-21-101, Midorigaoka-cho, Ashiya-city, Hyogo JAPAN. Zip code: 659-0014.
- A 850g ($\pm$ 5g) weight.
- Stopwatch with an accuracy to 1 second.

Test Procedure

A) Apparatus Calibration

- Pull down the vertical sliding plate until its bottom touches the tester base plate.
- Set the digital meter located at the side of the vertical sliding scale to zero mark.
- Raise the vertical sliding plate away from the tester base plate.

B) Definitions

- Before-bagger free height refers to the free height data measured on 10 pads of fresh diapers.
- Fresh Diapers - 10 diapers that have never been compressed (stack should be removed (where safely possible) immediately after exit from stacker, before any compression has occurred. If this is not possible, they should be removed from the fingers of a safely stopped stacker chain).
- Out-bag free height designates the free height data measured on 10 pads of aged diapers.
- Aged Diapers - 10 diapers that have been held under compression for approximately 1 minute and/or longer (i.e. 10 diapers come from a freshly opened diaper package).

C) Free Height Measurement

- Select 10 adjacent pads of diapers out of the middle from an appropriate source; Fresh diapers for before-bagger free height; Aged diapers for out-of-bag free height.
- Neatly stack these 10 pads of diapers underneath the vertical sliding plate.
(Align the center of the top pad directly below the central counter sunk hole of the vertical sliding plate.)
- Place the 850 g weight onto the vertical sliding plate.
- Allow the vertical sliding plate to slide down until its bottom lightly touches desired highest point of the stack.
- Measure the stack dimensions in mm by reading the value that appears on the digital meter.
- Remove the weight.
- Raise the vertical sliding plate away from the stack and remove the stack.
- Record the stack height reading to the nearest 1 mm shown on the digital meter.

Procedure -Aging Profile

A) Collect a minimum of three data points from different sample sets. e.g., Measure first point from fresh diapers, e.g., measure second point from diapers being aged in bag for 30 mm /1 hr/ 6 hr/ 12 hr /24 hr, e.g., measure third point from diapers being aged in bag for 5 days or longer.

B) Repeat the three steps as described in “Test Procedure” steps A), C), and D).

Procedure - Out-of-Bag Free Height Recovery

A) Collect 10 pads of fresh/aged diapers.

B) Repeat the first two steps as described in “Test Procedure” steps A) and C).

C) Repeat the steps above for general free height measurement except changing the waiting time (i.e., measure first point at 1 min and remaining points at 30 mm/1 hr/6hr/12 hr/1 day/3days/5 days, or longer).

Calculation/Reporting

- Report Sample Identification, i.e. complete description of product being tested (product brand name/size).
- Report the determined value for all measurement to the nearest 1 mm.

NOTE: In case of a series of measurements report the number of tested samples, and calculate/report the Average, Standard deviation, Minimum and Maximum of the values.

- Report the Production Date of the measured package (taken from package coding).
- Report the Testing Date and Analytical Method used (GCAS).

II. DETERMINE IN-BAG STACK

Equipment

- Universal Diaper Packaging Tester (UDPT), including a vertical sliding plate for adding weights. It is counter-balanced by a suspended weight to assure that no downward force is added from the vertical sliding plate assembly to the diaper package at all times. The UDPT is available from Matsushita Industry Co. LTD, 7-21-101, Midorigaoka-cho, Ashiya-city, Hyogo JAPAN. Zip code: 659-0014.
- A 850 g (± 5 g) weight.

Definitions

- “Package Width” is defined as the maximum distance between the two highest bulging points along the same compression stack axis of a diaper package.
- In-Bag Stack Height = (Package Width I Pad Count Per Stack) x 10 pads of diapers.

Apparatus Calibration

- Pull down the vertical sliding plate until its bottom touches the tester base plate.
- Set the digital meter located at the side of the vertical sliding scale to zero mark.
- Raise the vertical sliding plate away from the tester base plate.

