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54 TITULO

UN COMPUESTO NO TEJIDO CON PERMEABILIDAD ALTA ANTES DEL

HUMEDECIMIENTO Y DESPUES DEL HUMEDECIMIENTO

51 CLASIFICACION INTERNACIONAL

71 SOLICITANTE

KIMBERLY - CLARK WORLDWIDE, INC

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NEENAH, WISCONSIN, ESTADOS UNIDOS DE AMERICA

74 APODERADO

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202038

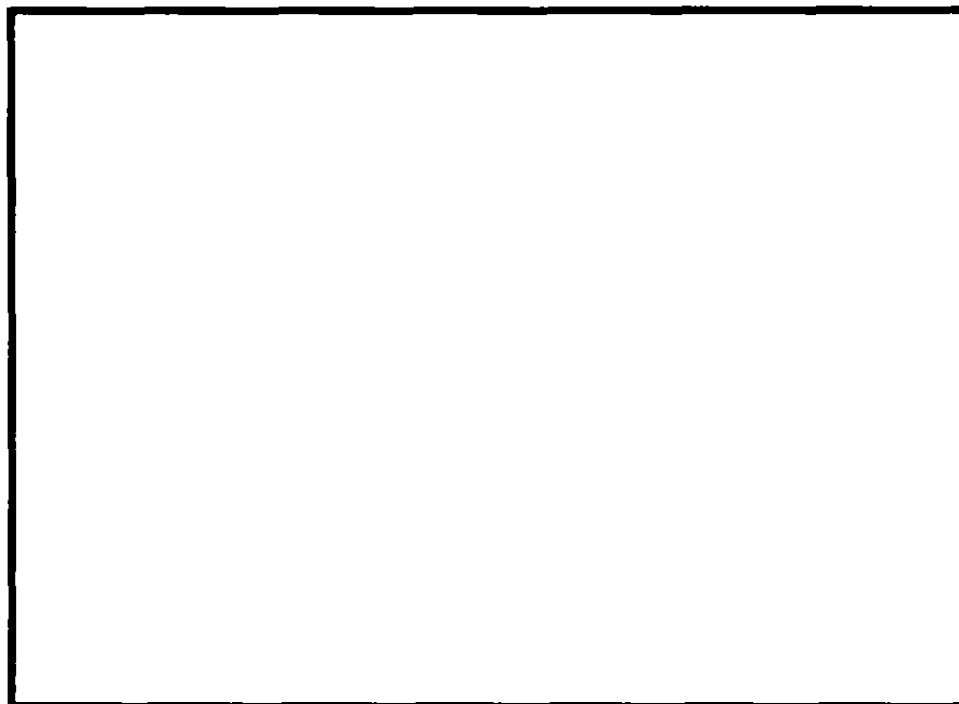
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- ☐ Documento que acredite la existencia y representación legal cuando el solicitante sea persona jurídica.
- ☒ Poderes, si fuere el caso. Protocolo No 17397
- ☒ Documento de cesión del inventor al solicitante o a su causante.
- ☐ Declaraciones
- ☒ Copia de la solicitud internacional. (Resumen, descripción, reivindicaciones, dibujos)
- ☒ Traducción de la solicitud internacional al castellano. (Resumen, descripción reivindicaciones, dibujos)
- ☒ Copia del examen preliminar efectuado por la IPEA.
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- ☐ De ser el caso, copia del contrato de acceso.
- ☐ De ser el caso, documento que acredite la licencia o autorización de uso de conocimientos tradicionales de las comunidades indígenas.
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- ☐ Arte final 12x12
- ☐ De ser el caso, información sobre otras solicitudes de patente o títulos obtenidos en el extranjero por el mismo titular o su causante, relacionadas parcial o totalmente con la invención de esta solicitud.
- ☒ Otros Tarjeta de Propietarios

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NOMBRE: RAMIRO CASTRO DUQUE

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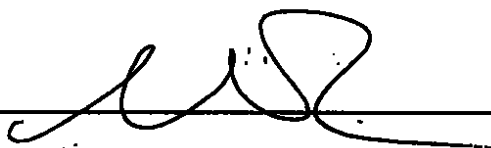
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(54) Title NONWOVEN COMPOSITE WITH HIGH PRE- AND POST WETTING PERMEABILITY

(57) Abstract: There is provided a new nonwoven material for personal care products where the superabsorbent is contained in micro-pockets in the nonwoven. These micro-pockets may be made by creping a nonwoven fabric. These materials exhibit good permeability to liquid in the pre and post wetted conditions, thus avoiding gel blocking and other negative effects of superabsorbent swelling within a fabric. Such a fibrous material is useful in personal care products like diapers, training pants, incontinence garments and feminine hygiene products.

WO 03/017901 A1

NONWOVEN COMPOSITE WITH HIGH PRE- AND POST-WETTING PERMEABILITY**BACKGROUND OF THE INVENTION**

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The present invention concerns formed materials mainly for personal care products like diapers training pants swim wear, absorbent underpants, adult incontinence products and feminine hygiene products. This material may also be useful for other applications such as, for example, in bandages and wound dressings, nursing pads and in
10 veterinary and mortuary applications

Personal care articles usually have multiple layers of material of some sort to absorb liquids from the body. These layers may include natural fibers synthetic fibers and superabsorbent particles in varying proportions. When liquid such as urine is deposited into a personal care product like a diaper, it goes through the uppermost layers,
15 typically a liner against the body and a "surge" or "intake" layer designed to provide temporary liquid holding capacity. The product may also have a "distribution" layer designed to move liquid in the X and Y directions in order to utilize more of the absorbent core. After going through these upper layers, the urine enters the absorbent core portion of the product. The absorbent core permanently retains the liquid

20 The functions of the layers mentioned above may each be performed by different layers or a layer may perform more than one function. The combination of more than one function in a single layer, however generally results in a significant decrease in the performance of each of the functions

Absorbent cores are typically composed of superabsorbent particles and/or pulp
25 A newer class of absorbents also uses a binder to improve wet stability and to ease

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converting into final products Binders can be liquid adhesive or thermally activatable fibers typically present in amounts between 10 and 25 weight percent

Superabsorbent particles absorb many times their weight in liquid and swell greatly as a result of being wetted This swelling holds liquid within the product and so protects the wearer's skin, clothing and bedding, but may also block the further intake of liquid This occurs because the swollen particles become so large as to close off fluid entrances to the structure, a phenomenon known in the art as "gel blocking"

Alternatively, an absorbent structure lacking superabsorbent and made of the traditional pulp and binder fiber can experience "wet collapse" This occurs as a result of saturation of the pulp and the subsequent inability to regenerate void space as fluid is added to the structure The binder fibers generally synthetic polymer fibers that are naturally hydrophobic, contribute to this problem since they interfere with the wicking performance of the structure due to their poor wettability In addition, the constraints induced by the bonding of the binder fibers restrains expansion of the absorbent structure, further reducing void volume and decreasing the ultimate capacity of the material If the structure were able to wick fluid away from the area of incipient wet collapse more efficiently, the phenomenon might be avoided completely

A material which treads the fine line between wet collapse and gel blocking would be very desirable Such a material would avoid the undesirable features of uncontrolled superabsorbent expansion while efficiently absorbing fluids It would also avoid wet collapse by maintaining a sufficient pore structure, allowing liquid to continue moving through it Such a material would exhibit high levels of multi-functional absorbent performance

SUMMARY OF THE INVENTION

1
In response to the discussed difficulties and problems encountered in the prior art,
a new structural composite comprising nonwoven fabric to which has been added
5 superabsorbent has been developed. The superabsorbent is preferably in the form of
particles (SAP). The SAP is placed in "micro-pockets" formed by various means like
creping or the manual creation of depressions in the surface of the nonwoven using a
pattern roll. The volume of the micro-pockets may be between 0.33 and 10 cubic
millimeters. The SAP need not be uniformly placed in the web but may be located in a
10 non-uniform manner across the width of the fabric. As a result of this construction, the
nonwoven web remains permeable to liquids before and after wetting. When the web is
wetted, the superabsorbent is free to swell without disrupting the fibrous network of the
web since it is located in the discrete pockets. The web should have a permeability above
1500 darcys and preferably above 2000 darcys.

15 In this invention, at least one layer having a mixture of polymeric fibers,
superabsorbent in an amount between 1 and 80 weight percent and binder in an amount
between 1 and 6 weight percent is provided. More particularly, amounts of
superabsorbent between 25 and 75 weight percent and still more particularly between 40
and 60 percent may be beneficial. Additional layers may be present as well and the
20 inventive layer may be placed in a personal care product to act as a distribution and
absorption layer. The inventive layer has good distribution properties, presumably due to
the avoidance of gel blocking, capillary disruption and wet collapse, by virtue of the
discrete placement of the superabsorbent. It is also possible to electrically treat the web
of this invention to improve particle adherence.

25 These materials are suitable for use in personal care products like diapers, training
pants, incontinence products, bandages, and sanitary napkins.

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DEFINITIONS

As used herein the term "nonwoven fabric or web" means a web having a structure
5 of individual fibers or threads which are interlaid, but not in an identifiable manner as in a
knitted fabric. Nonwoven fabrics or webs have been formed from many processes such as
for example, meltblowing processes, spunbonding processes, and bonded carded web
processes. The basis weight of nonwoven fabrics is usually expressed in ounces of material
per square yard (osy) or grams per square meter (gsm) and the fiber diameters useful are
10 usually expressed in microns (Note that to convert from osy to gsm, multiply osy by 33.91)

"Spunbonded fibers" refers to small diameter fibers that are formed by extruding
molten thermoplastic material as filaments from a plurality of fine capillaries of a spinneret.
Such a process is disclosed in, for example, US Patent 4,340,583 to Appel et al and US
15 Patent 3,802,817 to Matsuki et al. The fibers may also have shapes such as those
described, for example, in US Patents 5,277,976 to Hogle et al which describes fibers with
unconventional shapes

"Bonded carded web" refers to webs that are made from staple fibers which are
sent through a combing or carding unit, which separates or breaks apart and aligns the
20 staple fibers in the machine direction to form a generally machine direction-oriented
fibrous nonwoven web. This material may be bonded together by methods that include
point bonding, through air bonding, ultrasonic bonding, adhesive bonding, etc.

As used herein, the term "coform" means a process in which at least one meltblown
diehead is arranged near a chute through which other materials are added to the web while
25 it is forming. Such other materials may be pulp, superabsorbent particles, natural fibers (for
example, rayon or cotton fibers) and/or synthetic fibers (for example, polypropylene or

polyester) fibers, for example, where the fibers may be short cut of staple length. Coform processes are shown in commonly assigned US Patents 4,818,464 to Lau and 4,100,324 to Anderson et al. Webs produced by the coform process are generally referred to as coform materials.

5 "Airlaying" is a well-known process by which a fibrous nonwoven layer can be formed. In the airlaying process, bundles of small fibers having typical lengths ranging from about 3 to about 52 millimeters (mm) are separated and entrained in an air supply and then deposited onto a forming screen usually with the assistance of a vacuum supply. The randomly deposited fibers then are bonded to one another using, for
10 example, hot air to activate a binder component or a latex adhesive. Airlaying is taught in, for example, US Patent 4,840,810 to Laursen et al., and US Patent 5,885,516 to Christensen.

The term "creping" means a process for folding a web such that loops are created in the web structure. Such loops define an arch, semi-circle or similar configuration
15 extending above the plane of the uncreped nonwoven web, and terminating at both ends in the nonwoven web. Examples of creped materials and methods may be found in US Patent 6,150,002 to Varona and PCT publication WO 00/33780 (US Application 09/209,044) to Varona et al. Crepe level (CL) is a measure of creping expressed as a percentage and is calculated as the speed of the creping drum surface (A) minus the
20 speed of the windup reel for the creped web (B) divided by the speed of the creping drum surface (A), multiplied by 100, or $CL = (A-B)/A * 100$.

"Z-direction materials" refers to fabrics wherein the fibers are predominately oriented in the Z-direction during the formation of the fabric, as opposed to during a post-treatment step like creping. Examples of such materials and methods may be found in
25 PCT publication WO 00/68057 and WO 00/68284, corresponding to US Applications 09/538,744 and 09/537,564, respectively, and both commonly assigned.

A 7

The term "micro-pockets" means small pockets, in the order of a few cubic millimeters or less formed in a nonwoven web. They must be sufficiently large to allow entry for and provide storage for superabsorbent particles.

As used herein "thermal point bonding" involves passing a fabric or web of fibers to be bonded between a heated calender roll and an anvil roll. The calender roll is usually, though not always patterned in some way so that the entire fabric is not bonded across its entire surface, and the anvil roll is usually flat. As a result various patterns for calender rolls have been developed for functional as well as aesthetic reasons. One example of a pattern has points and is the Hansen Pennings or "H&P" pattern with about a 30% bond area with about 200 bonds/square inch as taught in U.S. Patent 3,855,046 to Hansen and Pennings. The H&P pattern has square point or pin bonding areas wherein each pin has a side dimension of 0.038 inches (0.965 mm), a spacing of 0.070 inches (1.778 mm) between pins, and a depth of bonding of 0.023 inches (0.584 mm). The resulting pattern has a bonded area of about 29.5%. Another typical point bonding pattern is the expanded Hansen Pennings or "EHP" bond pattern which produces a 15% bond area with a square pin having a side dimension of 0.037 inches (0.94 mm), a pin spacing of 0.097 inches (2.464 mm) and a depth of 0.039 inches (0.991 mm). Another typical point bonding pattern designated "714" has square pin bonding areas wherein each pin has a side dimension of 0.023 inches, a spacing of 0.062 inches (1.575 mm) between pins, and a depth of bonding of 0.033 inches (0.838 mm). The resulting pattern has a bonded area of about 15%. Yet another common pattern is the C-Star pattern which has a bond area of about 16.9%. The C-Star pattern has a cross-directional bar or "corduroy" design interrupted by shooting stars. Other common patterns include a diamond pattern with repeating and slightly offset diamonds with about a 16% bond area and a wire weave pattern looking as the name suggests, e.g. like a window screen with about a 19% bond area. Typically the percent bonding area varies from around 10% to around 30% of the area of the fabric laminate web. As is well known in the

art, the spot bonding holds the laminate layers together as well as imparts integrity to each individual layer by bonding filaments and/or fibers within each layer

As used herein, through-air bonding or "TAB" means a process of bonding a nonwoven bicomponent fiber web in which hot air is forced through the web. The temperature of the air is sufficient to melt one of the polymers of which the fibers are made. The air velocity is usually between 100 and 500 feet per minute and the dwell time may be as long as 6 seconds. The melting and resolidification of the polymer provides bonding. Through-air bonding (TAB) requires the melting of at least one component to accomplish bonding, so it is usually restricted to webs with two components like conjugate fibers or those which include an adhesive. In the through-air bonder, air having a temperature above the melting temperature of one component and below the melting temperature of another component is directed from a surrounding hood, through the web, and into a perforated drum supporting the web. Alternatively, the through-air bonder may be a flat arrangement wherein the air is directed vertically downward onto the web. The operating conditions of the two configurations are similar, the primary difference being the geometry of the web during bonding. The hot air melts the lower melting polymer component and thereby forms bonds between the filaments to integrate the web.

"Personal care product" means diapers, training pants, swim wear, absorbent underpants, adult incontinence products, bandages and feminine hygiene products. It may further encompass veterinary and mortuary products.

TEST METHODS AND MATERIALS

Basis Weight. A circular sample of 3 inches (7.6 cm) diameter is cut and weighed using a balance. Weight is recorded in grams. The weight is divided by the sample area. Five samples are measured and averaged.

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Material caliper (thickness) The caliper of a material is a measure of thickness and is measured at 0.05 psi (3.5 g/cm²) with a STARRET® bulk tester, in units of millimeters. Samples are cut into 4 inch by 4 inch (10.2 cm by 10.2 cm) squares and five samples are tested and the results averaged

5 **Density** The density of the materials is calculated by dividing the weight per unit area of a sample in grams per square meter (gsm) by the material caliper in millimeters (mm). The caliper should be measured at 0.05 psi (3.5 g/cm²) as mentioned above. The result is multiplied by 0.001 to convert the value to grams per cubic centimeter (g/cc). A total of five samples would be evaluated and averaged for the density values

10 **Permeability**

Permeability (k, in cm²) may be calculated and represents the resistance to flow of a liquid by a material. A liquid of known viscosity (η , in Pascal-sec) is forced through the material of given thickness (t, in cm) at a constant flow rate (v, in cm/sec) and the resistance to flow, measured as a pressure drop (ΔP in Pascal's) is monitored. Permeability is

15 calculated using Darcy's flow equation

$$k = v t \eta / \Delta P$$

Note that 1 darcy = 9.87×10^{-9} cm²

In a test for permeability, typical parameters are a velocity of 20 cm/sec, a sample thickness of 20 – 50 mils and a test liquid having a viscosity of about 6 Pascal-sec.

20

DETAILED DESCRIPTION OF THE INVENTION

This invention nonwoven web having superabsorbent contained within micro-pockets. This web has a high permeability and maintains high permeability to liquid flow even after being wetted. A permeability above 1500 darcys, and preferably above 2000 darcys is considered "high"

25

The nonwoven web of this invention may be made from a number of processes, including airlaying, spunbonding, bonding and carding, meltblowing and coforming. The material may be creped after formation, given Z-direction fiber orientation during formation, or may be a relatively flat nonwoven structure into which micro-pockets are depressed. Additional layers may be added to the structure and it may be included in personal care products.

The volume in the micro-pockets may be calculated relatively easily and is dependent upon the method of making the pockets. One embodiment of this invention is a creped, pre-bonded spunbond fabric. This is typically thermally bonded as it is produced with an EHP or other pattern in with either a square or diamond layout of the bond points (other layouts may be used but the calculations must be modified). As the fabric is creped, bond points will adhere to the creping drum as it is processed, causing the fabric to increase its Z - directional dimension and decrease or shorten in the X - direction. This results in the creation of the "micro-pockets" useful in this invention for holding superabsorbent, which, in the case of creping, are perhaps more readily envisioned as bulges of fiber between the bond points with space created between the fibers to accommodate the SAP. A typical EHP pattern has bond points spaced about 2.464 mm apart (see definition above) in a square or diamond pattern. Upon creping, the distance (a) between bond points decreases approximately by the crepe level (CL) expressed as a percentage and the height of the fabric increases approximately by the crepe level, yielding an area and volume encompassed by any four bond points of:

$$\text{Area} = ((100 - \text{CL}) * a^2)/100$$

$$\text{Volume for square pattern} = \text{area} * \text{CL}/200$$

$$\text{Volume for diamond pattern} = \text{area} * (2^{0.5} * a/2 * \text{CL})/200$$

It should be noted that the minor differences between the square and diamond pattern volumes are due to the orientation of the web when it undergoes creping. A square pattern bonded fabric enters the creping apparatus with two edges of a box

f09

1 formed by four bond points in the machine direction (MD) and two in the cross direction (CD). A diamond pattern bonded fabric does not have such an orientation and instead is oriented with the edges of a box formed by four bond points approximately 45 degrees away from either the cross or machine directions. Other bonding patterns may of course
5 be used. In such cases, the correct area and volume must be calculated. This may be done by those skilled in the art and may be aided by standard references such as for example the CRC Standard Mathematical Tables from the CRC Press of Cleveland Ohio.

Creping the webs contemplated for the practice of this invention results in volumes
10 of between about 0.33 to 10 cubic mm, more particularly between 0.33 and 5 cubic mm, more particularly between 0.5 and 1 cubic mm and still more particularly between 0.5 and 2 cubic mm.

As one example of this invention, a nonwoven web may be creped at a level of about 40 percent, and tumbled in a drum with superabsorbent particles to make an
15 addition rate of about 50 weight percent. Such an addition of particles would be in all of the micro-pockets in the fabric i.e., uniformly, assuming the micro-pockets were distributed uniformly. Alternatively, a length of creped fabric could be unwound around a roller or bar in order to open the folds of the creped fabric. As the fabric passes over the roller, superabsorbent particles could be added in a uniform or non-uniform pattern to
20 these folds. Such embodiments are intended to be within the scope of this invention.