Test Procedure

- Put one of the side panel of the diaper package along its width standing at the center of the tester base plate. Make sure the horizontal sliding plate is pulled to the right so it does not touch the package being tested.
- Add the 850 g weight onto the vertical sliding plate.
- Allow the vertical sliding plate to slide down until its bottom lightly touches desired highest point of the package.
- Measure the package width in mm (distance from the top of the base plate to the top of the diaper package). Record the reading that appears on the digital meter.
- Remove the 850 g weight.
- Raise the vertical sliding plate away from the diaper package.
- Remove the diaper package.

Calculation/Reporting

- Calculate and report the “In-Bag Stack Height” = (Package Width I Pad Count Per Stack) x 10.
- Report Sample Identification, i.e. complete description of product being tested (product brand name/size).
- Report the determined value for each measurement (Length/Width/Front-to-Back) to the nearest 1 mm.

NOTE: In case of a series of measurements report the number of tested samples, and calculate/report the Average, Standard deviation, Minimum and Maximum of the values.

- Report the Production Date of the measured package (taken from package coding).
- Report the Testing Date and Analytical Method used (GCAS).

III. CALCULATE %

- Calculate %: $1 - (\text{In-Bag Stack Height}) / (\text{Free Stack Height}) = \%$

All patents and patent applications (including any patents which issue thereon) assigned to the Procter & Gamble Company referred to herein are hereby incorporated by reference to the extent that it is consistent herewith.

The dimensions and values disclosed herein are not to be understood as being strictly limited to the exact numerical values recited. Instead, unless otherwise specified, each such dimension is intended to mean both the recited value and a functionally equivalent range surrounding that value. For example, a dimension disclosed as “40 mm” is intended to mean “about 40 mm.”

All documents cited in the Detailed Description of the Invention are, in relevant part, incorporated herein by reference; the citation of any document is not to be construed as an admission that it is prior art with respect to the present invention. To the extent that any meaning or definition of a term in this document conflicts with any meaning or definition of the same term in a document incorporated by reference, the meaning or definition assigned to that term in this document shall govern.

While particular embodiments of the present invention have been illustrated and described, it would be obvious to those skilled in the art that various other changes and modifications can be made without departing from the spirit and scope of the invention. It is therefore intended to cover in the appended claims all such changes and modifications that are within the scope of this invention.

CLAIMS

What is claimed is:

1. A disposable absorbent article comprising:
 - a chassis including a topsheet and a backsheet; and
 - a substantially cellulose free absorbent core located between the topsheet and the backsheet and including first and second absorbent layers, the first absorbent layer including a first substrate and the second absorbent layer including a second substrate, the first and second absorbent layers further including superabsorbent particulate polymer material deposited on the first and second substrates and thermoplastic adhesive material covering the absorbent particulate polymer material on the respective first and second substrates, the first and second absorbent layers combined together such that at least a portion of the thermoplastic adhesive material of the first absorbent layer contacts at least a portion of the thermoplastic adhesive material of the second absorbent layer, the absorbent particulate polymer material is disposed between the first and second substrates in an absorbent particulate polymer material area, and the absorbent particulate polymer material is substantially continuously distributed across the absorbent particulate polymer material area;
 - wherein the backsheet comprises a hydroenhanced nonwoven; wherein the nonwoven comprises a surface coating.
2. The disposable absorbent article according to Claim 1, wherein the nonwoven has a basis weight of at least about 22gsm, preferably at least about 25gsm, preferably at least about 28gsm, preferably at least about 30gsm.
3. The disposable absorbent article according to any one of the preceding claims, wherein the article has an in-bag compression of less than about 50%, preferably less than about 48%, preferably less than about 47%.
4. The disposable absorbent article according to any one of the preceding claims, wherein the surface coating is a fiber surface modifying agent and/or a surfactant.