Another method of making the web of this invention is to begin with a relatively flat web and pass it between a pattern and anvil roll to create depressions in the fabric. A lofty fabric is preferred for this embodiment since it will allow the fabric to have sufficient depth to provide adequate micro-pockets. Lofty fabrics are preferably bonded in a through-air
25 bonder rather than by thermal point bonding because thermal point bonding tends to compact the fabric as it passes between the rollers. A bicomponent crimped fabric, like, for example the fabric of US Patent 5,382,400 to Pike, that may be through-air bonded,

should work well in the practice of this invention. After formation and bonding, the depressions may be created in the fabric. This may be done, for example, by using unheated thermal point bonding and flat anvil rolls. The unheated pattern roll would not use a pattern that would pass fully through the web but would only depress the web in
5 pre-selected areas. The pattern may be uniform or non-uniform, providing depressions to only certain areas of the web or providing a changing density of depressions to the web. Patterns which may be used for the creation of depression are greatly varied, including those mentioned above for thermal point bonding, like the EHP, H&P and 714 patterns. After the formation of the depressions, superabsorbent may be deposited on the web to
10 fill all or some of the depressions to the degree desired.

In the case of a pattern and anvil roll used to create depressions in a fabric, the calculation to determine the size of the micro-pockets will be dependent upon the size of the pins used in the pattern roll and the depth of penetration of the pins into the fabric. The H&P pattern, if fully inserted into a fabric, produces a micro-pocket with a volume of
15 about 0.544 cubic mm and the EHP a volume of about 0.876 cubic mm, for example.

If the fabric to which the superabsorbent is added is creped, the superabsorbent should remain in place in micro-pockets formed in the folds of the fabric when the fabric resumes its normal position. If the fabric is relatively flat and provided with depressions, an adhesive may be needed to hold the superabsorbent in place. Alternatively,
20 electrostatic charge may be used to encourage the superabsorbent to remain in the depressions by means of differing electrical polarities or potentials.

Electrostatic charging of webs is accomplished by electret treatment which draws particles toward the fabric by virtue of their electrical charge. Electret treatment can be carried out by a number of different techniques. One technique is described in US Patent
25 number 5,401,448 to Tsai et al. assigned to the University of Tennessee Research Corporation. Tsai describes a process whereby a web or film is sequentially subjected to a series of electric fields such that adjacent electric fields have substantially opposite polarities.

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with respect to each other. Thus, one side of the web or film is initially subjected to a positive charge while the other side of the web or film is initially subjected to a negative charge. Then, the first side of the web or film is subjected to a negative charge and the other side of the web or film is subjected to a positive charge. Such webs are produced with a relatively high charge density without an attendant surface static electrical charge. The process may be carried out by passing the web through a plurality of dispersed non-arcing electric fields which may be varied over a range depending on the charge desired in the web. The web may be charged at a range of about 1 kVDC/cm to 12 kVDC/cm or more particularly 4 kVDC/cm to 10 kVDC/cm and still more particularly 7 kVDC/cm to about 8 kVDC/cm. Other methods of electret treatment are known in the art such as that described in US Patents 4,215,682 to Kubik et al, 4,375,718 to Wadsworth, 4,592,815 to Nakao and 4,874,659 to Ando.

The fabric used in the practice of this invention may have natural fibers, though webs of synthetic polymer fibers are preferred. An effective amount of binder, typically from 1 to 6 weight percent (based on the web weight before addition of superabsorbent), may be present to help provide mechanical integrity by binding the fibers and particles together. The binder may more particularly be between 1 and 5 percent and still more particularly between 1 and 4 percent. As much as 80 percent by weight of the web may be added as superabsorbent. A more particular range for the superabsorbent is between 25 and 75 weight percent and still more particularly between 40 and 60 weight percent.

Superabsorbents that are useful in the present inventions can be chosen from classes based on chemical structure as well as physical form. These include superabsorbents with low gel strength, high gel strength, surface cross-linked superabsorbents, uniformly cross-linked superabsorbents, or superabsorbents with varied cross-link density throughout the structure. Superabsorbents may be based on chemistries that include poly(acrylic acid), poly(iso-butylene-co-maleic anhydride), poly(ethylene oxide) carboxy-methyl cellulose, poly(-vinyl pyrrolidone) and poly(-vinyl

alcohol) The superabsorbents may range in swelling rate from slow to fast The superabsorbents may be in the form of foams, macroporous or microporous particles or fibers particles or fibers with fibrous or particulate coatings or morphology The superabsorbents may be in the shape of ribbons, particles, fibers, sheets or films

5 Superabsorbents in the form of particles are preferred for the practice of this invention Superabsorbents may be in various length and diameter sizes and distributions The superabsorbents may be in various degrees of neutralization Counter-ions are typically Li, Na, K, Ca

An exemplary superabsorbent was obtained from Stockhausen, Inc and is
10 designated FAVOR® SXM 880 Another example of these types of superabsorbents may be obtained from the Dow Chemical Company under the name DRYTECH® 2035 An example of fibrous superabsorbents may be obtained from Camelot Technologies, Ltd , of High River Alberta Canada and is designated FIBERDR® 1241 Another Example included in these types of superabsorbents is obtained from Chemtall Inc. or Riceboro,
15 GA, and is designated FLOSORB 60 LADY®, also known as LADYSORB 60® Additional types of superabsorbents not listed here which are commonly available and known to those skilled in the art can also be useful in the present inventions

Binders typically used in these structures help provide mechanical integrity and stabilization Binders include fiber, liquid or other binder means that may be thermally
20 activated Preferred fibers for inclusion are those having a relative melting point such as polyolefin fibers Lower melting point polymers provide the ability to bond the fabric together at fiber cross-over points upon the application of heat In addition, fibers having a lower melting polymer, like conjugate and biconstituent fibers are suitable for practice of this invention Fibers having a lower melting polymer are generally referred to as "fusible
25 fibers" By "lower melting polymers" what is meant are those having a glass transition temperature less than about 175 °C It should be noted that the texture of the absorbent web can be modified from soft to stiff through selection of the fusion and quenching

behavior of the polymer Exemplary binder fibers include conjugate fibers of polyolefins, polyamides and polyesters Three suitable binder fibers are sheath core conjugate fibers available from KoSa Inc. (Charlotte, North Carolina) under the designation T-255 and T-256, both with a polyolefin sheath or T-254, which has a low melt co-polyester sheath

5 Many suitable binder fibers are known to those skilled in the art, and are available by many manufacturers such as Chisso and Fibervisions LLC of Wilmington, DE A suitable liquid binder is KYMENE® 557LX available from Hercules Inc. of Wilmington, DE Other suitable liquid binders include ethylene vinyl acetate emulsion polymers sold by National Starch and Chemical Company (Bridgewater, New Jersey) under the tradename DUR-O-
10 SET® ELITE® series (including ELITE® 33 and ELITE® 22) Other suitable binders are sold by Air Products Polymers and Chemicals under the name AIRFLEX®.

Synthetic fibers include those made from polyolefins, polyamides, polyesters rayon, acrylics, superabsorbents, TENCEL® regenerated cellulose and any other suitable synthetic fibers known to those skilled in the art Synthetic fibers may also include
15 kosmotropes for product degradation

Many polyolefins are available for fiber production, for example polyethylenes such as Dow Chemical's ASPUN® 6811A linear low density polyethylene, 2553 LLDPE and 25355 and 12350 high density polyethylene are such suitable polymers The polyethylenes have melt flow rates, respectively of about 28, 40, 25 and 12 Fiber
20 forming polypropylenes include Exxon Chemical Company's ESCORENE® PD 3445 polypropylene and Montell Chemical Co.'s PF304 Many other polyolefins are also available

Natural fibers include wool, cotton, flax hemp and wood pulp Wood pulps include standard softwood fluffing grade such as NB-416 (Weyerhaeuser Corporation, Tacoma,
25 Washington) and CR-1654 (US Alliance Pulp Mills, Coosa Alabama) Pulp may be modified in order to enhance the inherent characteristics of the fibers and their processability Curl may be imparted to the fibers by methods including chemical

treatment or mechanical twisting. Curl is typically imparted before crosslinking or stiffening. Pulps may be stiffened by the use of crosslinking agents such as formaldehyde or its derivatives, glutaraldehyde, epichlorohydrin, methylolated compounds such as urea or urea derivatives, dialdehydes such as maleic anhydride, non-methylolated urea derivatives, citric acid or other polycarboxylic acids. Some of these agents are less preferable than others due to environmental and health concerns. Pulp may also be stiffened by the use of heat or caustic treatments such as mercerization. Examples of these types of fibers include NHB416 which is a chemically crosslinked southern softwood pulp fibers which enhances wet modulus, available from the Weyerhaeuser Corporation of Tacoma, WA. Other useful pulps are debonded pulp (NF405) also from Weyerhaeuser HPZ3 from Buckeye Technologies, Inc of Memphis, TN, has a chemical treatment that sets in a curl and twist, in addition to imparting added dry and wet stiffness and resilience to the fiber. Another suitable pulp is Buckeye HPF2 pulp and still another is IP SUPERSOFT® from International Paper Corporation. Suitable rayon fibers are 1.5 denier Merge 18453 fibers from Tencel Incorporated of Aids, Alabama.

Examples and Comparative Examples, follow

Example 1

A 0.4 osy (13.6 gsm) polypropylene web composed of 3.5 denier fibers was made according to the spunbonding process, bonded with a diamond EHP pattern and creped 25 percent producing micro-pockets with a volume of 0.661 cubic mm each. This material had a basis weight after creping of 0.5 osy (17 gsm) and was tumbled to add superabsorbent particles up to a 36 percent loading by weight on a dry basis. The permeability of the dry, (unswollen) composite web was 2000 darcys, according to the test method above. The fluid used for the testing was a mineral oil having a viscosity of 6 Pascal/sec and sold under the trade name PENETECK®. A sample of the composite web was placed in a large volume of 0.9 weight percent saline solution for sufficient time (approx. 20 minutes) to swell approximately to equilibrium. The swollen web was

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removed from the saline solution bath, dried on its surface, and tested for permeability in the same manner as the unswollen web. The permeability of the fully swollen composite web was 2060 darcys.

Example 2

5 A 0.4 osy (13.6 gsm) polypropylene web composed of 3.5 denier fibers was made according to the spunbonding process, bonded with a diamond EHP pattern and creped 35 percent to produce micro-pockets with a volume of 1.2 cubic mm each. This material had a basis weight after creping of 0.54 osy (18.3 gsm) and was tumbled to add superabsorbent particles up to a 45 percent loading by weight on a dry basis. The permeability of the dry (unswollen) composite web was 2100 darcys, according to the test method above. The permeability of the fully swollen composite web was 2133 darcys.

Comparative Example 1

A 0.4 osy (13.6 gsm) polypropylene web composed of 3.5 denier fibers was made according to the spunbonding process, bonded with an EHP pattern. No superabsorbent particles were added to the web. The permeability of the dry web was 450 darcys.

Comparative Example 2

A composite composed of 35 weight percent superabsorbent and 75 weight percent pulp was made by the airlaying process. The composite was compressed to an initial density of 0.2 g/cc. The dry permeability was 10 darcys and the swollen permeability was 16 darcys.

As can be seen from the Table, the Examples had high permeabilities and maintained their permeabilities well upon being wetted.

As will be appreciated by those skilled in the art, changes and variations to the invention are considered to be within the ability of those skilled in the art. Examples of such changes and variations are contained in the patents identified above, each of which is incorporated herein by reference in its entirety to the extent consistent with this

specification Such changes and variations are intended by the inventors to be within the scope of the invention

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What is claimed is

- 1) A nonwoven material for personal care products comprising a mixture of fibers binder
in an amount between 1 and 6 weight percent and superabsorbent in an amount
between 1 and 80 weight percent wherein said superabsorbent is contained in micro-
5 pockets in said nonwoven
- 2) The material of claim 1 wherein said superabsorbent concentration in said nonwoven
is between 25 and 75 weight percent
- 3) The material of claim 1 wherein said superabsorbent concentration in said nonwoven
is between 40 and 60 weight percent
- 10 4) The material of claim 1 wherein said micro-pockets are formed by creping
- 5) The material of claim 1 wherein said micro-pockets are formed by a pattern roll
- 6) The material of claim 5 wherein said pattern roll is unheated
- 7) The material of claim 1 wherein said micro-pockets are between 0.33 to 10 cubic
millimeters
- 15 8) The material of claim 1 wherein said micro-pockets are between 0.5 and 5 cubic
millimeters
- 9) A diaper comprising the material of claim 1
- 10) A training pant comprising the material of claim 1
- 11) An incontinence product comprising the material of claim 1
- 20 12) A bandage comprising the material of claim 1
- 13) A sanitary napkin comprising the material of claim 1
- 14) The material of claim 1 wherein said nonwoven web is electret treated prior to addition
of said superabsorbent
- 15) A lofty nonwoven web comprising fibers and binder in an amount between 1 and 6
25 weight percent, wherein said web is processed to produce micro-pockets and wherein
superabsorbent is placed in said micro-pockets

16) The web of claim 15 wherein said nonwoven web is electret treated prior to addition of said superabsorbent.

17) The web of claim 15 having a permeability above 1500 darcys

18) The web of claim 15 having a permeability above 2000 darcys

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 02/10680A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A61F13/532 D04H1/00 D04H3/00

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 D04H D21H

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, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 826 349 A (UNI CHARM CORP) 4 March 1998 (1998-03-04) column 2, line 46 - line 54 column 3, line 41 - line 53, figures	1-18
A	WO 99 22619 A (KIMBERLY CLARK CO) 14 May 1999 (1999-05-14) abstract	1-18

☐ Further documents are listed in the continuation of box C.☒ 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
- E earlier document but published on or after the international filing date
- L document which may throw doubts on priority claims) 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.
- & document member of the same patent family

Date of the actual completion of the international search

19 August 2002

Date of mailing of the international search report

23/08/2002

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 02/10680

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons

- 1 ☐ Claims Nos. _____
because they relate to subject matter not required to be searched by this Authority namely _____
- 2 ☒ Claims Nos. _____
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out specifically
see FURTHER INFORMATION sheet PCT/ISA/210
- 3 ☐ Claims Nos. _____
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this International application as follows.

- 1 ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
- 2 ☐ As all searchable claims could be searched without effort justifying an additional fee this Authority did not invite payment of any additional fee
- 3 ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos. _____
- 4 ☐ No required additional search fees were timely paid by the applicant. Consequently this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos. _____

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box I 2

Present claims 1-18 relate to an extremely large number of possible products. In fact, the claims contain so many options that a lack of clarity and conciseness within the meaning of Article 6 PCT arises to such an extent as to render a meaningful search of the claims impossible. Consequently, the search has been carried out for those parts of the application which do appear to be clear and concise, namely

a creped, spunbond polypropylene web for a personal care products with micropockets filled by superabsorbent particles

This product is recited in the example 1 and 2 and closely related to claim 1

The applicant's attention is drawn to the fact that claims, or parts of claims, relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66 1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 02/10680

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0826349	A	04-03-1998	JP 10014978 A	20-01-1998
			AU 694902 B2	30-07-1998
			AU 2839297 A	15-01-1998
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			CN 1285718 T	28-02-2001
			EP 1024721 A1	09-08-2000
			TW 410147 B	01-11-2000
			WO 9922619 A1	14-05-1999
			ZA 9809937 A	13-05-1999

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UN COMPUESTO NO TEJID CON PERMEABILIDAD ALTA ANTES DEL
HUMEDECIMIENTO Y DESPUES DEL HUMEDECIMIENTO

Antecedentes de la invención

5

La presente invención se refiere a materiales formados principalmente para productos para el cuidado personal tales como pañales, calzoncillos de aprendizaje, ropa para nadar, prendas interiores absorbentes, productos para la
10 incontinencia del adulto y productos para la higiene de la mujer Este material también puede ser útil para otras aplicaciones tales como, por ejemplo, en vendajes y vendas para heridas, almohadillas para amamantar y en aplicaciones veterinarias y mortuorias

15

Los artículos para el cuidado personal usualmente tienen capas múltiples de material de alguna clase para absorber los líquidos desde el cuerpo Estas capas pueden incluir fibras naturales, fibras sintéticas y partículas superabsorbentes en
20 proporciones variables Cuando el líquido tal como la orina se deposita en un producto para el cuidado personal tal como un pañal, este va a través de las capas más superiores, típicamente un forro en cuanto al cuerpo y una capa de "surgimiento" o de "toma" diseñada para proporcionar temporalmente una capacidad de
25 retención del líquido El producto también puede tener una capa de "distribución" diseñada para mover el líquido en las direcciones X e Y a fin de utilizar más del núcleo absorbente

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Después de ir a través de estas capas superiores, la orina entra en la parte de núcleo absorbente del producto. El núcleo absorbente retiene permanentemente el líquido.

5 Las funciones de las capas mencionadas arriba pueden cada una ser llevadas a cabo por diferentes capas o una capa puede llevar a cabo más de una función. La combinación de más de una función en una capa única, sin embargo, generalmente resulta en una disminución significativa en el desempeño de cada
10 una de estas funciones.

Los núcleos absorbentes están típicamente compuestos de partículas superabsorbentes y/o de pulpa. Una clase más nueva de absorbentes también usa un aglutinante para
15 mejorar la estabilidad en húmedo y la facilidad de convertirlos en productos finales. Los aglutinantes pueden ser fibras térmicamente activables o de adhesivo líquido presentes en cantidades de entre 10 y 25% por peso.

20 Las partículas superabsorbentes absorben muchas veces su peso en líquido y se hinchan mucho como un resultado de ser humedecidas. El hinchamiento retiene el líquido dentro del producto y así protege a la piel del usuario, la ropa y a las sábanas, pero también puede bloquear la toma adicional del
25 líquido. Esto ocurre debido a que las partículas hinchadas se hacen tan grandes como para cerrar las entradas del fluido a la

estructura, un fenómeno conocido en el arte como "bloqueo de gel"

Alternativamente, una estructura absorbente que
5 carece de superabsorbente y está hecha de pulpa tradicional y
fibra aglutinante puede experimentar un "plegado húmedo" esto
ocurre como un resultado de la saturación de la pulpa y de la
incapacidad subsecuente de regenerar los espacios huecos al ser
agregado el fluido a la estructura Las fibras aglutinantes,
10 generalmente fibras de polímero sintético que son naturalmente
hidrofóbicas, contribuyen a este problema ya que la
interferencia con el desempeño de transmisión de la estructura
debido a una pobre humectabilidad Además, las restricciones
inducidas por la unión de las fibras aglutinantes restringen la
15 expansión de la estructura absorbente, reduciendo además el
volumen hueco y disminuyendo la capacidad final del material
Si la estructura fuera capaz de transmitir el líquido hacia
fuera del área de plegado húmedo incipiente más eficientemente,
podría evitarse completamente el fenómeno

20

Un material el cual incluye la línea fina entre el
plegado húmedo y el bloqueo de gel sería muy deseable Tal
material evitaría las características indeseables de una
expansión de superabsorbente no controlada mientras que se
25 absorben eficientemente los fluidos También se evitaría el
plegado mediante el mantener una estructura de poro suficiente
permitiendo al líquido el continuamente mover el líquido a

través de este Tal material exhibirá altos niveles de desempeño absorbente multifuncional

Síntesis de la invención

5

En respuesta a las dificultades y problemas discutidos encontrados en el arte previo, un compuesto estructural nuevo que comprende una tela no tejida a la cual se ha agregado superabsorbente se ha desarrollado Los superabsorbentes están preferiblemente en la forma de partículas (SAP) El SAP se colocó en las "microbolsas" formadas por varios medios como el crepado o la creación manual de depresiones en la superficie del no tejido usando un patrón de rodillo El volumen de las microbolsas puede ser de entre 0.33 y 10 mm cúbicos El SAP no requiere ser colocado uniformemente en el tejido pero puede estar localizado en una manera no uniforme a través del ancho de la tela Como resultado esta construcción, la tela no tejida permanece permeable a los líquidos antes y después del humedecimiento Cuando el tejido es humedecido, el superabsorbente está libre para hincharse sin interrumpir la red fibrosa del tejido ya que esta está localizada en bolsas discretas El tejido debe tener una permeabilidad arriba de 1500 darcys y preferiblemente (alrededor de 2000 darcys)

25

En esta invención, se proporciona por lo menos una capa que tiene una mezcla de fibras poliméricas, superabsorbente

en una cantidad de entre 1 y 80% por peso y aglutinante a una cantidad entre 1 y 6% por peso. Más particularmente, las cantidades de superabsorbente de entre 25 y 75% por peso y aún más particularmente de entre 40 y 60% por peso pueden ser benéficas. Las capas adicionales pueden estar presentes también y la capa de la invención puede ser colocada en un producto para el cuidado personal para actuar como una capa de distribución y de absorción. La capa de la invención tiene buenas propiedades de distribución, presumiblemente debido a que se evita el bloqueo de gel, la interrupción capilar y el colapso húmedo, por virtud de la colocación discreta del superabsorbente. También es posible el tratar eléctricamente el tejido de esta invención para mejorar la adherencia de partículas.

Estos materiales son adecuados para usarse en los productos para el cuidado personal tal como los pañales, los calzoncillos de aprendizaje, los productos para la incontinencia, los vendajes y las toallas sanitarias.

Definiciones

Como se usó aquí el término "tejido o tela no tejida" significa un tejido que tiene una estructura de fibras o hilos individuales los cuales están entrecolocados, pero no en una manera identificable como en una tela tejida. Las telas no tejidas o los tejidos se han formado de muchos procesos tales como por ejemplo, los procesos de soplado con fusión, los

procesos de unión con hilado y los procesos de tejido cardado y
unido El peso base de las telas no tejidas es expresado
usualmente en onzas de material por yarda cuadrada (osy) o
gramos por metro cuadrado (gsm) y los diámetros de fibra útiles
5 son usualmente expresados en micras (nótese que para convertir
de onzas por yarda cuadrada a gramos por metro cuadrado, debe
multiplicarse onzas por yarda cuadrada por 33 91)

"Las fibras unidas con hilado" se refieren a
10 fibras de diámetro pequeño que son formadas mediante el extrudir
el material termoplástico fundido como filamentos desde una
pluralidad de vasos capilares finos de un órgano de hilado Tal
proceso está descrito en, por ejemplo, la Patente a los Estados
Unidos de América No 4 340 563 otorgada a Appel y otros y en la
15 Patente de los Estados Unidos de América No 3 802 817 otorgada
a Matsuki y otros Las fibras también pueden tener formas tal
como aquellas descritas, por ejemplo, en la Patente de los
Estados Unidos de América No 5 277 976 otorgada a Hogle y otros
la cual describe fibras con formas no convencionales

20

"Una tela cardada y unida" se refiere a tejidos
que están hechos de fibras cortas las cuales son enviadas a
través de una unidad de peinado o de cardado, la cual separa o
rompe y alinea las fibras cortas en la dirección de la máquina
25 para formar una tela no tejida fibrosa orientada en la dirección
generalmente de la máquina Este material puede ser unido junto

por métodos que incluyen la unión de punto, la unión a través de aire, la unión ultrasónica, la unión adhesiva, etc

Como se usó aquí, el término "coform" significa un
5 proceso en el cual por lo menos una cabeza de matriz de soplado con fusión está arreglada cerca de un conducto a través del cual son agregados otros materiales al tejido mientras que este se está formando Tales otros materiales pueden ser pulpa, partículas superabsorbentes, fibras naturales (por ejemplo
10 fibras de rayón o de algodón) y/o fibras sintéticas (por ejemplo de polipropileno o de poliéster, por ejemplo, en donde las fibras pueden ser cortadas cortas de una longitud básica Los procesos coform están mostrados en las Patentes de los Estados Unidos de América comúnmente cedidas de los Estados Unidos de
15 América No 4 818 464 otorgada a Lay y 4 100 324 otorgadas a Anderson y otros Los tejidos producidos por el proceso coform son generalmente mencionados como materiales coform

La "colocación por aire" es un proceso muy
20 conocido por el cual una capa tejida no fibrosa puede ser formada En el proceso de colocación por aire, los manojos de fibras pequeñas que tienen longitudes típicas variando de desde alrededor de 3 a alrededor de 52 milímetros (mm) son separados y llevados en un suministro de aire y después depositados sobre
25 una rejilla formadora, usualmente con la ayuda de un suministro de vacío Las fibras depositadas al azar son entonces unidas unas a otras usando, por ejemplo, aire caliente para activar un

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componente aglutinante o un adhesivo de látex La colocación por aire se enseña en, por ejemplo, la Patente de los Estados Unidos de América No 4 640 810 otorgada a Laursen y otros y en la Patente a los Estados Unidos de América No 5 885 516
5 otorgada a Christensen

El término "crepado" significa un proceso para doblar un tejido de manera que los rizos son creados en la estructura de tejido Tales rizos definen una configuración de arco, de semicírculo o similar que se extiende arriba del plano
10 de la tela no tejida y no crepada, y que termina a ambos extremos en la tela no tejida Los ejemplos de los materiales crepados y de los métodos pueden encontrarse en la Patente de los Estados Unidos de América No 6 150 002 otorgada a Varona y
15 la publicación del Tratado de Cooperación de Patentes WO 00/33780 (Solicitud de Patente de los Estados Unidos de América Serie No 09/209 044 otorgada a Varona y otros El nivel de crepado (CL) es una medida del crepado expresada como un porcentaje y se calcula como la velocidad de la superficie de
20 tambor de crepado (A) menos la velocidad del carrete de enrollado para el tejido crepado (B) dividido por la velocidad de la superficie del tambor de crepado (A), multiplicado por 100, o $CL = (A-B)/A \times 100$

25 La frase "materiales en la dirección-Z" se refiere a telas en las que las fibras están orientadas predominantemente en la dirección-Z durante la formación de la tela, en oposición

a durante el paso de tratamiento posterior como el crepado Los ejemplos de tales materiales y de los métodos pueden encontrarse en la publicación del Tratado de Comercio de Patentes WO 00/66057 y WO 00/66284, que corresponden a las Solicitudes de los Estados Unidos de América No 09/538 744 y 09/537 564 respectivamente y ambas cedidas en forma común

El término "microbolsas" significa bolsas pequeñas, en el orden de unos cuantos milímetros cúbicos o menos, formadas en una tela no tejida Estas deben ser suficientemente grandes para permitir la entrada y para proporcionar el almacenamiento para las partículas superabsorbentes

Como se usó aquí la frase "unido de punto térmico" involucra el pasar un tejido o tela de fibras que van a ser unidas entre un rodillo de calandrado calentado y un rodillo de yunque El rodillo de calandrado tiene usualmente, aún cuando no siempre, un patrón en alguna manera de forma que la tela completa no este unida a través de su superficie completa, y el rodillo de yunque es usualmente plano Como un resultado, se han desarrollado varios patrones de rodillos para calandrado por razones funcionales así como estéticas Un ejemplo de un patrón que tiene puntos y es el patrón Hansen Pennings o "H&P" con alrededor de un área de unión de 30% con alrededor de 200 uniones/pulgada cuadrada como se enseña en la Patente a los Estados Unidos de América No 3 855 046 otorgada a Hansen y

Pennings El patrón H&P tiene áreas de unión de perno o de punto cuadrado en donde cada perno tiene una dimensión lateral de 0 965 mm, un espaciamento de 1 178 mm entre los pernos, y una profundidad de unión de 0 584 mm El patrón resultante tiene un área unida de alrededor de 29 5% Otro patrón de unión de punto típico es el patrón de unión Hansen Pennings expandido o "EHP" el cual produce un área de unión de 15% con un perno cuadrado que tiene una dimensión lateral de 0 94 mm, un espaciamento de perno de 2 464 mm y una profundidad de 0 991 mm Otro patrón de unión de punto típico designado "714" tiene áreas de unión de perno cuadrado en donde cada perno tiene una dimensión lateral de 0 023 pulgadas, un espaciamento de 1 575 mm entre los pernos, y una profundidad de unión de 0 838 mm El patrón resultante tiene un área unida de alrededor de 15% Aún otro patrón común es el patrón de estrellas en C el cual tiene un área unida de alrededor de 6 9% El patrón de estrella en C tiene una barra en la dirección transversal o un diseño "de pana" interrumpido por estrellas fugaces Otros patrones comunes incluyen un patrón de diamante con diamantes repetitivos y ligeramente descentrados con alrededor de un área de 16% de unión y un patrón de tejido de alambre que se ve como el hombre lo sugiere, como una rejilla de ventana, con un área unida de alrededor de 19% Típicamente, el por ciento de área de unión varia de desde alrededor de 10% a alrededor de 30% del área del tejido laminado de tela Como se sabe en el arte, la unión de punto mantiene a las capas laminadas juntas así como el que

7/7/26

imparte integridad a cada capa individual mediante el unir los filamentos y/o las fibras dentro de cada capa

Como se usó aquí, la unión a través de aire o

5 "TAB" significa un proceso de unión de una tela de fibra de bicomponente no tejida en la cual el aire caliente es forzado a través del tejido. La temperatura del aire es suficiente para fundir uno de los polímeros de los cuales están hechas las fibras. La velocidad del aire es usualmente de entre 100 y 500

10 pies por minuto y el tiempo de permanencia puede ser tan prolongado como de 6 segundos. El derretido y resolidificación del polímero proporcionan la unión. La unión a través de aire (TAB) requiere el fundido de por lo menos un componente para lograr la unión, de manera que usualmente se restringe a los

15 tejidos con dos componentes como fibras conjugadas o aquellos los cuales incluyen un adhesivo. En el unidor a través de aire, el aire que tiene una temperatura arriba de la temperatura de derretido de un componente y abajo de la temperatura de derretido de otro componente se dirige desde una cubierta

20 circundante, a través del tejido y hasta un tambor perforado que sostiene al tejido. Alternativamente, el unidor a través de aire puede ser un arreglo plano en donde el aire está dirigido verticalmente hacia abajo sobre el tejido. Las condiciones de operación de las dos configuraciones son similares, la

25 diferencia primaria siendo la geometría del tejido durante la unión. El aire caliente derrite el componente de polímero de

derretido más bajo y por tanto forma las uniones entre los filamentos para integrar el tejido

El "producto para el cuidado personal" significa
5 pañales, calzoncillos de aprendizaje, ropa para nadar, calzones interiores absorbentes, productos para la incontinencia del adulto, vendajes y productos para la higiene de la mujer. Puede además abarcar productos veterinarios y mortuorios.

10 Métodos de prueba y materiales

Peso base Una muestra circular de 7.6 cm de diámetros cortada y pesada usando una balanza. El peso es registrado en gramos. El peso es dividido por el área de
15 muestra. Son medidas y promediadas cinco muestras.

Calibre de material (grosor) El calibre del material es una medida del grosor y se mide a 3.5 g/cm^2 con un probador de volumen STARRET®, en unidades de milímetros. Las
20 muestras son cortadas en cuadros de 10.2 cm por 10.2 cm y son probadas cinco muestras y los resultados se promediaron.

Densidad La densidad de los materiales es calculada mediante el dividir el peso por área de unidad de la
25 muestra en gramos por metro cuadrado (gsm) por el calibre de material en milímetros (mm). El calibre debe ser medido a 3.5 g/cm^2 como se indicó arriba. Los resultados son multiplicados

por 0 001 para convertir el valor a gramos por centímetro cúbico (g/cc) Un total de cinco muestras pueden ser evaluadas y promediadas para los valores de densidad

5 Permeabilidad La permeabilidad (k , en cm^2) puede ser calculada y representa la resistencia al flujo de un líquido por un material Un líquido de viscosidad conocida (η , en pascal-segundos) es forzado a través del material de un grosor dado (t , en cm) a una tasa de flujo constante (v , en cm/seg) y
10 la resistencia al flujo, medida como una gota de presión (ΔP , en Pascal) es vigilada La permeabilidad es calculada usando la ecuación de flujo Darcy

$$K = v t \eta / \Delta P$$

Notar que $1 \text{ darcy} = 9.87 \times 10^{-9} \text{ cm}^2$

15 En una prueba para la permeabilidad, los parámetros típicos son una velocidad de 20 cm/seg , un grosor de muestra de 20-50 milésimas de pulgada y un líquido de prueba que tiene una viscosidad de alrededor de 6 pascal-seg

20 Descripción detallada de la invención

Esta tela no tejida de la invención tiene el superabsorbente contenido dentro de las microbolsas Este tejido tiene una alta permeabilidad y mantiene una alta
25 permeabilidad al flujo del líquido aún después de haberse mojado Una permeabilidad arriba de 1500 darcys y preferiblemente arriba de 2000 darcys se considera "alta"

3029

La tela no tejida de esta invención puede hacerse de un número de procesos, incluyendo la colocación por aire, la unión con hilado, el pegado y cardado, el soplado con fusión y el proceso coform. El material puede ser crepado después de la formación, se le puede dar una orientación de fibra en la dirección-Z durante la formación, o puede ser una estructura no tejida relativamente plana dentro de la cual son deprimidas las microbolsas. Las capas adicionales pueden ser agregadas a la estructura y está puede ser incluida en los productos para el cuidado personal.

El volumen en las microbolsas puede ser calculado en forma relativamente fácil y depende del método de fabricación de las bolsas. Una incorporación de esta invención es una tela unida con hilado unida previamente y crepada. Este se une en forma típica térmicamente al ser producido con un patrón de Hansen Pennings extendido u otro patrón con una colocación de cuadros o diamantes de los puntos de unión (otros despliegues pueden ser usados pero los cálculos deben ser modificados). Al ser crepada la tela, los puntos de unión se adherirán al tambor de crepado al ser este procesado, haciendo que la tela aumente su dimensión en la dirección-Z y disminuya o acorte en la dirección-X. Esto resulta en la creación de "microbolsas" útiles en esta invención para contener el superabsorbente el cual, en el caso de crepado son quizás vistas más fácilmente como protuberancias de fibra entre los puntos de unión con

3/30

espacio creado entre las fibras para acomodar el SAP. Un patrón EHP extendido típico tiene puntos de unión espaciados por alrededor de 2 464 mm de separación (véase la definición dada arriba) en un patrón cuadrado o de diamante. Con el crepado, la distancia (a) entre los puntos de unión disminuirá aproximadamente por el nivel de crepado (CL) expresado como un porcentaje y la altura de la tela aumenta por aproximadamente el nivel de crepado, dando un área y volumen abarcado por cualquier cuatro puntos de unión.

10

$$\text{Area} = ((100 - \text{CL}) * a^2) / 100$$

$$\text{Volumen por patrón cuadrado} = \text{area} * \text{CL} / 200$$

$$\text{Volumen para patrón de diamante} = \text{area} * (2^{0.5} * a / 2 * \text{CL}) / 200$$

15

Deberá notarse que las diferencias menores entre los volúmenes de patrón de cuadrados y diamantes se deben a la orientación del tejido cuando este sufre el crepado. Una tela unida con patrón cuadrado entra en el aparato de crepado con dos orillas de una caja formada por cuatro puntos de unión en la dirección de la máquina (MD) y dos en la dirección transversal (CD). Una tela unida con patrón de diamantes no tiene que tener una orientación y en vez de esto está orientada con las orillas de una caja formada por cuatro puntos de unión de aproximadamente 45 grados hacia fuera de cualquiera las direcciones transversal o de la máquina. También pueden ser usados desde luego otros patrones de unión. En estos casos, el

72/31

5 área correcta y el volumen deben ser calculados Esto puede
hacerse por aquellos expertos en el arte y esto puede ser
auxiliado por referencias estándar tal como un ejemplo, las
tablas matemáticas estándares CRC de CRC Press de Cleveland,
Ohio

10 El crepado de los tejidos contemplados para la
práctica de esta invención resulta en volúmenes de entre
alrededor de 0.33 a 10 cm cúbicos, más particularmente de entre
0.33 y 5 mm cúbicos, más particularmente de entre 0.5 y 1 mm
cúbico y aún más particularmente de entre 0.5 y 2 mm cúbicos

15 Como un ejemplo de esta invención, una tela no
tejida puede ser crepada a un nivel de alrededor de 40%, y
ponerse en un tambor con partículas superabsorbentes para hacer
una tasa de adición de alrededor de 50% por peso Tal adición
de partículas estará en todas las microbolsas en la tela, por
ejemplo, uniformemente, asumiendo que las microbolsas estuvieron
distribuidas uniformemente En forma alterna, un tramo de tela
crepada puede ser desenrollado alrededor de un rodillo o barra a
20 fin de abrir los dobleces de la tela crepada Al pasar la tela
sobre el rodillo, las partículas superabsorbentes pueden ser
agregadas en un patrón uniforme o no uniforme para estos
dobleces Tales incorporaciones se intenta que estén dentro del
alcance de esta invención

25

Otro método para hacer el tejido de esta invención
es el de comenzar con un tejido relativamente plano y pasarlo

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entre un rodillo con patrón y de yunque para crear depresiones en la tela. Una tela esponjada es preferida para esta incorporación ya que esta permitirá a la tela tener una profundidad suficiente para proporcionar microbolsas adecuadas.

5 Las telas esponjadas son preferiblemente unidas en un unidor a través de aire más bien que mediante unión de punto térmico debido a que la unión de punto térmico tiende a compactar la tela al pasar esta entre los rodillos. Una tela rizada de bicomponente, por ejemplo, la tela de la Patente a los Estados
10 Unidos de América No 5 382 400 otorgada a Pike que puede ser unida a través de aire debe trabajarse bien en la práctica de la invención. Después de la formación y de la unión, pueden ser creadas las depresiones en la tela. Esto puede hacerse, por ejemplo, mediante el usar la unión de punto térmico no calentada
15 y los rodillos de yunque planos. El patrón o calentado no usará un patrón que pueda pasar completamente a través del tejido sino que solo lo deprimirá en áreas preseleccionadas. El patrón puede ser uniforme o no uniforme siempre que las depresiones se hagan sobre ciertas áreas del tejido o proporcione un cambio de
20 densidad de depresiones al tejido. Los patrones los cuales pueden ser usados para la creación de las depresiones son muy variados, incluyendo aquellos mencionados anteriormente para la unión de punto térmico, como el patrón EHP extendido, el patrón EHP y el 714. Después de la formación de las depresiones, el
25 superabsorbente puede ser depositado en el tejido para llenar todas o algunas de las depresiones en un grado deseado.