5. A disposable absorbent article comprising:
 - a chassis including a topsheet and a backsheet; and
 - a substantially cellulose free absorbent core located between the topsheet and the backsheet and including first and second absorbent layers, the first absorbent layer including a first substrate and the second absorbent layer including a second substrate, the first and second absorbent layers further including superabsorbent particulate polymer material deposited on the first and second substrates and thermoplastic adhesive material covering the absorbent particulate polymer material on the respective first and second substrates, the first and second absorbent layers combined together such that at least a portion of the thermoplastic adhesive material of the first absorbent layer contacts at least a portion of the thermoplastic adhesive material of the second absorbent layer, the absorbent particulate polymer material is disposed between the first and second substrates in an absorbent particulate polymer material area, and the absorbent particulate polymer material is substantially continuously distributed across the absorbent particulate polymer material area;

wherein the article has an in-bag compression of less than about 50%, preferably less than about 48%, preferably less than about 47%.
6. The disposable absorbent article according to Claim 5, wherein the backsheet comprises a hydroenhanced nonwoven; wherein the nonwoven comprises a surface coating, preferably the surface coating is a fiber surface modifying agent and/or a surfactant.
7. The disposable absorbent article according to Claim 6, wherein the nonwoven has a basis weight of at least about 22gsm, preferably at least about 25gsm, preferably at least about 28gsm, preferably at least about 30gsm.
8. The disposable absorbent article according to Claim 5, wherein the backsheet and/or topsheet comprises a nonwoven; wherein the nonwoven comprises a treatment selected from application of a fiber surface modifying agent, application of a surfactant, and/or treatment by a selfing mechanism.
9. A disposable absorbent article comprising a chassis comprising a topsheet, a backsheet; and an absorbent core located between topsheet and the backsheet; wherein either the

topsheet or the backsheet comprises a nonwoven; wherein the nonwoven comprises a surface coating; wherein the article has an in-bag compression of less than about 50%, preferably less than about 48%, preferably less than about 47%; wherein the nonwoven has basis weight of at least about 22gsm, preferably at least about 25gsm, preferably at least about 28gsm, preferably at least about 30gsm; preferably the nonwoven is hydroenhanced.