3/33

En el caso de un rodillo de patrón y de yunque usado para crear las depresiones en la tela, el cálculo para determinar el tamaño de las microbolsas dependerá del tamaño de los pernos usados en el rodillo con patrón y de la profundidad de la penetración de los pernos adentro de la tela. El patrón EHP, si se insertó completamente en la tela, produce una microbolsa con un volumen de alrededor de 0.544 mm cúbicos y el patrón de EHP extendido a un volumen de alrededor de 0.876 mm cúbicos, por ejemplo

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Si la tela a la cual es agregada el superabsorbente es crepada, el superabsorbente debe permanecer en el lugar en las microbolsas formadas en los dobleces de la tela cuando la tela vuelve a asumir su posición normal. Si la tela está relativamente doblada y proporcionada con depresiones, puede ser necesaria un adhesivo para mantener el superabsorbente en el lugar. En forma alterna, la carga electrostática puede ser usada para alentar al superabsorbente a permanecer en las depresiones por medio de potenciales o polaridades eléctricas que difieren

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La carga electrostática de los tejidos se logra por el tratamiento de electreto el cual jala las partículas hacia la tela por virtud de su carga eléctrica. El tratamiento con electreto puede ser llevado a cabo por un número de técnicas diferentes. Una técnica está descrita en la Patente de los Estados Unidos de América No. 5,401,446 otorgada a Tsai y otros

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3534

y cedida a The University of Tennessee Research Corporation El inventor Tsai describe un proceso porque un tejido o película es sometido en secuencia a una serie de campos eléctricos de manera que los campos eléctricos tengan polaridades esencialmente opuestas unas con respecto a otros Por tanto, un lado del tejido de la película es inicialmente sometido a una carga positiva mientras que el otro lado del tejido o de la película es inicialmente sometido a una carga negativa Después, el primer lado del tejido o de la película se somete a una carga negativa y el otro lado del tejido de la película se somete a una carga positiva Tales tejidos son producidos con una densidad de carga relativamente alta sin una carga eléctrica estática de superficie inherente El proceso puede ser llevado a cabo mediante el pasar el tejido a través de una pluralidad de campos eléctricos dispersados los cuales pueden ser variados sobre un rango que depende de la carga deseada en el tejido El tejido puede ser cargado a un rango de alrededor de 1 kVDC/CM A 12 kVDC/CM o más particularmente 4 kVDC/cm a 10 kVDC/cm y aún más particularmente 7 kVDC/cm a alrededor de 8 kVDC/cm otros métodos de tratamiento de electreto se conoce en el arte tal como los que se describen en las Patentes de los Estados Unidos de América Nos 4 215 682 otorgada a Kubik y otros, 4 375 718 otorgada a Wadsworth, 4 592 815 otorgada a Nakao y 4 874 659 otorgada a Ando

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La tela usada en la práctica de esta invención puede tener fibras naturales, aún cuando los tejidos de fibras

7635

de polímero sintético son preferidas. Una cantidad efectiva de aglutinante, típicamente de desde 1 a 6% por peso (basada sobre el peso del tejido antes de la adición del superabsorbente) puede estar presente para ayudar a proporcionar integridad mecánica mediante el unir las fibras y las partículas juntas. El aglutinante puede ser más particularmente de entre 1 y 5% y aún más particularmente de entre 1 y 4%. Tanto como 80% por peso del tejido puede ser agregado como superabsorbente. Un rango más particular del superabsorbente es dentro de 25 y 75% por peso y aún más particularmente de entre 40 y 60% por peso.

Los superabsorbentes que son útiles en las presentes invenciones pueden ser escogidos de las clases basadas en la estructura química así como en la forma física. Estos incluyen superabsorbentes con una resistencia de gel baja, una resistencia de gel alta, superabsorbentes entrecruzados de superficie, superabsorbentes uniformemente entrecruzados, o superabsorbentes con una densidad entrecruzada variada a través de la estructura. Los superabsorbentes pueden estar basados en químicas que incluyen poli(ácido acrílico), poli(iso-butileno-co-anhídrido maléico), poli(óxido de etileno), carboximetil celulosa, poli(vinil pirrolidona) y poli(-alcohol vinílico). Los superabsorbentes pueden variar en tasa de hinchamiento de desde lenta a rápida. Los superabsorbentes pueden estar en la forma de espumas, partículas macroporosas o microporosas o fibras, partículas o fibras con morfología o recubrimientos en partículas o fibrosos. Los superabsorbentes pueden estar en la

forma de cintas, partículas, fibras, hojas o películas Los
superabsorbentes en la forma de partículas son preferidos para
la práctica de esta invención Los superabsorbentes pueden
estar en varias longitudes y tamaños y distribuciones de
5 diámetro Los superabsorbentes pueden estar en varios grados de
neutralización Los contraiones son típicamente Li, Na, K, Ca

Un superabsorbente de ejemplo fue obtenido de
Stockhausen, Inc y es designado FAVOR® SXM 880 Otro ejemplo
10 de estos tipos de superabsorbentes puede ser obtenido de Dow
Chemical Company bajo el nombre de comercio DRYTECH® 2035 Un
ejemplo de los superabsorbentes fibrosos puede ser obtenido de
Camelot Technologies, Ltd , de High River, Alberta, Canadá y
está designado FIBERDRI® 1241 Otro ejemplo incluido en estos
15 tipos de superabsorbentes es obtenido de Chemtall Inc o de
Riceboro, GA, y está designado FLOSORB 60 LADY®, también
conocido como LADYSORB 60® Los tipos adicionales de
superabsorbentes no listados aquí los cuales están
comercialmente disponibles en forma común y conocidos por
20 aquellos expertos en el arte también pueden ser útiles en las
presentes invenciones

Los aglutinantes típicamente usados en estas
estructuras ayudan a proporcionar una estabilidad e integridad
25 mecánica Los aglutinantes incluyen la fibra, el líquido u
otros medios de aglutinante que pueden ser activados
térmicamente Las fibras preferidas para la inclusión son

37

aquellas que tienen un punto de derretido relativo tal como las fibras de poliolefina. Los polímeros de punto de derretido más bajo proporciona la capacidad de unir la tela junta en los puntos de cruce de fibra con la aplicación de calor. Además, 5 las fibras que tienen un polímero de derretido más bajo, como las fibras conjugadas y de biconstituyentes son adecuadas para la práctica de la invención. Las fibras que tienen un polímero de derretido más bajo son generalmente mencionadas como "fibras fundibles". Por "polímeros de derretido más bajo" lo que se 10 quiere decir es aquellos que tienen una temperatura de transición del vidrio de menos de alrededor de 175°C. Deberá notarse que la textura del tejido absorbente puede ser modificada de suave a rígida a través de la selección del templado y fusión del polímero. Las fibras aglutinantes de 15 ejemplo incluyen las fibras de poliolefinas, poliamidas y poliésteres. Tres fibras aglutinantes adecuadas son las fibras conjugadas de núcleo y vaina disponibles de KoSa Inc (de Charlotte, Carolina del Norte) bajo la designación de comercio T-255 y T-256, ambas con una poliolefina, vaina o T-254, la cual 20 tiene una vaina de co-poliéster de derretido bajo. Muchas fibras aglutinantes adecuadas son conocidas por aquellos expertos en el arte y están disponibles de muchos fabricantes tales como Chisso y Fibervisions LLC de Wilmington, DE. Un aglutinante líquido adecuado es KYMENE® 557LX Hercules Inc, 25 Wilmington, DE. Otros aglutinantes líquidos adecuados incluyen los polímeros de emulsión de etileno vinil acetato vendidos por National Starch y Chemical Company (Bridgewater, Nueva Jersey).

3438

bajo la marca de las series DUR-O-SET® ELITE® (ELITE® 33 y ELITE® 22) Otros aglutinantes adecuados son venidos por Air Productos Polymers and Chemicals bajo el nombre AIRFLEX®

5 Las fibras sintéticas incluyen aquellas hechas de poliolefinas, poliamidas, poliésteres, rayón, acrílicos, superabsorbentes, celulosa regenerada TENCEL® y otras fibras sintéticas adecuadas conocidas por aquellos expertos en el arte Las fibras sintéticas también pueden incluir cosmotropos para
10 degradación del producto

Muchas poliolefinas están disponibles para la producción de fibra, por ejemplo los polietilenos tal como el polietileno de baja densidad lineal de Dow Chemical ASPUN®
15 6811A, el LLDPE 2553 y 25355 y el polietileno de alta densidad 12350 son tales polímeros adecuados Los polietilenos que tienen tasas de flujo de derretido, respectivamente, de alrededor de 26, 40, 25 y 12 Los polipropilenos formadores de fibra incluyen el polipropileno ESCORENE® PD 3445 de Exxon
20 Chemical Company y el PF304 de Montell Chemical Co Muchas otras poliolefinas también están disponibles

Las fibras naturales incluyen lana, algodón, lino, cáñamo y pulpa de madera Las pulpas de madera incluyen la
25 borra de madera suave estándar tal como NB-416 (de Weyerhaeuser Corporation de Tacoma, Washington) y CR-1654 (US Alliance Pulp Mills, Coosa, Alabama) La pulpa puede ser modificada a fin de

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mejorar las características inherentes de las fibras y su procesamiento. El rizado puede ser impartido a las fibras por métodos que incluyen el tratamiento químico o el torcido mecánico. El rizado es típicamente impartido antes del
5 entrecruzamiento o el rigidizado. Las pulpas pueden ser rigidizadas por el uso de agentes entrecruzadores tal como formaldehído o sus derivados, glutaraldehído, epíclorohidrina, compuestos metilolados tal como urea o derivados de urea, dialdehídos tal como anhídrido maléico, derivados de urea no
10 metilolados, ácido cítrico u otros ácidos policarboxílicos. Algunos de estos agentes son menos preferibles que otros debido a las preocupaciones ambientales y de salud. La pulpa también puede ser rigidizada por el uso de calor o tratamientos cáusticos tales como mercerización. Los ejemplos de estos tipos
15 de fibras incluyen NHB416 el cual son fibras de pulpa de madera suave del sur entrecruzadas químicamente las cuales mejoran los módulos húmedos, disponibles de Weyerhaeuser Corporation de Tacoma, WA. Otras pulpas útiles son la pulpa desunida (NF405) también de Weyerhaeuser. El producto HPZ3 de Buckeye
20 Technologies, Inc de Memphis, TN, tiene un tratamiento químico que asienta en un rizado y torcido, además de impartir una rigidez y elasticidad en seco y en húmedo agregada a la fibra. Otra pulpa adecuada es la pulpa Buckeye HPF2 y aún otra es SUPERSOFT® de International Paper Corporation. Las fibras de
25 rayón adecuadas son fibras Merge 18453 de 1.5 denier de Tencel Incorporated de Axis, Alabama.

Los ejemplos y los ejemplos comparativos se dan
abajo

Ejemplo 1

5 Un tejido de polipropileno de 13 6 (gsm) compuesto
de fibras de 3 5 denier se hizo de acuerdo al proceso de unión
con hilado, se unió con un patrón EHP extendido de diamantes y
se crepó 25% produciendo microbolsas con un volumen de 0 661 mm
cúbicos cada una Este material tuvo un peso base después del
10 crepado de 17 gsm y se dio de vueltas para agregar partículas
superabsorbentes de hasta una carga de 36% por peso sobre una
base seca La permeabilidad del tejido compuesto seco (no
hinchado) fue de 2000 darcys, de acuerdo al método de prueba
dado arriba El fluido usado para la prueba fue un aceite
15 mineral que tiene un viscosidad de 6 pascales por segundo y se
vende bajo la marca de comercio PENETECK® Una muestra del
tejido compuesto fue colocada en un volumen grande de 0 9% por
peso de solución de agua salada por un tiempo suficiente (por
aproximadamente 20 minutos) para hincharse aproximadamente al
20 equilibrio El tejido hinchado fue removido del baño de
solución de agua salada, se secó sobre su superficie y se probó
respecto de la permeabilidad de la misma manera que el tejido no
hinchado La permeabilidad del tejido compuesto completamente
hinchado fue de 2060 darcys

47/41

Ejemplo 2

Un tejido de polipropileno de 13 6 gsm compuesto de fibras de 3 5 denier se hizo de acuerdo al proceso de unión con hilado, se unió con un patrón EHP extendido de diamantes y se crepó 35% para producir microbolsas con un volumen de 1 2 mm cúbicos cada una Este material tuvo un peso base después del crepado de 18 3 gsm y fue agitado para agregar las partículas superabsorbentes hasta una carga de 45% por peso sobre una base seca La permeabilidad del tejido compuesto seco (no hinchado) fue de 2100 darcys, de acuerdo al método de prueba indicado arriba La permeabilidad del tejido compuesto o completamente hinchado fue de 2133 darcys

Ejemplo Comparativo 1

Se hizo un tejido de polipropileno de 13 6 gsm compuesto de fibras de 3 5 denier de acuerdo al proceso de unión con hilado, y se unió con un patrón de EHP extendido No se agregaron partículas superabsorbentes al tejido La permeabilidad al tejido seco fue de 450 darcys

Ejemplo comparativo 2

Se hizo un compuesto constituido de 35% por peso de superabsorbente y 75% por peso de pulpa por el proceso de colocado por aire El compuesto fue comprimido a una densidad inicial de 0 2 gsm La permeabilidad en seco fue de 10 darcys y la permeabilidad hinchada fue de 16 darcys

423
f3

Como puede verse de la tabla, los ejemplos tienen permeabilidades altas y mantuvieron sus permeabilidades bien al mojarse

5 Como se apreciará por aquellos expertos en el arte, los cambios y las variaciones a la invención están considerados como que están dentro de la capacidad de aquellos expertos en el arte. Los ejemplos de cada uno se incorporan aquí por referencia en su totalidad en la extensión consistente

10 con esta descripción. Tales cambios de variaciones se intentan por los inventores para que estén dentro del alcance a la invención

REIVINDICACIONES

- 1 Un material no tejido para productos para el cuidado personal que comprende una mezcla de fibras, aglutinante en una cantidad entre 1 y 6% por peso y superabsorbente en una cantidad entre 1 y 80% por peso, en donde dicho superabsorbente está contenido en microbolsas en dicho no tejido
- 2 El material tal y como se reivindica en la cláusula 1 caracterizado porque dicha concentración superabsorbente en dicho no tejido es de entre 25 y 75% por peso
- 3 El material tal y como se reivindica en la cláusula 1 caracterizado porque dicha concentración superabsorbente en dicho no tejido es de entre 40 y 60% por peso
- 4 El material tal y como se reivindica en la cláusula 1 caracterizado porque las microbolsas son formadas por crepado
- 5 El material tal y como se reivindica en la cláusula 1 caracterizado porque las microbolsas son formadas por un rodillo con patrón

6 El material tal y como se reivindica en la cláusula 5 caracterizado porque el rodillo con patrón no está calentado

5 7 El material tal y como se reivindica en la cláusula 1 caracterizado porque las microbolsas son de ente 0 33 a 10 mm cúbicos

8 El material tal y como se reivindica en la
10 cláusula 1 caracterizado porque las microbolsas son de ente 0 5 a 5 mm cúbicos

(9) Un pañal que comprende el material tal y como se reivindica en la cláusula 1

15

(10) Un calzoncillo de aprendizaje que comprende el material tal y como se reivindica en la cláusula 1

20

(11) Un producto para incontinencia que comprende el material tal y como se reivindica en la cláusula 1

(12) Un vendaje que comprende el material tal y como se reivindica en la cláusula 1

25

(13) Una toalla sanitaria que comprende el material tal y como se reivindica en la cláusula 1

4645

14 El material tal y como se reivindica en la cláusula 1 caracterizado porque la tela no tejida es tratada con electreto antes de la adición al superabsorbente

5

15

Una tela no tejida esponjada que comprende fibras y aglutinante en una cantidad de entre 1 y 6% por peso, en donde dicho tejido es procesado para producir microbolsas y en donde el superabsorbente es colocado en las microbolsas

10

16

El tejido tal y como se reivindica en la cláusula 15 caracterizado porque dicha tela no tejida es tratada con electreto antes de la adición del superabsorbente

17

El tejido tal y como se reivindica en la cláusula 15 caracterizado porque tiene una permeabilidad arriba de 1500 darcys

18

El tejido tal y como se reivindica en la cláusula 15 caracterizado porque tiene una permeabilidad arriba de 2000 darcys

20

R E S U M E N

Se proporciona un nuevo material no tejido para productos para el cuidado personal en donde el superabsorbente
5 está contenido en microbolsas en el no tejido Estas microbolsas pueden hacerse por crepado de una tela no tejida Estos materiales exhiben buena permeabilidad a los líquidos en condiciones antes y después del humedecimiento, evitando por tanto el bloqueo de gel y otros efectos negativos del
10 hinchamiento del superabsorbente dentro de una tela Tal material fibroso es útil en productos para el cuidado personal como pañales, calzoncillos de aprendizaje, prendas para la incontinencia y productos para la higiene de la mujer

15

20

PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To
STEVEN D. FLACK
KIMBERLY-CLARK WORLDWIDE INC
401 N LAKE STREET
NEENAH WI 54956

NOV 10 2003

PCT

NOTIFICATION OF TRANSMITTAL OF
INTERNATIONAL PRELIMINARY
EXAMINATION REPORT

(PCT Rule 71.1)

Date of Mailing
(day/month/year)

05 NOV 2003

Applicant's or agent's file reference

14729

IMPORTANT NOTIFICATION

International application No

International filing date (day/month/year)

Priority date (day/month/year)

PCT/US02/10680 ✓

05 April 2002 (05 04 2002) ✓

22 August 2001 (22 08 2001) ✓

Applicant

KIMBERLY-CLARK WORLDWIDE INC

- 1 The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes if any established on the international application
- 2 A copy of the report and its annexes if any, is being transmitted to the International Bureau for communication to all the elected Offices
- 3 Where required by any of the elected Offices the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices
- 4 **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301)

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/US

Mail Stop PCT Attn. IPEA/US
Commissioner for Patents
P O Box 1490
Alexandria Virginia 22313-1490

Facsimile No (703)305-3230

Authorized Officer
Secretary & Printer

Telephone No (703) 308-0661

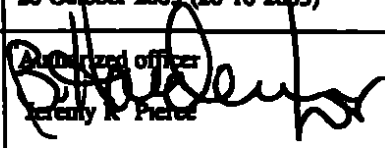
Form PCT/IPEA/416 (July 1992)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 14729	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No PCT/US02/10680	International filing date (day/month/year) 05 April 2002 (05 04 2002)	Priority date (day/month/year) 22 August 2001 (22 08 2001)
International Patent Classification (IPC) or national classification and IPC IPC(7) B32B 3/26 5/24 D21H 11/00 13/00 D04H 1/00 3/00 1/36 and US Cl. 428/304 4 311 11 315 5 442/401 604/367 380		
Applicant KIMBERLY-CLARK WORLDWIDE INC		
1 This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36 2 This REPORT consists of a total of <u>4</u> sheets including this cover sheet ☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70 16 and Section 607 of the Administrative Instructions under the PCT) These annexes consist of a total of <u> </u> sheets		
3 This report contains indications relating to the following items I ☒ Basis of the report II ☐ Priority III ☐ Non-establishment of report with regard to novelty, inventive step and industrial applicability IV ☐ Lack of unity of invention V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability, citations and explanations supporting such statement VI ☒ Certain documents cited VII ☐ Certain defects in the international application VIII ☐ Certain observations on the international application		
Date of submission of the demand 11 March 2003 (11 03 2003)	Date of completion of this report 20 October 2003 (20 10 2003)	
Name and mailing address of the IPEA/US Mail Stop PCT Attn. IPEA/US Commissioner for Patents P O Box 1450 Alexandria, Virginia 22313 1450 Facsimile No (703)305-3230	 Authorized officer Jeremy R. Pierce Telephone No (703) 308-0661	

Form PCT/IPEA/409 (cover sheet)(July 1998)

1 Basis of the report**1 With regard to the elements of the international application ***

- ☒ the international application as originally filed
- ☒ the description
pages 1 17 as originally filed
pages NONE filed with the demand
pages NONE filed with the letter of _____
- ☒ the claims
pages 18 and 19 as originally filed
pages NONE as amended (together with any statement) under Article 19
pages NONE filed with the demand
pages NONE filed with the letter of _____
- ☒ the drawings
pages None as originally filed
pages NONE filed with the demand
pages NONE filed with the letter of _____
- ☐ the sequence listing part of the description
pages NONE as originally filed
pages NONE filed with the demand
pages NONE filed with the letter of _____

2 With regard to the language all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item

These elements were available or furnished to this Authority in the following language _____ which is

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23 1(b))
- ☐ the language of publication of the international application (under Rule 48 3(b))
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55 2 and/or 55 3)

3 With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing

- ☐ contained in the international application in printed form
- ☐ filed together with the international application in computer readable form
- ☐ furnished subsequently to this Authority in written form
- ☐ furnished subsequently to this Authority in computer readable form
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

4 The amendments have resulted in the cancellation of

- ☐ the description, pages NONE
- ☐ the claims, Nos NONE
- ☐ the drawings, sheets/fig NONE

5 This report has been established as if (some of) the amendments had not been made since they have been considered to go beyond the disclosure as filed as indicated in the Supplemental Box (Rule 70 2(c)) **

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)

** Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No
PCT/US02/10680**V Reasoned statement under Rule 66 2(a)(ii) with regard to novelty, inventive step or industrial applicability, citations and explanations supporting such statement****1 STATEMENT**

Novelty (N)	Claims <u>7, 8, 14, 16-18</u>	YES
	Claims <u>1-6, 9-13, 15</u>	NO
Inventive Step (IS)	Claims <u>NONE</u>	YES
	Claims <u>1 18</u>	NO
Industrial Applicability (IA)	Claims <u>1 18</u>	YES
	Claims <u>NONE</u>	NO

2 CITATIONS AND EXPLANATIONS**NEW CITATIONS**

US 4 055 180 A (KARAMI) 25 October 1977 see column 1 line 55 -column 2 line 9

US 5 549 964 A (SHOHJI et al) 27 August 1996 see column 9 lines 60-62

Claims 1-6 9-13 and 15 lack novelty under PCT Article 33(2) as being anticipated by Karami (U S Patent No 4 055 180) Karami discloses a nonwoven material comprising fibers binder and superabsorbent material where the superabsorbent material is contained in pockets (column 1 lines 55-65) Claims 4-6 are directed to processing limitations for creating the pockets, but would not substantially change the actual product claim

Claims 7 8 17 and 18 lack an inventive step under PCT Article 33(3) as being obvious over Karami Claims 7 and 8 define a size of the pockets which would be obvious to a person having skill in the art to provide since it is merely adjusting a size parameter Claims 17 and 18 define a desired property of the product which if not inherent, would also be obviously provided by optimizing the desired properties of the nonwoven.

Claims 14 and 16 lack an inventive step under PCT Article 33(3) as being obvious over Karami in view of Shohji et al Karami does not teach electret treatment to the nonwoven Shohji et al teach that absorbent garments may undergo an electret treatment to improve filtering (column 9 lines 60-62) It would be obvious to a person having ordinary skill in the art to provide an electret treatment to the material of Karami in order to improve filtering as taught by Shohji et al

Claims 1 18 meet the criteria set out in PCT Article 33(4) and thus have industrial applicability because the subject matter claimed can be made or used in industry

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No

PCT/US02/10680

VI Certain documents cited

1 Certain published documents (Rule 70 10)

Application No

Patent No

US 6 428 350

Publication Date

(day/month/year)

06 August 2002 (06 08 2002)

Filing Date

(day/month/year)

27 August 1999 (27 08 1999)

Priority date (valid claim)

(day/month/year)

None

2 Non-written disclosures (Rule 70 9)

Kind of non-written disclosure

Date of non-written disclosure

(day/month/year)

Date of written disclosure referring to
non-written disclosure

(day/month/year)

TRATADO DE COOPERACIÓN DE PATENTES

52
53

Remitente

OFICINA ENCARGADA DEL EXAMEN PRELIMINAR INTERNACIONAL

PCT

A
STEVEN D FLACK
KIMBERLY-CLARK WORLDWIDE, INC
401 N LAKE STREET
NEENAH, WI 54596

NOTIFICACIÓN DE TRANSMISIÓN DEL REPORTE DEL EXAMEN PRELIMINAR INTERNACIONAL

(Regla 71.1 PCT)

Fecha de envío
(Día/Mes/Año)

05 NOV 2003

No de Expediente del Solicitante o Apoderado
14792

COMUNICACIÓN IMPORTANTE

No de Solicitud Internacional
PCT/US02/10880

Fecha Internacional de Presentación
(día/mes/año)
05 de Abril de 2002 (05 04 2002)

Fecha de Prioridad (día/mes/año)
22 de Agosto de 2001 (22 08 2001)

Solicitante

KIMBERLY-CLARK WORLDWIDE, INC

1 Se comunica al solicitante que la oficina encargada del examen preliminar internacional le envía con el presente el informe de examen preliminar internacional elaborado para la solicitud internacional en caso dado con los anexos correspondientes.

2 Una copia del informe en caso dado con los anexos correspondientes, se hace llegar a la Oficina Internacional para su envío posterior a todas las oficinas seleccionadas.

3 A solicitud de una oficina seleccionada la Oficina Internacional preparará una traducción del informe (pero no de los anexos) al inglés y la remitirá a esta oficina.

4 RECORDATORIO

Para ingresar en la fase nacional el solicitante dentro de los 30 meses a partir de la fecha de prioridad (o en algunas oficinas incluso después) tiene que realizar ante cada oficina seleccionada ciertos actos (entrega de traducciones y desembolso de honorarios nacionales) (Artículo 39 (1)) (véase también la información remitida por la Oficina Internacional en el Formulario PCT/IB/301)

Si se tiene que enviar a una oficina seleccionada una traducción de la solicitud internacional, entonces esta traducción tiene que incluir traducciones de todos los anexos al informe de examen preliminar internacional. Es obligación del solicitante elaborar dichas traducciones y hacerlas llegar directamente a las oficinas seleccionadas respectivas.

Mayores detalles en cuanto a los plazos normativos y los requisitos de las oficinas seleccionadas se desprenden del Volumen II de la guía PCT para solicitantes.

Nombre y dirección postal de la IPEA/US

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Comisionado de Patentes
P O Box 1450
Alexandria, Virginia 22313-1450
Facsimil No (703)305-3230

Empleado Autorizado

Jeremy R Pierce

Teléfono No 703-308-0661

Formulario PCT/IPEA/416 (Julio 1992)

TRATADO SOBRE COOPERACIÓN INTERNACIONAL
EN MATERIA DE PATENTES

PCT

INFORME DE EXAMEN PRELIMINAR INTERNACIONAL
(Artículo 36 y Regla 70 PCT)

53

No de Expediente del Solicitante o Apoderado 14792	PROCEDIMIENTO POSTERIOR Véase comunicación sobre el envío del informe de examen preliminar internacional (Formulario PCT/IPEA/416)	
No Solicitud Internacional PCT/US02/10680	Fecha Internacional de Presentación (día/mes/año) 05 de Abril de 2002 (05 04 2002)	Fecha de Prioridad (día/mes/año) 22 de 3 Agosto de 2001 (22 08 2001)
Clasificación Internacional de Patente (IPC) o Clasificación Nacional e IPC IPC(7) B32B 3/26 5/24 D21H 11/00 13/00 D04H 1/00 3/00 1/56 y US CL 428/304.4 311 1 315 5 442/401 604/367 380		
Solicitante KIMBERLY-CLARK WORLDWIDE, INC		

1 Este informe de examen preliminar internacional fue elaborado por la Oficina Encargada del Examen Preliminar Internacional y se envía al solicitante según Artículo 36

2 Esta INFORME comprende un total de 4 hojas Incluye esta portada

☐ Además se adjuntan ANEXOS al Informe en este caso se trata de hojas con descripciones reivindicaciones y/o dibujos que se modificaron y que sirven de base a este informe y/o hojas con correcciones efectuadas por esta oficina (véase Regla 70.16 y Sección 807 de las instrucciones administrativas al PCT)

Estos anexos comprenden en total de 0 hojas

3. Este informe contiene datos con respecto a los siguientes puntos

- I ☒ Base del Informe
- II ☐ Prioridad
- III ☐ Sin elaboración de un dictamen sobre novedad actividad inventiva y posibilidad de aplicación industrial
- IV ☐ Uniformidad deficiente de la invención
- V ☒ Declaración justificada según Artículo 35(2) con respecto a la novedad la actividad inventiva y la posibilidad de aplicación industrial; documentos y explicaciones que sustentan esta declaración
- VI ☒ Ciertos documentos enumerados
- VII ☐ Ciertas deficiencias del registro internacional
- VIII ☐ Ciertas observaciones relacionadas con la solicitud internacional

Fecha de presentación de la petición 11 de Marzo de 2003 (11 03 2003)	Fecha de la preparación de este informe 20 de Octubre de 2003 (20 10 2003)
Nombre y dirección postal del IPEA/US Mail Stop PCT Attn IPEA/US Comisionado de Patentes P O Box 1450 Alexandria Virginia 22313-1450 Facsimil No (703)305-3230	Empleado Autorizado Jeremy R Price Telefono (703) 308-0661

Formulario PCT/IPEA/409 (hoja de portada)(Julio de 1998)

INFORME DEL EXAMEN PRELIMINAR INTERNACIONAL

Solicitud Internacional No
PCT/US02/10680

I Bases para este reporte

1 Respecto a los elementos de la solicitud internacional *

- ☒ la solicitud internacional como se entregó originalmente
- ☒ la descripción
 - páginas 1-17 _____ como se entregaron originalmente
 - páginas NINGUNA _____ como se entregaron con la demanda
 - páginas NINGUNA _____ como se entregaron con la carta de _____
- ☒ las reivindicaciones
 - páginas 18 y 19 _____ como se entregaron originalmente
 - páginas NINGUNA _____ como se entregaron (junto con cualquier declaración) bajo el Artículo 19
 - páginas NINGUNA _____ como se entregaron con la demanda
 - páginas NINGUNA _____ como se entregaron con la carta de _____
- ☒ los dibujos
 - páginas Ninguna _____ como se entregaron originalmente
 - páginas NINGUNA _____ como se entregaron con la demanda
 - páginas NINGUNA _____ como se entregaron con la carta de _____
- ☐ la lista de la descripción
 - páginas NINGUNA _____ como se entregaron originalmente
 - páginas NINGUNA _____ como se entregaron con la demanda
 - páginas NINGUNA _____ como se entregaron con la carta de _____

2 Respecto al idioma, todos los elementos anteriormente marcados estaban disponibles o fueron suministrados a esta oficina en el idioma en el que se entregó la solicitud internacional, a menos que se diga lo contrario en este punto. Estos elementos estaban disponibles o fueron entregados a esta oficina en el siguiente idioma _____ los cuales son

- ☐ El idioma de la traducción entregada para propósitos de la búsqueda internacional (Regla 23 1 (b))
- ☐ El idioma de publicación de la solicitud internacional (bajo la Regla 48 3 (b))
- ☐ El idioma de la traducción entregada para propósitos del examen preliminar internacional (bajo las Reglas 55 2 y/o 55 3)

3 respecto a cualquier secuencia de nucleótido y/o aminoácidos divulgados en esta solicitud internacional, el examen preliminar internacional se realizó sobre la base de la secuencia

- ☐ contenida en la solicitud en forma impresa
- ☐ entregada junto con la solicitud internacional en una forma legible en un computador
- ☐ suministrada subsiguientemente a esta oficina de forma escrita
- ☐ suministrada subsiguientemente a esta oficina en forma legible en un computador
- ☐ la declaración que la secuencia escrita suministrada no va más allá de lo divulgado en la solicitud internacional como se entregó ha sido suministrada
- ☐ La declaración que la información registrada en la forma legible a computador es idéntica a la secuencia escrita ha sido suministrada

4 ☐ Las correcciones han resultado en la cancelación de

- ☐ la descripción páginas NINGUNA
- ☐ las reivindicaciones, Nos NINGUNA
- ☐ los dibujos, hojas/figuras NINGUNA

5 ☐ Este informe ha sido admitido como si (algunas de) las enmendaduras no hubieran sido hechas, ya que se considera que estas van más allá de la divulgación preliminar como se indica el Apartado Suplementario (Regla 70 2 (c)) **

* Las hojas de reemplazo que han sido suministradas a la Oficina receptora en respuesta a una invitación bajo el Artículo 14 se mencionan en este informe como "entregadas originalmente" y no se anexan a este informe ya que no contienen enmendaduras (Reglas 70 16 y 70 17)

** Cualquier hoja de reemplazo que contiene tales enmendaduras debe mencionarse bajo el asunto 1 de este informe

V Declaración concluyente de acuerdo a la Regla 66 2 (a)(ii) con relación a la novedad, el nivel inventivo o la aplicabilidad industrial citas y explicaciones que soportan tal declaración

1 DECLARACIÓN

Novedad (N)	Reivindicaciones 7, 8, 14, 16-18	Si
	Reivindicaciones 1-6, 9-13, 15	No
Nivel Inventivo (IS)	Reivindicaciones NINGUNA	Si
	Reivindicaciones 1-18	No
Aplicabilidad Industrial (IA)	Reivindicaciones 1-18	Si
	Reivindicaciones NINGUNA	No

2 CITAS Y EXPLICACIONES

———— NUEVAS CITAS Y EXPLICACIONES ————

US⁴ 055,180 A (KARAMI) 25 de Octubre de 1997 ver columna 1, línea 55 – columna 2 línea 9
US^{5,549,984}A (SHOHJI y colaboradores) 27 de Agosto de 1996, ver columna 9 líneas 60-62

Las reivindicaciones 1-6, 9-13 y 15 carecen de novedad bajo el Artículo 33(2) del PCT como lo anticipa Karami (Patente U S 4,055,180) Karami divulga un material no tejido que comprende fibras aglomerante, y un material súperabsorbente donde el material súperabsorbente es contenido en bolsillos (columna 1, líneas 55-65) Las reivindicaciones 4-6 se dirigen a limitaciones de procesamiento para crear los bolsillos, pero no cambiarán sustancialmente la reivindicación actual del producto

Las reivindicaciones 7 8 17 y 18 carecen de nivel inventivo de acuerdo al Artículo 33(3) del PCT ya que es obvio sobre Karami Las reivindicaciones 7 y 8 definen un tamaño del bolsillo que sería obvio de proporcionar para una persona que tenga habilidad en el arte ya que meramente ajusta un parámetro Las reivindicaciones 17 y 18 definen una propiedad deseada del producto, la cual si no es inherente, también sería obviamente proporcionada por optimización de las propiedades deseadas del material no tejido

Las reivindicaciones 14 y 16 carecen de nivel inventivo bajo el Artículo 33(3) ya que es obvio sobre Karami en vista de Shohji y colaboradores Karami no enseña un tratamiento de electreto al no tejido Shohji y colaboradores enseñan que las prendas absorbentes pueden soportar un tratamiento de electreto para mejorar el filtrado (columna 9, líneas 60-62) Sería obvio para una persona con una habilidad ordinaria en el arte proporcionar untratamiento de electreto al material de Karami con el fin de mejora el filtrado como lo enseña Shohji y colaboradores

Las reivindicaciones 1-18 cumplen los criterios fijados en el Artículo 33(4) del PCT, y por lo tanto tienen aplicabilidad industrial porque el asunto de la materia reivindicada se puede hacer o usar en la industria

56

VI Ciertos documentos citados

1 Ciertos documentos publicados (Regla 70 10)

Solicitud No. <u>Patente No</u>	Fecha de Publicación <u>(día/mes/año)</u>	Fecha de Entrega <u>(día/mes/año)</u>	Fecha de Prioridad (Reivindicación válida) <u>(día/mes/año)</u>
U S 6 429 350	06 de Agosto de 2002 (06 08.2002)	27 de Agosto de 1999 (27 08 1999)	Ninguna

2 Divulgaciones no escrita (Regla 70 9)

<u>Tipo de divulgación no escrita</u>	Fecha de la divulgación no escrita <u>(día/mes/año)</u>	Fecha de la divulgación escrita que hace referencia a la divulgación no escrita <u>(día/mes/año)</u>
---------------------------------------	--	--

PCT REQUEST

Original (for SUBMISSION) printed on 05 04 2002 09:14 44 AM

14729

0	For receiving Office use only	
0 1	International Application No	
0-2	International Filing Date	
0-3	Name of receiving Office and "PCT International Application	
0-4	Form PCT/RO/101 PCT Request	
0-4-1	Prepared using	PCT-EASY Version 2 92 (updated 01 01 2002)
0-5	Petition The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty	
0-6	Receiving Office (specified by the applicant)	United States Patent and Trademark Office (USPTO) (RO/US)
0-7	Applicant's or agent's file reference	14729
I	Title of invention	NONWOVEN COMPOSITE WITH HIGH PRE- AND POST-WETTING PERMEABILITY
II	Applicant	
II 1	This person is.	applicant only
II 2	Applicant for	all designated States
II-4	Name	KIMBERLY-CLARK WORLDWIDE, INC
II-5	Address	401 N Lake Street Neenah, WI 54956 United States of America
II-6	State of nationality	US
II 7	State of residence	US
II-8	Telephone No	(920) 721-5580
II 9	Facsimile No.	(920) 721-7339
III-1	Applicant and/or Inventor	
III-1 1	This person is	inventor only
III 1-4	Name (LAST First)	VARONA, Eugenio, Go
III 1-5	Address	3309 Woodrun Trail Marietta, GA 30062 United States of America

7458

2/7

PCT REQUEST

14729

Original (for SUBMISSION) printed on 05 04 2002 09 14 44 AM

IV-1	Agent or common representative, or address for correspondence The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as	agent
IV 1 1	Name (LAST First)	FLACK, Steven, D
IV 1-2	Address	KIMBERLY-CLARK WORLDWIDE, INC 401 N Lake Street Neenah, WI 54956 United States of America
IV 1 3	Telephone No	(770) 587-8646
IV 1-4	Facsimile No	(920) 721-7339
IV 1-5	Agent's registration No	40608
IV-2	Additional agent(s)	additional agent(s) with same address as first named agent
IV 2 1	Name(s)	BENDEL, Michael, J (39605); CHARLIER, Patricia, A (38840); CONNELLY, Thomas, J. (28404); CROFT, Gregory, E. (27542); CURTIN, Jeffrey, B (37601); DEAN, Ralph, H (41550); DUDKOWSKI, Alyssa, A (40596); FIELDHACK, Randall, W (43611); GAGE, Thomas, M. (33385); GARRISON, Scott, B (39198); HARPS, Joseph, P (28854); HERRICK, William, D (25468); KAPPES, Kyle, K (34846); KIRBY, John, P (25348); KLEMBUS, Nancy, M (40051); KYRIAKOU, Chris, S (42776); LEACH, Nicholas, N (31776); LETSON, William, W (42797); MIELKE, Thomas, J (31399); MILLER, Douglas, L (30406); PARKER, Thomas, M (42063); PUGLIESE III, Sebastian, C (42091); ROBINSON, James, B (34912); SHANE, Rick, M (50921); SIDOR, Karl, V (32597); STANO, Dana, E (50750); TULLEY, JR., Douglas, H (34743); WATSON, Sue, C (38850); WILSON, Patrick, C (31893); YEE, Paul, Y (29460)

59

PCT REQUEST

14729

Original (for SUBMISSION) printed on 05 04 2002 09 14 44 AM

V	Designation of States	
V 1	Regional Patent (other kinds of protection or treatment, if any are specified between parentheses after the designation(s) concerned)	AP GH GM KE LS MW MZ SD SL SZ TZ UG ZM ZW and any other State which is a Contracting State of the Harare Protocol and of the PCT EA AM AZ BY KG KZ MD RU TJ TM and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT EP AT BE CH&LI CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE TR and any other State which is a Contracting State of the European Patent Convention and of the PCT OA BF BJ CF CG CI CM GA GN GQ GW ML MR NE SN TD TG and any other State which is a member State of OAPI and a Contracting State of the PCT
V-2	National Patent (other kinds of protection or treatment if any are specified between parentheses after the designation(s) concerned)	AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH&LI CN CO CR CU CZ DE DK DM DZ EC 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 MZ NO NZ OM PH PL PT RO RU SD SE SG SI SK SL TJ TM TN TR TT TZ UA UG UZ VN YU ZA ZM ZW
V-5	Precautionary Designation Statement In addition to the designations made under Items V 1 V-2 and V-3 the applicant also makes under Rule 4 9(b) all designations which would be permitted under the PCT except any designation(s) of the State(s) indicated under Item V-6 below The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit.	
V-6	Exclusion(s) from precautionary designations	NONE
VI 1	Priority claim of earlier national application	
VI-1 1	Filing date	22 August 2001 (22 08 2001)
VI 1-2	Number	09/935,088
VI 1-3	Country	US

6/60

PCT REQUEST

14729

Original (for SUBMISSION) printed on 05 04 2002 09 14 44 AM

VI-2	Priority document request The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) identified above as item(s):	VI - 1	
VII 1	International Searching Authority Chosen	European Patent Office (EPO) (ISA/EP)	
VIII	Declarations	Number of declarations	
VIII 1	Declaration as to the identity of the inventor	-	
VIII 2	Declaration as to the applicant's entitlement, as at the international filing date to apply for and be granted a patent	1	
VIII-3	Declaration as to the applicant's entitlement, as at the international filing date to claim the priority of the earlier application	1	
VIII-4	Declaration of inventorship (only for the purposes of the designation of the United States of America)	-	
VIII 5	Declaration as to non-prejudicial disclosures or exceptions to lack of novelty	-	

61

PCT REQUEST

14729

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VIII-2 1	Declaration Entitlement to apply for and be granted a patent Declaration as to the applicant's entitlement as at the international filing date to apply for and be granted a patent (Rules 4 17(II) and 51bis 1(a)(II)) In a case where the declaration under Rule 4 17(IV) is not appropriate Name	in relation to this international application KIMBERLY-CLARK WORLDWIDE, INC is entitled to apply for and be granted a patent by virtue of the following.
VIII 2 1 (IV)		an assignment from VARONA, Eugenio, Go to KIMBERLY-CLARK WORLDWIDE, INC , dated 22 August 2001 (22 08 2001)
VIII-2 1 (IX)	This declaration is made for the purposes of	all designations except the designation of the United States of America

62

PCT REQUEST

14729

Original (for SUBMISSION) printed on 05 04 2002 09 14 44 AM

VIII-3-1	Declaration Entitlement to claim priority Declaration as to the applicant's entitlement, as at the International filing date to claim the priority of the earlier application specified below where the applicant is not the applicant who filed the earlier application or where the applicant's name has changed since the filing of the earlier application (Rules 4 17(III) and 51bis 1(a)(II)) Name	in relation to this international application KIMBERLY-CLARK WORLDWIDE, INC is entitled to claim priority of earlier application No 09/935,088 by virtue of the following
VIII-3-1 (iv)		an assignment from VARONA, Eugenio, Go to KIMBERLY-CLARK WORLDWIDE, INC , dated 22 August 2001 (22 08 2001)
VIII-3-1 (x)	This declaration is made for the purposes of	all designations

5463

7/7

PCT REQUEST

14729

Original (for SUBMISSION) printed on 05 04 2002 09 14 44 AM

IX	Check list	number of sheets	electronic file(s) attached
IX-1	Request (including declaration sheets)	7	-
IX 2	Description	17	-
IX-3	Claims	2	-
IX-4	Abstract	1	EZABST00 TXT
IX-5	Drawings	0	-
IX 7	TOTAL	27	
	Accompanying Items	paper document(s) attached	electronic file(s) attached
IX-8	Fee calculation sheet	✓	-
IX-9	Original separate power of attorney	✓	-
IX 17	PCT-EASY diskette	-	Diskette
IX 18	Other (specified)	POST CARD	-
IX 19	Figure of the drawings which should accompany the abstract		
IX-20	Language of filing of the international application	English	
X 1	Signature of applicant agent or common representative		
X-1 1	Name (LAST First)	DUDKOWSKI, Alyssa, A.	