10. The disposable absorbent article according to any one of the preceding claims wherein the article is a diaper.

1/4

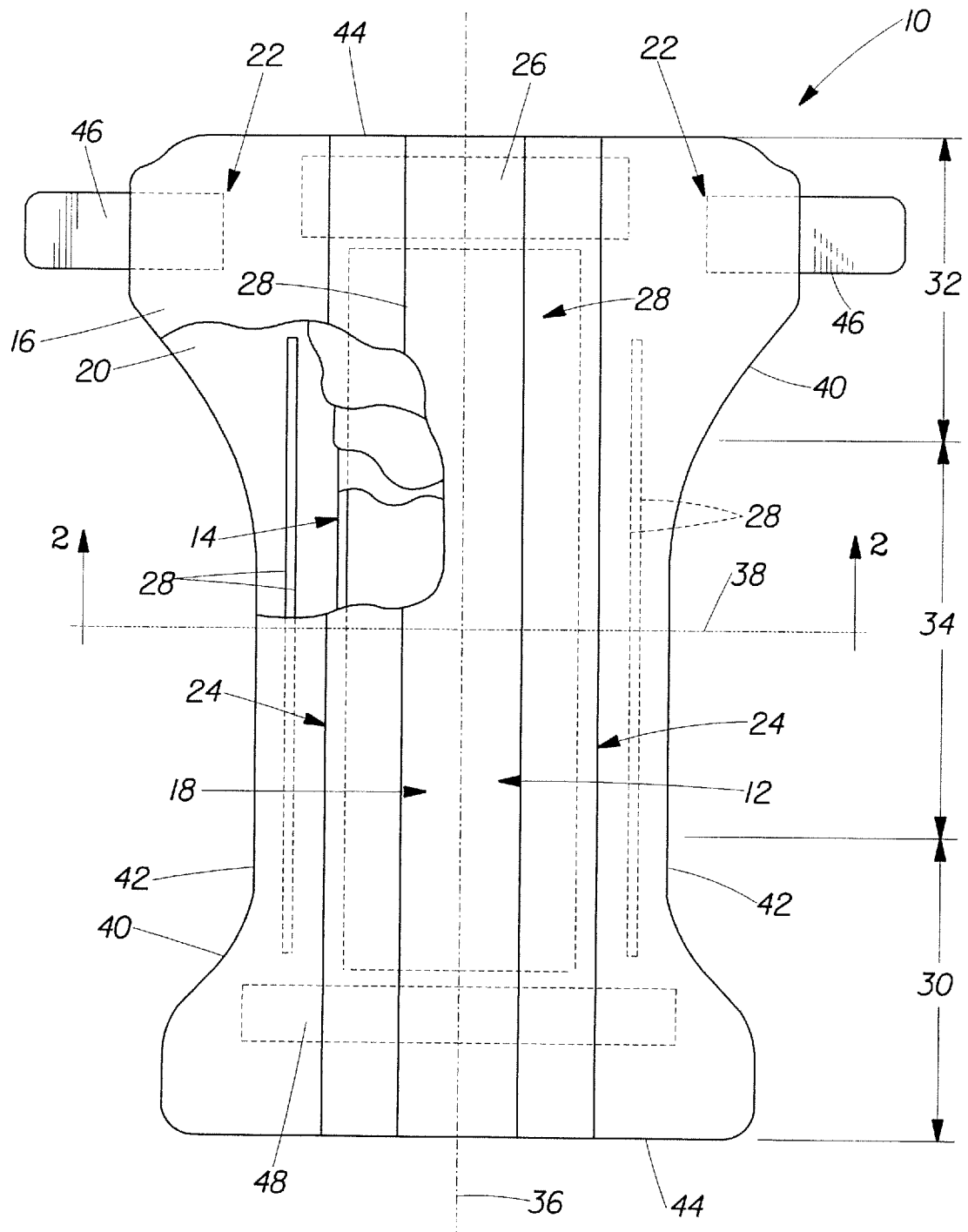


Fig. 1

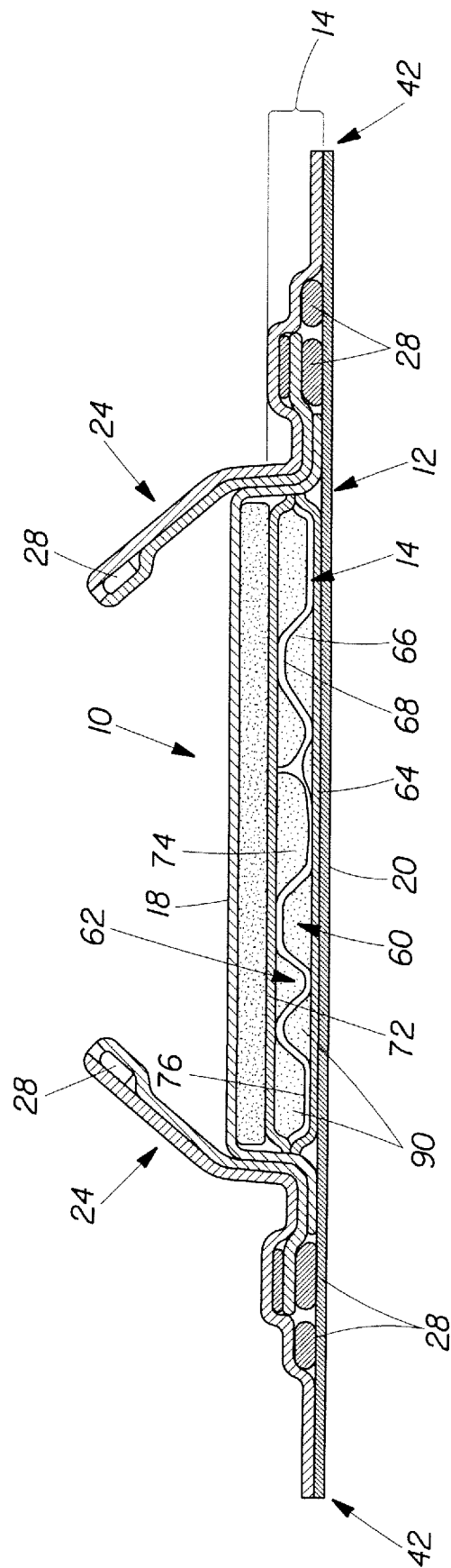


Fig. 2

3/4

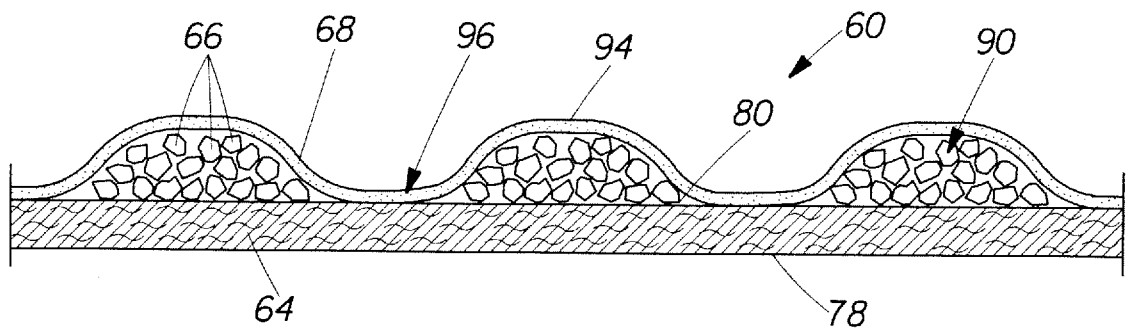


Fig. 3

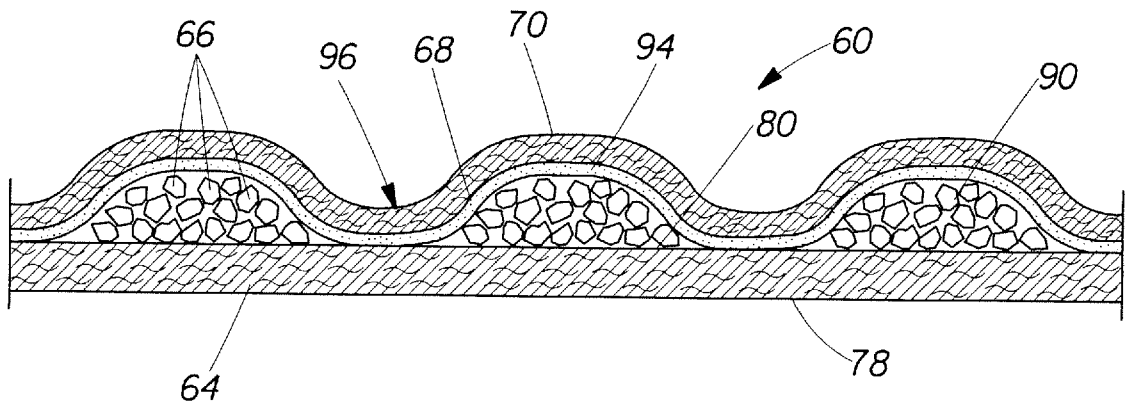


Fig. 4

4 / 4

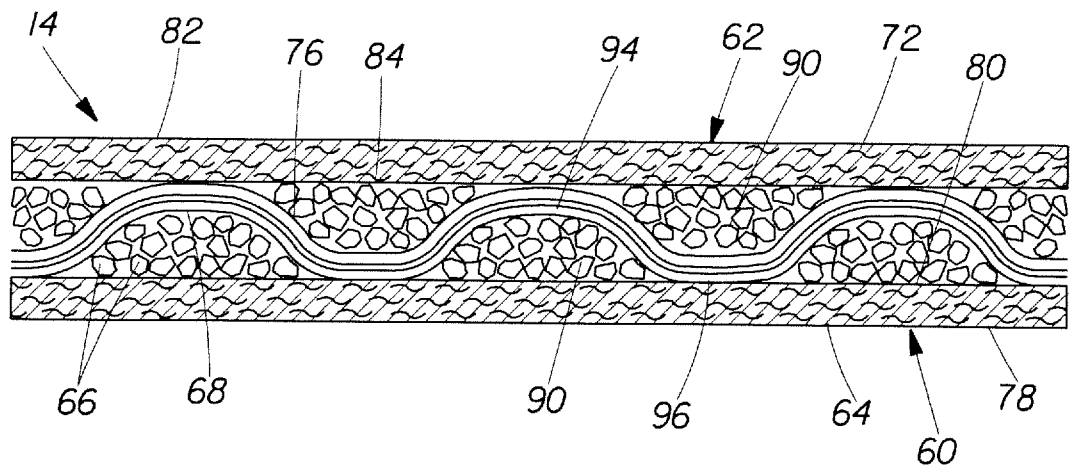


Fig. 5

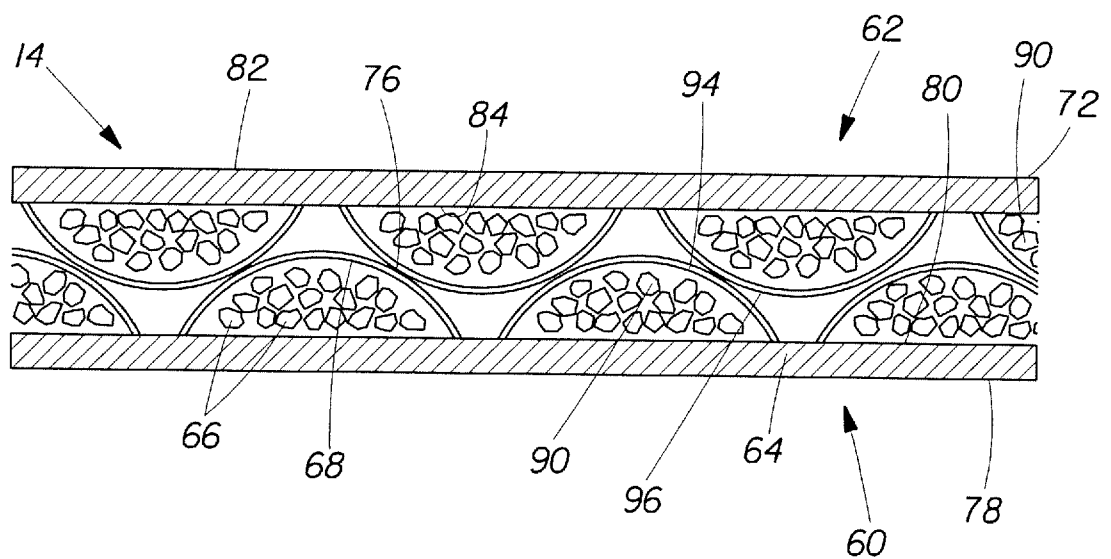


Fig. 6

INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2008/054593

A. CLASSIFICATION OF SUBJECT MATTER
INV. 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)

A61F D04H

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)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2004/162536 A1 (BECKER UWE JURGEN [DE] ET AL) 19 August 2004 (2004-08-19)	5,10
Y	paragraphs [0009], [0022], [0053], [0025], [0046] - [0059]; figures 1,3-6	1-4,6-9
Y	US 2006/057921 A1 (TURI MORDECHAI [US] ET AL) 16 March 2006 (2006-03-16) cited in the application paragraphs [0060], [0032]; claim 13	1-4,6-9
A	US 2004/167486 A1 (BUSAM LUDWIG [DE] ET AL) 26 August 2004 (2004-08-26) cited in the application the whole document	1-10
A	US 2007/167928 A1 (BECKER UWE J [DE] ET AL) 19 July 2007 (2007-07-19) the whole document	1-10
----- -/--		