FOR RECEIVING OFFICE USE ONLY

10 1	Date of actual receipt of the purported international application	
10-2	Drawings	
10-2-1	Received	
10-2 2	Not received	
10-3	Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application	
10-4	Date of timely receipt of the required corrections under PCT Article 11(2)	
10-5	International Searching Authority	ISA/EP
10-6	Transmittal of search copy delayed until search fee is paid	

FOR INTERNATIONAL BUREAU USE ONLY

11 1	Date of receipt of the record copy by the International Bureau	
------	--	--

PCT (ANNEX - FEE CALCULATION SHEET)

Original (for SUBMISSION) printed on 05 04 2002 09:14 44 AM

(This sheet is not part of and does not count as a sheet of the international application)

0	For receiving Office use only	
0-1	International Application No.	
0-2	Date stamp of the receiving Office	
0-4	Form PCT/RO/101 (Annex) PCT Fee Calculation Sheet	
0-4-1	Prepared using	PCT-EASY Version 2 92 (updated 01 01 2002)
0-8	Applicant's or agent's file reference	14729
2	Applicant	KIMBERLY-CLARK WORLDWIDE, INC
12	Calculation of prescribed fees	fee amount/multiplier Total amounts (USD)
12-1	Transmittal fee T	⇒ 240
12 2 1	Search fee S	⇒ 866
12 2-2	International search to be carried out by	EP
12-3	International fee	
	Basic fee	
	(first 30 sheets) b1	407
12-4	Remaining sheets	0
12-5	Additional amount (X)	9
12-6	Total additional amount b2	0
12 7	b1 + b2 = B	407
12-8	Designation fees	
	Number of designations contained in international application	92
12-9	Number of designation fees payable (maximum 5)	5
12 10	Amount of designation fee (X)	88
12 11	Total designation fees D	440
12 12	PCT-EASY fee reduction R	-125
12 13	Total international fee (B+D-R) I	⇒ 722
12 14	Fee for priority document	
	Number of priority documents requested	1
12 15	Fee per document (X)	15
12 16	Total priority document fee P	⇒ 15
12 17	TOTAL FEES PAYABLE (T+S++P)	⇒ 1,843
12 19	Mode of payment	authorization to charge deposit account
12-20	Deposit account instructions	
	The receiving Office	United States Patent and Trademark Office (USPTO) (RO/US)
12-20-1	Authorization to charge the total fees indicated above	✓

ff 65

2/2

PCT (ANNEX - FEE CALCULATION SHEET)

14729

Original (for SUBMISSION) printed on 05 04 2002 09 14 44 AM

12-20-2	Authorization to charge any deficiency or credit any overpayment in the total fees indicated above	✓
12-20-3	Authorization to charge the fee for priority document.	✓
12-21	Deposit account No.	11-0875
12-22	Date	05 April 2002 (05 04 2002)
12-23	Name and signature	DUDKOWSKI, Alyssa, A <i>Alyssa A Dudkowski</i>

VALIDATION LOG AND REMARKS

13-2-2	Validation messages States	Green? More designations could be made The following States have not been designated US Please verify
13-2-7	Validation messages Contents	Green? The international application contains no drawings Please verify
13-2-8	Validation messages Payment	Green? Please ensure that you have a valid deposit account with the receiving Office selected

66

The demand must be filed directly with the competent International Preliminary Examining Authority or if two or more Authorities are competent, with the one chosen by the applicant. The full name or two-letter code of that Authority may be indicated by the applicant on the line below.

IPEA/ US

PCT

CHAPTER II

DEMAND

under Article 31 of the Patent Cooperation Treaty
The undersigned requests that the international application specified below be the subject of
international preliminary examination according to the Patent Cooperation Treaty and
hereby elects all eligible States (except where otherwise indicated)

For International Preliminary Examining Authority use only		
Identification of IPEA		Date of receipt of DEMAND
Box No. I IDENTIFICATION OF THE INTERNATIONAL APPLICATION		Applicant's or agent's file reference 14729
International application No PCT/US02/10680	International filing date (day/month/year) 5 April 2002 (05/04/2002)	(Earliest) Priority date (day/month/year) 22 August 2001 (22/08/2001)
Title of invention NONWOVEN COMPOSITE WITH HIGH PRE- AND POST-WETTING PERMEABILITY		
Box No. II APPLICANT(S)		
Name and address (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) KIMBERLY-CLARK WORLDWIDE, INC 401 North Lake Street Neenah, Wisconsin 54956 USA		Telephone No (920) 721-7068
		Facsimile No. (920) 721-7339
		Teleprinter No.
		Applicant's registration No. with the Office
State (that is, country) of nationality US		State (that is, country) of residence US
Name and address (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)		
State (that is, country) of nationality		State (that is, country) of residence
Name and address (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)		
State (that is, country) of nationality		State (that is, country) of residence
☐ Further applicants are indicated on a continuation sheet		

6767

Sheet No. 2

International application No
PCT/US02/10680

Box No. III AGENT OR COMMON REPRESENTATIVE OR ADDRESS FOR CORRESPONDENCE

The following person is ☒ agent ☐ common representative

and ☒ has been appointed earlier and represents the applicant(s) also for international preliminary examination

☐ is hereby appointed and any earlier appointment of (an) agent(s)/common representative is hereby revoked

☐ is hereby appointed specifically for the procedure before the International Preliminary Examining Authority in addition to the agent(s)/common representative appointed earlier

Name and address *(Family name followed by given name for a legal entity, full official designation. The address must include postal code and name of country.)*

FLACK, Steven D
KIMBERLY-CLARK WORLDWIDE, INC
401 North Lake Street
Neenah, Wisconsin 54956 US

Telephone No.

(770) 587-8646

Facsimile No.

(920) 721-7339

Teleprinter No

Agent's registration No. with the Office
40608

☐ Address for correspondence: Mark this check box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

Box No. IV BASIS FOR INTERNATIONAL PRELIMINARY EXAMINATION

Statement concerning amendments *

1 The applicant wishes the international preliminary examination to start on the basis of:

☒ the international application as originally filed

the description

☐ as originally filed

☐ as amended under Article 34

the claims

☐ as originally filed

☐ as amended under Article 19 (together with any accompanying statement)

☐ as amended under Article 34

the drawings

☐ as originally filed

☐ as amended under Article 34

2 ☐ The applicant wishes any amendment to the claims under Article 19 to be considered as reversed.

3 ☐ The applicant wishes the start of the international preliminary examination to be postponed until the expiration of 20 months from the priority date unless the International Preliminary Examining Authority receives a copy of any amendments made under Article 19 or a notice from the applicant that he does not wish to make such amendments (Rule 69 1(d)) *(This check-box may be marked only where the time limit under Article 19 has not yet expired.)*

* Where no check-box is marked international preliminary examination will start on the basis of the international application as originally filed or where a copy of amendments to the claims under Article 19 and/or amendments of the international application under Article 34 are received by the International Preliminary Examining Authority before it has begun to draw up a written opinion or the international preliminary examination report, as so amended

Language for the purposes of international preliminary examination **English**

☒ which is the language in which the international application was filed

☐ which is the language of a translation furnished for the purposes of international search.

☒ which is the language of publication of the international application

☐ which is the language of the translation (to be) furnished for the purposes of international preliminary examination

Box No. V ELECTION OF STATES

The applicant hereby elects all eligible States *(that is, all States which have been designated and which are bound by Chapter II of the PCT)*

excluding the following States which the applicant wishes not to elect

Sheet No 3.

International application No.
PCT/US02/10680

Box No. VI CHECK LIST

The demand is accompanied by the following elements, in the language referred to in Box No. IV for the purposes of international preliminary examination

- | | |
|---|--------|
| 1 translation of international application | sheets |
| 2 amendments under Article 34 | sheets |
| 3 copy (or where required translation) of amendments under Article 19 | sheets |
| 4 copy (or where required, translation) of statement under Article 19 | sheets |
| 5 letter | sheets |
| 6 other (specify) | sheets |

For International Preliminary Examining Authority use only

- | received | not received |
|--------------------------|--------------------------|
| ☐ | ☐ |
| ☐ | ☐ |
| ☐ | ☐ |
| ☐ | ☐ |
| ☐ | ☐ |
| ☐ | ☐ |

The demand is also accompanied by the item(s) marked below

- | | |
|--|--|
| 1 ☒ fee calculation sheet | 5 ☐ statement explaining lack of signature |
| 2 ☐ original separate power of attorney | 6 ☐ sequence listings in computer readable form |
| 3 ☐ original general power of attorney | 7 ☐ tables in computer readable form related to sequence listings |
| 4 ☐ copy of general power of attorney reference number if any | 8 ☒ other (specify) Post Card and PCT Intl Search Report |

Box No. VII SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the demand).

Karl V Sidor

Karl V Sidor
Patent Attorney

For International Preliminary Examining Authority use only

1 Date of actual receipt of DEMAND

2 Adjusted date of receipt of demand due to CORRECTIONS under Rule 60 1(b)

3 ☐ The date of receipt of the demand is AFTER the expiration of 19 months from the priority date and item 4 or 5 below does not apply

☐ The applicant has been informed accordingly

4 ☐ The date of receipt of the demand is WITHIN the period of 19 months from the priority date as extended by virtue of Rule 80 5

5 ☐ Although the date of receipt of the demand is after the expiration of 19 months from the priority date the delay in arrival is EXCUSED pursuant to Rule 82

For International Bureau use only

Demand received from IPEA on

PCT

FEE CALCULATION SHEET

Annex to the Demand

International application No. PCT/US02/10680 Applicant's or agent's file reference 14729	For International Preliminary Examining Authority use only Date stamp of the IPEA																
Applicant KIMBERLY-CLARK WORLDWIDE, INC																	
CALCULATION OF PRESCRIBED FEES <table style="width: 100%;"> <tr> <td style="width: 50%;">1 Preliminary examination fee</td> <td style="width: 10%; text-align: right;">750 00</td> <td style="width: 10%; text-align: center;">P</td> <td style="width: 30%;"></td> </tr> <tr> <td>2 Handling fee (Applicants from certain States are entitled to a reduction of 75% of the handling fee. Where the applicant is (or all applicants are) so entitled, the amount to be entered at H is 25% of the handling fee.)</td> <td style="text-align: right;">146 00</td> <td style="text-align: center;">H</td> <td></td> </tr> <tr> <td>3 Total of prescribed fees Add the amounts entered at P and H and enter total in the TOTAL box</td> <td style="text-align: right;">896 00</td> <td></td> <td></td> </tr> <tr> <td></td> <td colspan="3" style="text-align: center;">TOTAL</td> </tr> </table>		1 Preliminary examination fee	750 00	P		2 Handling fee (Applicants from certain States are entitled to a reduction of 75% of the handling fee. Where the applicant is (or all applicants are) so entitled, the amount to be entered at H is 25% of the handling fee.)	146 00	H		3 Total of prescribed fees Add the amounts entered at P and H and enter total in the TOTAL box	896 00				TOTAL		
1 Preliminary examination fee	750 00	P															
2 Handling fee (Applicants from certain States are entitled to a reduction of 75% of the handling fee. Where the applicant is (or all applicants are) so entitled, the amount to be entered at H is 25% of the handling fee.)	146 00	H															
3 Total of prescribed fees Add the amounts entered at P and H and enter total in the TOTAL box	896 00																
	TOTAL																
MODE OF PAYMENT <table style="width: 100%;"> <tr> <td>☒ authorization to charge deposit account with the IPEA (see below)</td> <td>☐ cash</td> </tr> <tr> <td>☐ cheque</td> <td>☐ revenue stamps</td> </tr> <tr> <td>☐ postal money order</td> <td>☐ coupons</td> </tr> <tr> <td>☐ bank draft</td> <td>☐ other (specify)</td> </tr> </table>		☒ authorization to charge deposit account with the IPEA (see below)	☐ cash	☐ cheque	☐ revenue stamps	☐ postal money order	☐ coupons	☐ bank draft	☐ other (specify)								
☒ authorization to charge deposit account with the IPEA (see below)	☐ cash																
☐ cheque	☐ revenue stamps																
☐ postal money order	☐ coupons																
☐ bank draft	☐ other (specify)																
AUTHORIZATION TO CHARGE (OR CREDIT) DEPOSIT ACCOUNT (This mode of payment may not be available at all IPEAs) <table style="width: 100%;"> <tr> <td style="width: 50%;"> ☒ Authorization to charge the total fees indicated above. ☒ (This check-box may be marked only if the conditions for deposit accounts of the IPEA so permit) Authorization to charge any deficiency or credit any overpayment in the total fees indicated above. </td> <td style="width: 50%;"> IPEA/ <u>US</u> Deposit Account No <u>11-0875</u> Date <u>11 March 2003</u> Name <u>Karl V Sidor</u> Signature <u>Karl V Sidor</u> </td> </tr> </table>		☒ Authorization to charge the total fees indicated above. ☒ (This check-box may be marked only if the conditions for deposit accounts of the IPEA so permit) Authorization to charge any deficiency or credit any overpayment in the total fees indicated above.	IPEA/ <u>US</u> Deposit Account No <u>11-0875</u> Date <u>11 March 2003</u> Name <u>Karl V Sidor</u> Signature <u>Karl V Sidor</u>														
☒ Authorization to charge the total fees indicated above. ☒ (This check-box may be marked only if the conditions for deposit accounts of the IPEA so permit) Authorization to charge any deficiency or credit any overpayment in the total fees indicated above.	IPEA/ <u>US</u> Deposit Account No <u>11-0875</u> Date <u>11 March 2003</u> Name <u>Karl V Sidor</u> Signature <u>Karl V Sidor</u>																

PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To
STEVEN D FLACK
KIMBERLY-CLARK WORLDWIDE INC
401 N LAKE STREET
NEENAH WI 54956

PCT

WRITTEN OPINION

(PCT Rule 66)

Date of Mailing (day/month/year) 11 JUL 2003	
Applicant's or agent's file reference 14729	REPLY DUE within 2 months/days from the above date of mailing
International application No PCT/US02/10680 ✓	International filing date (day/month/year) 05 April 2002 (05 04 2002) ✓
Priority date (day/month/year) 22 August 2001 (22 08 2001) ✓	
International Patent Classification (IPC) or both national classification and IPC IPC(7) B32B 3/26 5/24 D21H 11/00 13/00 D04H 1/00 3/00 1/56 and US Cl 428/304 4 311 11 315 5 442/401 604/367 380	
Applicant KIMBERLY-CLARK WORLDWIDE INC	

- 1 This written opinion is the first (first, etc) drawn by this International Preliminary Examining Authority
- 2 This opinion contains indications relating to the following items
 - I ☒ Basis of the opinion
 - II ☐ Priority
 - III ☐ Non-establishment of opinion with regard to novelty inventive step and industrial applicability
 - IV ☐ Lack of unity of invention
 - V ☒ Reasoned statement under Rule 66 2 (a)(ii) with regard to novelty inventive step or industrial applicability citations and explanations supporting such statement
 - VI ☒ Certain documents cited
 - VII ☐ Certain defects in the international application
 - VIII ☐ Certain observations on the international application
- 3 The applicant is hereby invited to reply to this opinion

When? See the time limit indicated above ~~The applicant may, before the expiration of that time limit, request this Authority to grant an extension. See rule 66.2(d).~~

How? By submitting a written reply accompanied where appropriate by amendments according to Rule 66 3 For the form and the language of the amendments see Rules 66 8 and 66 9

Also For an additional opportunity to submit amendments see Rule 66 4
For the examiner's obligation to consider amendments and/or arguments see Rule 66 4 bis
For an informal communication with the examiner see Rule 66 6

If no reply is filed, the international preliminary examination report will be established on the basis of this opinion
- 4 The final date by which the international preliminary examination report must be established according to Rule 69 2 is 22 December 2003 (22 12 2003)

Name and mailing address of the IPEA/US Mail Stop PCT Attn IPEA/US Commissioner for Patents P O Box 1450 Alexandria Virginia 22313 1450 Facsimile No (703)305 3230	Authorized officer Jeremy R Pierce Telephone No (703) 308-0661
---	--

Form PCT/IPEA/408 (cover sheet)(July 1998)

WRITTEN OPINION

International application No

PCT/US02/10680

71

I Basis of the opinion

1 With regard to the elements of the international application *

- ☒ the international application as originally filed
- ☒ the description
 pages 1 17 as originally filed
 pages NONE filed with the demand
 pages NONE filed with the letter of _____
- ☒ the claims
 pages 18 and 19 as originally filed
 pages NONE as amended (together with any statement) under Article 19
 pages NONE filed with the demand
 pages NONE filed with the letter of _____
- ☒ the drawings
 pages None as originally filed
 pages NONE filed with the demand
 pages NONE filed with the letter of _____
- ☐ the sequence listing part of the description
 pages NONE as originally filed
 pages NONE filed with the demand
 pages NONE filed with the letter of _____

2 With regard to the language all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item
 These elements were available or furnished to this Authority in the following language _____ which is

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23 1(b))
- ☐ the language of publication of the international application (under Rule 48 3(b))
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55 2 and/or 55 3)

3 With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the written opinion was drawn on the basis of the sequence listing

- ☐ contained in the international application in printed form
- ☐ filed together with the international application in computer readable form
- ☐ furnished subsequently to this Authority in written form
- ☐ furnished subsequently to this Authority in computer readable form
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

4 ☐ The amendments have resulted in the cancellation of

- ☐ the description pages NONE
- ☐ the claims, Nos NONE
- ☐ the drawings sheets/fig NONE

5 ☐ This opinion has been drawn as if (some of) the amendments had not been made since they have been considered to go beyond the disclosure as filed as indicated in the Supplemental Box (Rule 70 2(c))

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this opinion as "originally filed"

WRITTEN OPINION

International application No.
PCT/US02/10680**V Reasoned statement under Rule 66 2(a)(i) with regard to novelty, inventive step or industrial applicability, citations and explanations supporting such statement****1 STATEMENT**

Novelty (N)	Claims <u>7, 8, 14, 16-18</u>	YES
	Claims <u>1-6, 9-13, 15</u>	NO
Inventive Step (IS)	Claims <u>NONE</u>	YES
	Claims <u>1-18</u>	NO
Industrial Applicability (IA)	Claims <u>1-18</u>	YES
	Claims <u>NONE</u>	NO

2 CITATIONS AND EXPLANATIONS**NEW CITATIONS**

US 4 055 180 A (KARAMI) 25 October 1977 see column 1 line 55 -column 2 line 9

US 5 549 964 A (SHOHJI et al) 27 August 1996 see column 9 lines 60-62

Claims 1-6 9-13 and 15 lack novelty under PCT Article 33(2) as being anticipated by Karami (U S Patent No 4,055 180) Karami discloses a nonwoven material comprising fibers binder and superabsorbent material where the superabsorbent material is contained in pockets (column 1, lines 55-65) Claims 4-6 are directed to processing limitations for creating the pockets, but would not substantially change the actual product claim

Claims 7 8 17 and 18 lack an inventive step under PCT Article 33(3) as being obvious over Karami Claims 7 and 8 define a size of the pockets which would be obvious to a person having skill in the art to provide since it is merely adjusting a size parameter Claims 17 and 18 define a desired property of the product which if not inherent would also be obviously provided by optimizing the desired properties of the nonwoven

Claims 14 and 16 lack an inventive step under PCT Article 33(3) as being obvious over Karami in view of Shohji et al Karami does not teach electret treatment to the nonwoven Shohji et al teach that absorbent garments may undergo an electret treatment to improve filtering (column 9 lines 60-62) It would be obvious to a person having ordinary skill in the art to provide an electret treatment to the material of Karami in order to improve filtering as taught by Shohji et al

Claims 1-18 meet the criteria set out in PCT Article 33(4) and thus have industrial applicability because the subject matter claimed can be made or used in industry

WRITTEN OPINION

International application No
PCT/US02/10680

73

Supplemental Box

(To be used when the space in any of the preceding boxes is not sufficient)

TIME LIMIT

The time limit set for response to a Written Opinion may not be extended 37 CFR 1.484(d). Any response received after the expiration of the time limit set in the Written Opinion will not be considered in preparing the International Preliminary Examination Report.

WRITTEN OPINION

International application No

PCT/US02/10680

74

VI Certain document cited

1 Certain published documents (Rule 70 10)

Application No

Publication Date

Filing Date

Priority Date (valid claim)

Patent No

(day/month/year)

(day/month/year)

(day/month/year)

US 6 429 350

06 August 2002 (06 08 2002)

27 August 1999 (27 08 1999)

None

2 Non-written disclosures (Rule 70 9)

Kind of non-written disclosure

Date of non written disclosure

(day/month/year)

Date of written disclosure referring to
non-written disclosure

(day/month/year)

United States Patent [19]

Karnal

[11]

4,055,180

[45]

Oct. 25, 1977

[34] ABSORBENT ARTICLE WITH RETAINED HYDROCOLLOID MATERIAL

[75] Inventor: Hannah Karnal, Crystal Lake, Ill.

[73] Assignee: Colgate-Palmolive Company, New York, N.Y.

[21] Appl. No. 679,841

[22] Filed: Apr. 23, 1976

[31] Int. Cl.² A61B 13/02; A61F 13/16

[32] U.S. Cl. 128/287; 128/284; 128/290 P; 128/296

[36] Field of Search 128/284, 287, 290 R, 128/290 P, 296

[36] References Cited

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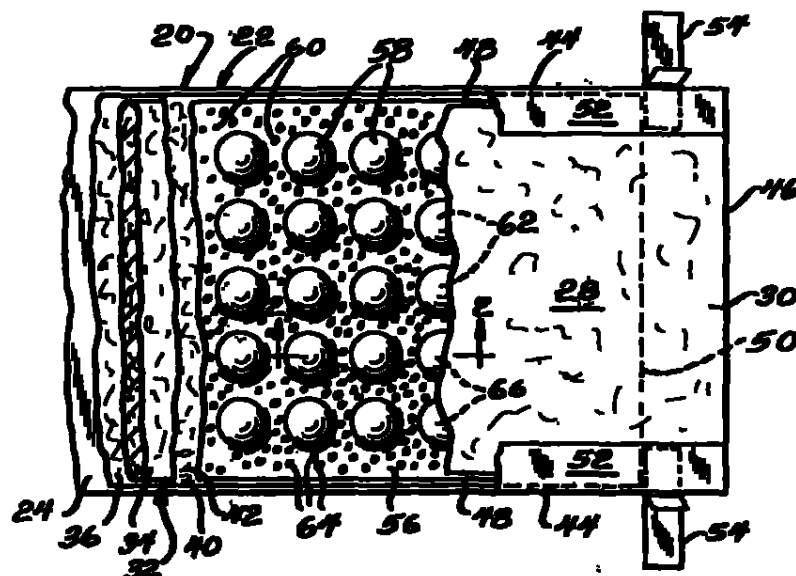
Primary Examiner—Aldrich F. Medbery

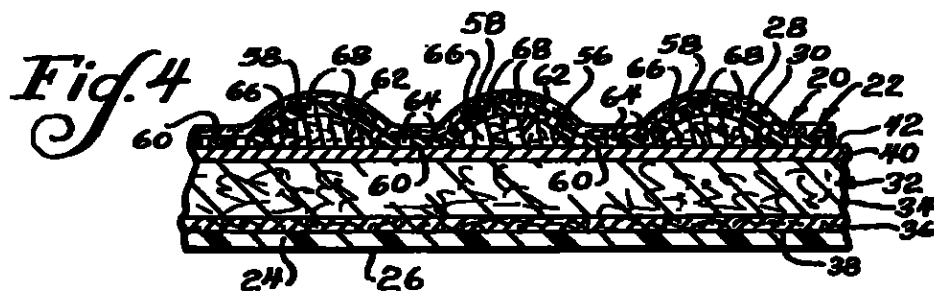
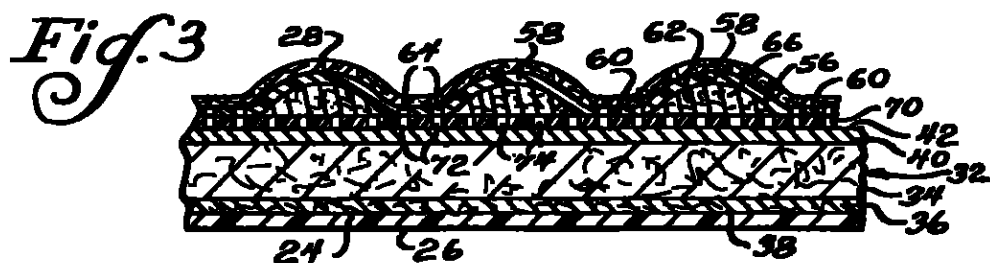
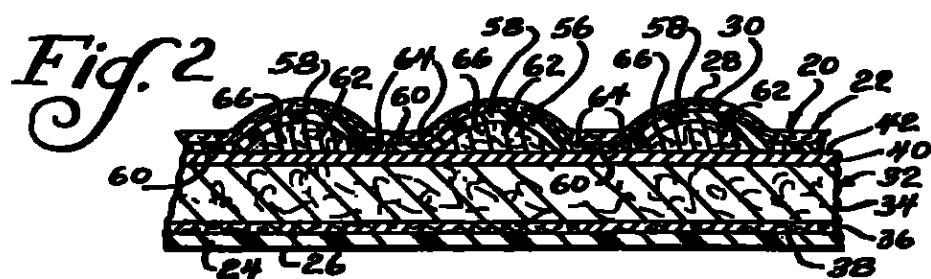
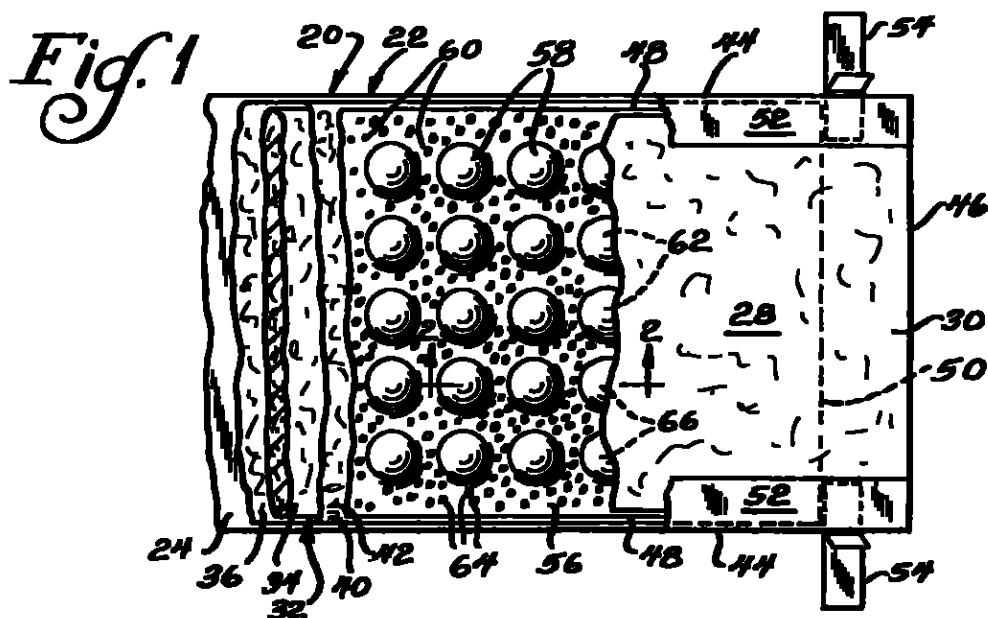
Attorney, Agent, or Firm—Powell L. Springer

[57] ABSTRACT

An absorbent article comprising, an absorbent pad assembly having an absorbent pad, and pockets for retaining a hydrocolloid material in association with the pad.

31 Claims, 13 Drawing Figures





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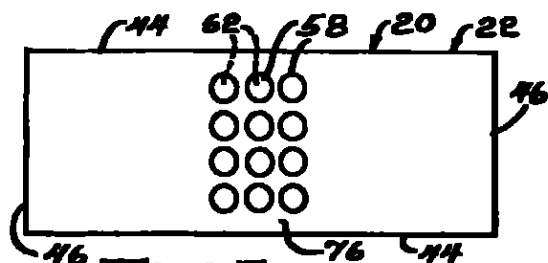


Fig. 5

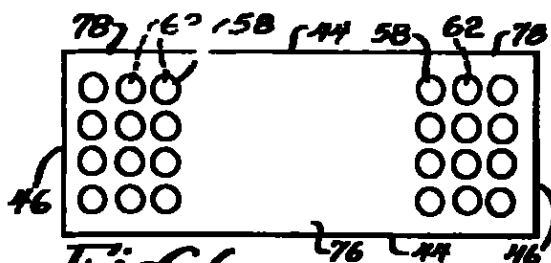


Fig. 6

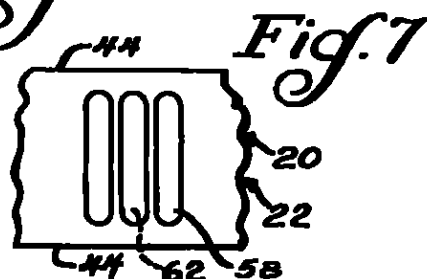


Fig. 7



Fig. 8

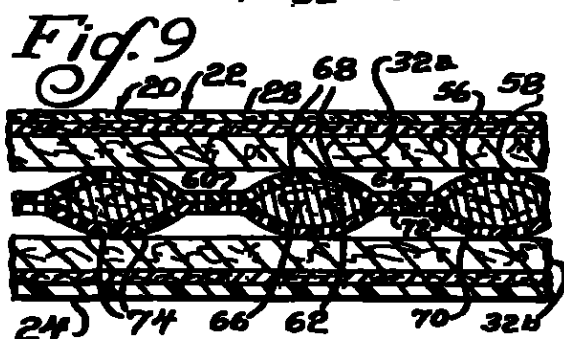


Fig. 9

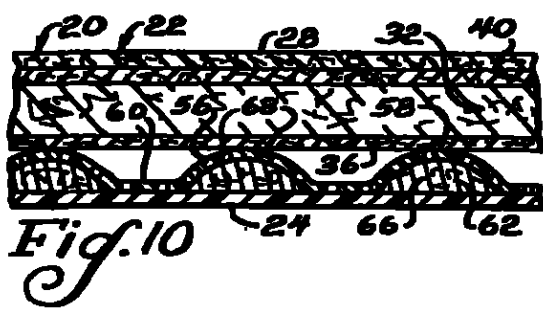


Fig. 10

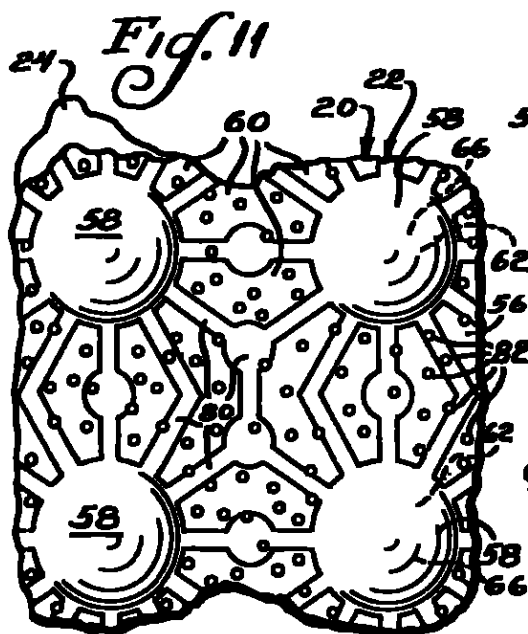


Fig. 11

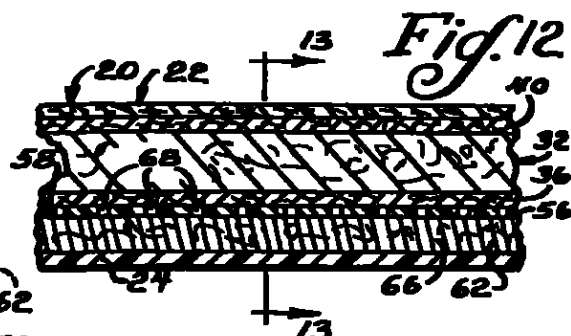


Fig. 12

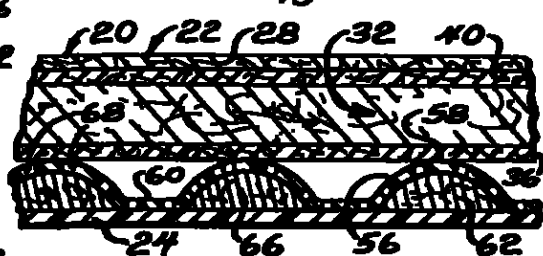


Fig. 13

ABSORBENT ARTICLE WITH RETAINED HYDROCOLLOID MATERIAL

BACKGROUND OF THE INVENTION

The present invention relates to absorbent articles.

A various assortment of absorbent articles, such as disposable diapers and sanitary napkins, have been proposed for absorbing and retaining body fluids. Such articles have been constructed with an absorbent pad having a relatively large volume of pad material, in order to provide the necessary absorbency and fluid holding capacity for the articles, which add an undesired bulk to the articles. For example, disposable diapers are commonly made from a fluid impervious backing sheet, a fluid pervious cover sheet, and an absorbent pad, such as comminuted wood pulp known in the art as wood fluff, located between the backing and cover sheets. The pads of such conventional diapers are relatively bulky, particularly in the crotch region, resulting in a poor fit and minimal comfort to the infant.

More recently, it has been proposed to include highly absorbent materials, such as hydrocolloid polymers, in the pads. In theory, the hydrocolloid materials permit a reduction in pad bulk while increasing desirable absorbent and fluid holding characteristics of the pads, since such materials are capable of absorbing and retaining many times their weight in liquid, such as urine or other body fluids. In practice, use of such materials in absorbent articles has been limited due to numerous difficulties caused by the nature of the materials.

Initially, it is preferred that the hydrocolloid materials be utilized in a particulate form, such as granules or flakes, since the particles provide a greater exposed surface area for increased absorbency. However, it has been found that when placed in the pad, the particles migrate in the pad before the article has been used by the wearer. Particle migration may take place during packaging, storage, transportation, or other handling of the articles, and results in movement of the particles from their initial location to remote parts of the pad where they are less effective.

When wetted, the hydrocolloid materials swell and become gelatinous, and assume a slippery or slimy texture which is unstable. As a result, the materials migrate further in the pad when wetted, and cause the pad to become unstable. Thus, it has been found that the wetted materials cause the pads to shift, ball, split and shred during use of the articles. Further, certain of the wetted hydrocolloid materials may be somewhat irritating to the skin, and it is thus desirable to minimize contact of the materials with the skin.

SUMMARY OF THE INVENTION

A principal feature of the present invention is the provision of an absorbent article which retains a hydrocolloid material at a fixed location for improved performance of the article.

The article of the present invention comprises an absorbent pad assembly having an absorbent pad, and a first retaining sheet. The sheet is attached to the pad or a second retaining sheet in areas and is free of attachment in regions between the areas to define pocket means. The pad assembly has a hydrocolloid material positioned in the pocket means.

A feature of the invention is that the retaining sheet prevents migration of the hydrocolloid material prior to and during use of the article.

Another feature of the present invention is that the hydrocolloid material is retained at a desired location in the article to provide maximum absorbency and fluid retention during use of the article.

A further feature of the invention is that the article prevents movement of the hydrocolloid material into the absorbent pad during use of the article, and thus prevents degradation of the pad by the wetted hydrocolloid material.

Still another feature of the invention is that the article prevents contact of the wetted hydrocolloid material against the wearer's skin.

Further features will become more fully apparent in the following description of the embodiments of this invention and from the appended claims.

DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a fragmentary plan view of an absorbent article of the present invention, shown in the form of a disposable diaper;

FIG. 2 is a fragmentary sectional view taken substantially as indicated along the line 2-2 of FIG. 1;

FIG. 3 is a fragmentary sectional view of another embodiment of the article of the present invention;

FIG. 4 is a fragmentary sectional view of another embodiment of the article of the present invention;

FIG. 5 is a diagrammatic plan view showing an embodiment of the article of the present invention;

FIG. 6 is a diagrammatic plan view showing an embodiment of the article of the present invention;

FIG. 7 is a diagrammatic fragmentary plan view showing an embodiment of the article of the present invention;

FIG. 8 is a diagrammatic plan view showing an embodiment of the article of the present invention;

FIG. 9 is a fragmentary sectional view of another embodiment of the article of the present invention;

FIG. 10 is a fragmentary sectional view of another embodiment of the article of the present invention;

FIG. 11 is a fragmentary plan view showing a retaining portion in another embodiment of the article of the present invention;

FIG. 12 is a fragmentary sectional view of another embodiment of the article of the present invention; and

FIG. 13 is a fragmentary sectional view taken substantially as indicated along the line 13-13 of FIG. 12.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIGS. 1 and 2, there is shown an absorbent article generally designated 20 having an absorbent pad assembly 22. For convenience, the article 20 is disclosed in the form of a disposable diaper although it will be understood that the invention is applicable to other absorbent articles, such as sanitary pads and maternity napkins.