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *G* document member of the same patent family

Date of the actual completion of the international search

20 February 2009

Date of mailing of the international search report

03/03/2009

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Elsässer, Ralf

INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2008/054593

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 2002/117419 A1 (TIPPEY DAROLD DEAN [US] ET AL) 29 August 2002 (2002-08-29) paragraph [0074]; figures 1-13 -----	3,5,9
A	EP 0 780 325 A (PROCTER & GAMBLE [US] PROCTER & GAMBLE [US]; OPTIMA FILLING AND PACKAG) 25 June 1997 (1997-06-25) column 1, line 8; claim 1 column 4, line 25 - line 38; claim 8 -----	3,5-9

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2008/054593

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2004162536 A1	19-08-2004	AT 409447 T	15-10-2008
		AU 2004212005 A1	26-08-2004
		BR PI0407432 A	24-01-2006
		CA 2515143 A1	26-08-2004
		CN 1741781 A	01-03-2006
		CN 101036612 A	19-09-2007
		CN 101036613 A	19-09-2007
		CN 101036614 A	19-09-2007
		EG 23766 A	08-08-2007
		EP 1447066 A1	18-08-2004
		EP 1813236 A2	01-08-2007
		EP 1813237 A2	01-08-2007
		EP 1808152 A2	18-07-2007
		EP 1982678 A1	22-10-2008
		JP 2006513823 T	27-04-2006
		JP 2007244882 A	27-09-2007
		JP 2007222646 A	06-09-2007
		JP 2007244883 A	27-09-2007
		KR 20050100391 A	18-10-2005
		MX PA05007929 A	22-02-2006
		US 2007156108 A1	05-07-2007
		WO 2004071363 A1	26-08-2004
		ZA 200505365 A	26-04-2006
US 2006057921 A1	16-03-2006	AU 2005285063 A1	23-03-2006
		BR PI0515348 A	22-07-2008
		CA 2580047 A1	23-03-2006
		CN 101065528 A	31-10-2007
		EP 1786968 A2	23-05-2007
		JP 2008512580 T	24-04-2008
		KR 20080016777 A	22-02-2008
		US 2008045106 A1	21-02-2008
		WO 2006031656 A2	23-03-2006
US 2004167486 A1	26-08-2004	AT 380007 T	15-12-2007
		AU 2004212006 A1	26-08-2004
		BR PI0407132 A	07-02-2006
		CA 2515118 A1	26-08-2004
		CL 2462004 A1	08-04-2005
		CN 1741780 A	01-03-2006
		DE 60317873 T2	13-11-2008
		EG 23770 A	08-08-2007
		EP 1447067 A1	18-08-2004
		EP 1911425 A2	16-04-2008
		EP 1917940 A2	07-05-2008
		EP 1913912 A1	23-04-2008
		EP 1913913 A2	23-04-2008
		EP 1913914 A2	23-04-2008
		EP 1911426 A2	16-04-2008
		ES 2297062 T3	01-05-2008
		JP 2006513824 T	27-04-2006
		KR 20050113179 A	01-12-2005
		KR 20070103519 A	23-10-2007
		MX PA05007634 A	25-05-2006
		US 2008125735 A1	29-05-2008
		WO 2004071539 A2	26-08-2004
		ZA 200505366 A	26-04-2006

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2008/054593

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2007167928 A1	19-07-2007	US 2007179464 A1	02-08-2007
US 2002117419 A1	29-08-2002	TW 271846 Y	01-08-2005
		US 2003155265 A1	21-08-2003
EP 0780325 A	25-06-1997	AT 226548 T	15-11-2002
		AU 1411497 A	17-07-1997
		BR 9612215 A	13-07-1999
		CA 2241335 A1	03-07-1997
		DE 69528662 D1	28-11-2002
		DE 69528662 T2	03-07-2003
		ES 2185680 T3	01-05-2003
		JP 11500988 T	26-01-1999
		WO 9723391 A1	03-07-1997
		ZA 9610647 A	24-06-1997