The pad assembly 22 has a fluid impervious backing sheet 24, such as polyethylene, defining a back surface 26 of the article or diaper, a fluid pervious top or cover sheet 28 defining a front surface 30 for the diaper, and an absorbent pad 32 positioned intermediate the top sheet 28 and backing sheet 24. The absorbent pad 32 may have a pad portion 34 comprising a cellulosic material, such as one or more sheets of cellulosic wadding or comminuted wood pulp known in the art as wood fluff, a back wadding sheet 36 of cellulosic material defining a back surface 38 of the pad 32, and a front

X478

wadding sheet 40 of cellulosic material defining a front surface 42 of the pad 32. The front and back wadding sheets 40 and 36, respectively, provide structural integrity for the pad portion 34 during use of the article.

As illustrated in FIG. 1, the pad assembly 22 has a pair of side edges 44 and end edges 46 connecting the side edges 44, and the absorbent pad 32 has a pair of side edges 48 and end edges 50 connecting the side edges 48. In a preferred form, the side edges 48 of the pad 32 are located adjacent the side edges 44 of the pad assembly 22, and the backing sheet 24 has lateral side margins 52 folded over and secured to the top sheet 28 over lateral side margins of the pad 32. The diaper may have conventional tape fasteners 54 for use in securing the diaper about an infant during placement of the diaper.

Referring to FIGS. 1 and 2, the pad assembly 22 has a fluid impervious retaining sheet 56 positioned intermediate the top sheet 28 and the front wadding sheet 40. The retaining sheet 56 is free of attachment or spaced from the wadding sheet 40 in a plurality of spaced regions 58, and is attached to the front surface 42 of the wadding sheet 40 in areas 60 surrounding the regions 58. Thus, the retaining sheet 56 and wadding sheet 40 define a plurality of spaced pockets 62 located intermediate the retaining sheet 56 and front wadding sheet 40. In the particular embodiment shown, the pockets 62 have a generally circular shape, and are aligned laterally and longitudinally along the pad assembly 22.

Although the retaining sheet 56 may be attached to the front wadding sheet 40 by any suitable means, such as adhesive, in a preferred form the retaining sheet 56 comprises a film of thermoplastic material, such as polyethylene, and the film is fused to the front wadding sheet in the areas 60 by suitable means, such as by heating. As shown, the areas 60 of the retaining sheet or film 56 have a plurality of openings or apertures 64 extending through the sheet 56 to permit passage of body fluids through the openings 64 into the pad 32. Although the openings 64 may be formed in any suitable manner, in one form the openings may comprise perforations in the sheet 56 which are enlarged by heating when the sheet 56 is fused to the pad, in a manner similar to that described in my copending application Ser. No. 552,463, filed Feb. 24, 1975. In the present embodiment, as shown, the retaining sheet 56 is closed in the regions 58 to prevent passage of fluids between the pockets 62 and the front surface 38 of the pad assembly 22.

The pad assembly 22 has a hydrocolloid material 66, such as (a) hydrolyzed starch polyacrylonitrile copolymer H-span, Product 35-A-100, Grain Processing Corp., Muscatine, Iowa, disclosed in U.S. Pat. No. 3,661,815, (b) Product No. XD-8587.01L, which is cross-linked, Dow Corning Chemical Co., Midland, Michigan, (c) Product No. SGP 5028, General Mills Chemical, Inc., Minneapolis, Minnesota, (d) Product No. 78-3710, National Starch and Chemical Corp., New York, N.Y., (e) a hydrogel base product, Carbowax, a trademark of Union Carbide Corp., Charleston, West Virginia, or (f) base-saponified starch-polyacrylonitrile and graft copolymers, United States Department of Agriculture, Peoria, Illinois, disclosed in U.S. Pat. No. 3,425,971, which is positioned in the pockets 62. Such hydrocolloid materials have the capability of absorbing many times their weight in liquids such as urine or other body fluids, and swell and form a gelatinous mass when wetted. In general, the hydrocolloid materials useful in the articles of the present invention may be organic or

inorganic, are physiologically nonobjectionable (non-toxic), and are characterized by swelling in the presence of water, by a relatively high affinity for water, and by normally at least partially assuming a suspension in the presence of water. Preferably, the hydrocolloid materials are utilized in a particulate form, such as powders, granules, or flakes, although they may be coated on one or more of the sheets in a solution, if desired.

The retaining sheet 56 and front wadding sheet 40 retain the hydrocolloid materials 66 in the pockets 62, and prevent migration of the materials 66 into and throughout the pad portion 34 during transportation, storage, or other handling of the articles prior to use. Thus, the materials 66 are retained at desired locations in the pad assembly 22 for maximum benefit during use, and are prevented from passing to undesired locations in the pad assembly prior to use of the article.

During use of the article or diaper 20, body fluids pass through the openings 64 of the retaining sheet areas 60 and into the pad 32, after which the body fluids are permitted to pass through the front wadding sheet 40 into the pockets 62 for absorption and retention by the hydrocolloid materials 66. The front wadding sheet 40 has a sufficient wet strength to prevent passage of the wetted hydrocolloid material 66 through the wadding sheet 40 into the pad portion 34, such that the wadding sheet 40 serves as a second retaining sheet to retain the wetted materials in the pockets during use of the article. Additionally, the wetted materials 66 are prevented from entering the pad portion 34 to eliminate degradation of the pad, such as shifting, ballooning, splitting, or shredding of the pad portion 34, which otherwise might occur due to the unstable and slippery texture of the wetted materials 66. Moreover, the closed regions 58 of the retaining sheet 56 prevent passage of the wetted materials 66 to the front surface of the pad assembly, and thus prevent contact of the wetted materials against the wearer's skin. However, if desired, the regions 58 of the retaining sheet 56 may have relatively small openings or apertures 68, as shown in FIG. 4, by maintaining the size of the openings 68 smaller than the size of the hydrocolloid particles. Thus, the openings 68 permit passage of body fluids into the pockets 62, but are sufficiently small to prevent passage of the wetted materials to the front surface of the article. In this regard, it is noted that the particles swell when wetted, further limiting the possibility of passage of the particles through the openings 68. Although the retaining sheet 56 has been described as being attached to the front surface of the pad, it will be appreciated that the sheet may be attached to the back surface of the pad, or to a surface of a pad layer, if desired.

Another embodiment of the present invention is illustrated in FIG. 3, in which like reference numerals designate like parts. In this embodiment, the pad assembly 22 has a second retaining sheet 70 attached to the first retaining sheet 56 in the areas 60, and defining pockets 62 in the regions 58, such that the hydrocolloid material 66 is retained in the pockets 62 intermediate the retaining sheets 56 and 70. In a preferred form, the second retaining sheet 70 comprises a fluid impervious material, such as polyethylene, and has a plurality of openings 72 aligned with the openings 64 of the first retaining sheet 56 to permit passage of body fluids through the retaining sheets 56 and 70. The second retaining sheet 70 also has a plurality of openings 74 in the regions 58 to permit passage of body fluids into the pockets 62. Thus, in the embodiment shown, the second retaining sheet 70 is

87
79

positioned adjacent the front surface 43 of the pad 32, such that body fluids pass through the openings 64 and 72 of the retaining sheets 56 and 70, respectively, into the pad during use of the article, and from the pad 32 through the openings 74 of the sheet 70 into the pockets 62 for absorption and retention by the hydrocolloid materials 66. As before, the materials 66 are retained in the pockets 62 before and during use of the article. In this regard, the size of the openings 74 is preferably less than the size of the hydrocolloid particles 66 in the pockets 62.

If desired, the second retaining sheet 70 may comprise a cellulosic sheet additional to the wadding sheet, with sufficient wet strength to prevent passage of the wetted hydrocolloid materials 66 through the sheet 70, or the sheet 70 may be arranged with the top wadding sheet 40 to prevent passage of such wetted materials. In a preferred form, at least one of the first and second retaining sheets 56 and 70 comprises a film of thermoplastic material, and the sheets are fused together in the areas 60. If desired, the first and second retaining sheets 56 and 70 may be located intermediate the backing sheet 24 and the back surface 38 of the pad 32, or may be positioned intermediate layers of absorbent pads.

A diagrammatic view showing an arrangement of the article pockets is set forth in FIG. 5. In this embodiment, the regions 58 and pockets 62 retaining the hydrocolloid materials have a generally circular shape and are arranged in rows in a longitudinal central portion of the article 20 between the end edges 46. For example, in a disposable diaper, the pockets 62 may be located in a crotch region 76 at the point of contact of body fluids during use of the diaper. However as shown in FIG. 6, if desired the pockets 62 may be arranged adjacent the end edges 46 of the article, for example, in waistline portions 78 of a disposable diaper. In an alternative form, as shown in FIG. 7, the pockets 62 and regions 58 may be elongated, and may extend laterally between the side edges 44 of the article 20. In a further form, as shown in FIG. 8, the elongated regions 58 and pockets 62 may extend longitudinally between the end edges 46 of the article 20.

Another embodiment of the article 20 of the present invention is illustrated in FIG. 9, in which like reference numerals designate like parts. In this embodiment, the pad assembly 22 has first and second layers 32a and 32b of absorbent pads, and first and second retaining sheets 56 and 70 positioned intermediate the pads 32a and 32b. The sheets 56 and 70 are preferably made from a fluid impervious material, such as polyethylene, and are attached together in the areas 60, such as by fusing, while being spaced in the regions 58 or otherwise defining pockets 62 intermediate the retaining sheets 56 and 70. The sheets 56 and 70 have aligned openings 64 and 72 to permit passage of body fluids through the sheets 56 and 70 in the areas 60. The retaining sheet 56 has a plurality of openings 68 in the regions 58 to permit passage of body fluids from the pad 32a into the pockets 62, while the retaining sheet 70 has a plurality of openings 74 in the regions 58 to permit passage of body fluids from the pad 32b into the pockets 62. Thus, the sheets 56 and 70 permit passage of body fluids between the pads 32a and 32b, and permit passage of body fluids from both of the pads 32a and b into the pockets 62 for absorption and retention by the hydrocolloid materials in the pockets 62. As before, the size of the openings 68 and 74 are preferably smaller than the size of the hydrocolloid particles to minimize possibility of particle passage

through the sheets 56 and 70. In an alternative form of the article 20, the apertured retaining sheets 56 and 70 may be positioned intermediate the top or backing sheets and the pad.

Another embodiment of the present invention is illustrated in FIG. 10, in which like reference numerals designate like parts. In this embodiment, the retaining sheet 56 is attached to the inner surface of the backing sheet 24 in the areas 60, while defining pockets 62 in the regions 58. The hydrocolloid material 66 is retained in the pockets 62 defined intermediate the retaining sheet 56 and backing sheet 24 in the regions 58. As shown, the retaining sheet 56, is fluid impervious, has a plurality of openings 68 in the regions 58 to permit passage of body fluids from the pad 32 into the pockets 62 for absorption and retention by the hydrocolloid materials 66. In a preferred form, at least one of the sheets 56 or 24 comprise a film of thermoplastic material, and the sheets 56 and 24 are fused together in the areas 60. In the embodiment of FIG. 10, the regions 58 and pockets 62 may have a generally circular shape, as previously described, although they may have any suitable shape, as desired, such as relatively elongated pockets and regions, as shown in FIGS. 12 and 13.

Another embodiment of the article 20 of the present invention is illustrated in FIG. 11, in which like reference numerals designate like parts. In this embodiment, the retaining sheet 56 is attached to the backing sheet 24, such as by fusing the sheets together, in areas of attachment 60. The retaining sheets 56 and 24 define pockets 62 in regions 58 for retaining the hydrocolloid materials intermediate the retaining sheet 56 and backing sheet 24. The retaining sheet 56 and backing sheet 24 are free of attachment at locations defining channel means 80 extending between the sheets 56 and 24 and communicating with the pockets 62. As shown, the retaining sheet 56 has a plurality of openings 82 extending through the sheet 56, with at least a portion of the openings 82 communicating with the network of channel means 80. In this embodiment, the regions 58 of the sheet 56 are closed to prevent passage of body fluids through the sheet 56 in the regions 58. However, the body fluids are permitted to pass through the openings 82 into the channel means 80, after which the body fluids pass through the channel means 80 into the pockets 62 for absorption and retention by the hydrocolloid materials retained in the pockets. In an alternative form, the openings 82 may extend through the joined sheets, and the sheets may be positioned adjacent a front surface of the pad, or may be located intermediate separate layers of the pad.

The foregoing detailed description is given for clearness of understanding only, and no unnecessary limitations should be understood therefrom, as modifications will be obvious to those skilled in the art.

I claim:

1. An absorbent article comprising, a fluid pervious top sheet, a fluid impervious backing sheet, first and second retaining sheets located intermediate said top and backing sheets and extending substantially between opposed ends of the article, said retaining sheets being attached together in areas and defining a plurality of pockets between said areas and means for permitting passage of body fluids into the pockets, and a hydrocolloid material positioned in said pockets.

2. An absorbent article comprising, a layer of absorbent pad having opposed surfaces, a pair of side edges, and a pair of end edges, first and second retaining sheets

8/80

positioned adjacent one of said surfaces of said layer including a longitudinal central portion intermediate the end edges, said retaining sheets being attached together in areas and defining a plurality of pockets between said areas and means for permitting passage of body fluids into the pockets, and a hydrocolloid material positioned in said pockets.

3. The article of claim 2 wherein said retaining sheets define a plurality of spaced pockets for said material adjacent at least one of said end edges of the pad.

4. The article of claim 2 wherein said retaining sheets define at least one elongated pocket for said material extending laterally between said side edges.

5. The article of claim 2 wherein said retaining sheets define at least one elongated pocket for said material extending longitudinally between said end edges.

6. The article of claim 2 including a second layer of absorbent pad, and in which said retaining sheets are located intermediate said layers.

7. An absorbent article comprising, a fluid impervious backing sheet, a fluid pervious top sheet, a retaining sheet located intermediate said top and backing sheets, and retaining sheet being attached to said backing sheet in areas including a portion thereof spaced from said top sheet and defining pocket means between said areas intermediate the backing and retaining sheet, with said retaining sheet permitting passage of body fluids into the pocket means, and a hydrocolloid material positioned in said pocket means.

8. An absorbent article comprising, an absorbent pad assembly having an absorbent pad, a fluid impervious retaining sheet located adjacent a front surface of said pad, said retaining sheet being attached to the front surface of the pad in areas surrounding a plurality of regions, with said retaining sheet defining a plurality of spaced pockets between the retaining sheet and pad in said regions, and with said retaining sheet having a plurality of openings extending through said areas to permit passage of body fluids into said pad, and said pad assembly having a hydrocolloid material located in said pockets.

9. The article of claim 8 wherein said pad includes a front wadding sheet defining a front surface of the pad, and in which said areas of the retaining sheet are attached to said wadding sheet.

10. The article of claim 8 wherein said retaining sheet comprises a film of thermoplastic material, and in which said film is fused to said pad in said areas.

11. The article of claim 8 wherein said retaining sheet is closed in said regions to prevent passage of liquid between said pockets and a front surface of the article.

12. The article of claim 8 wherein said retaining sheet has a plurality of openings extending through said regions.

13. The article of claim 12 wherein said hydrocolloid material comprises a plurality of particles, and in which the size of said openings in said regions is smaller than the size of said particles.

14. The article of claim 8 including a fluid pervious cover sheet covering a front surface of said retaining sheet, and a fluid impervious backing sheet covering a back surface of said pad.

15. An absorbent article comprising, an absorbent pad assembly having an absorbent pad, a first fluid impervious retaining sheet located adjacent a front surface of the pad, a second fluid impervious retaining sheet located adjacent a front surface of the first retaining sheet, said first and second sheets being attached in areas sur-

rounding a plurality of regions, with said first and second sheets defining a plurality of spaced pockets in said regions, with said first and second sheets having a plurality of aligned openings in said areas permitting passage of body fluids through the openings into said pad, and with said first sheet having a plurality of openings in said regions permitting passage of fluid from the pad into said pockets, and said pad assembly having a hydrocolloid material in said pockets.

16. The article of claim 15 wherein said second sheet is closed in said regions to prevent passage of fluid between said pockets and a front surface of the article.

17. The article of claim 15 in which at least one of said first and second sheets comprises a film of thermoplastic material, and in which said first and second sheets are fused in said areas.

18. The article of claim 15 including a fluid pervious top sheet covering a front surface of said second sheet, and a fluid impervious backing sheet covering a back surface of said pad.

19. An absorbent article comprising, an absorbent pad assembly having layers of first and second absorbent pads, a first retaining sheet located adjacent an inner surface of said first pad, and a second retaining sheet located intermediate said first sheet and an inner surface of said second pad, said first and second sheets being attached in areas surrounding a plurality of regions, with said first and second sheets defining a plurality of spaced pockets in said regions, with said first and second sheets permitting passage of fluid through said areas and with at least one of said sheets permitting passage of fluid between pockets and a pad, and said pad assembly having a hydrocolloid material in said pockets.

20. The article of claim 19 wherein said first sheet comprises a fluid impervious material having a plurality of openings in said areas.

21. The article of claim 20 wherein said first sheet has a plurality of openings in said regions.

22. The article of claim 19 wherein said first and second sheets comprise a fluid impervious material having a plurality of aligned openings in said areas, with at least one of said sheets having a plurality of openings in said regions.

23. The article of claim 22 wherein the other of said sheets has a plurality of openings in said regions.

24. The article of claim 19 wherein at least one of said first and second sheets comprises a film of thermoplastic material, and in which said film is fused to the other of said sheets in said areas, with said film having a plurality of openings in said areas.

25. The article of claim 19 including a fluid pervious top sheet covering an outer surface of one of said pads, and a fluid impervious backing sheet covering an outer surface of the other of said pads.

26. An absorbent article comprising, an absorbent pad assembly having an absorbent pad, a fluid impervious backing sheet, and a retaining sheet located intermediate said backing sheet and pad, said retaining sheet and backing sheet being attached together in areas surrounding a plurality of spaced regions, with said retaining sheet and backing sheet defining a plurality of spaced pockets in said regions and means for permitting passage of fluids into said pockets, and said pad assembly having a hydrocolloid material in said pockets.

27. The article of claim 26 wherein the retaining sheet comprises a fluid impervious material having a plurality

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of openings in said regions communicating with the pockets.

28. The article of claim 26 in which at least one of said retaining sheet and backing sheet comprises a film of thermoplastic material, and in which said sheets are fused together in said areas.

29. An absorbent article comprising, an absorbent pad assembly having an absorbent pad, a fluid impervious backing sheet, a fluid impervious retaining sheet located intermediate said backing sheet and pad, said backing sheet and retaining sheet being attached together in areas defining a plurality of spaced pockets intermediate the retaining and backing sheets and defining channel means communicating with said pockets, with said retaining sheet being closed in regions covering said pockets, and with said retaining sheet having a plurality of openings communicating with said channel means to permit passage of fluids through the openings and channel means into the pockets, and said pad assembly having a hydrocolloid material positioned in said pockets.

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30. The article of claim 29 wherein at least one of said retaining sheet and backing sheet comprises a film of thermoplastic material, and in which said sheets are fused together in said areas.

31. An absorbent article comprising, an absorbent pad assembly having a backing sheet of fluid impervious material, an absorbent pad including a pad portion and a wadding sheet defining a surface of the pad, a separate retaining sheet being attached to said surface to the wadding sheet in areas spaced from the backing sheet and defining pocket means between said areas intermediate the retaining sheet and said wadding sheet surface, and a hydrocolloid material positioned in said pocket means with said wadding sheet separating the hydrocolloid material from said pad portion.

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United States Patent [19]

Shohji et al.

[11] Patent Number 5,549,964

[45] Date of Patent: Aug. 27, 1996

[54] STRETCHABLE NONWOVEN FABRIC AND METHOD OF MANUFACTURING THE SAME

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[21] Appl. No. 371,690

[22] Filed: Jan. 11, 1995

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[63] Continuation of Ser. No. 27,606, Mar. 5, 1993, abandoned, which is a continuation of Ser. No. 691,036, Jan. 27, 1991, abandoned.

[30] Foreign Application Priority Data

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[51] Int. Cl.⁶ D02G 3/00; D04N 1/04, C08K 3/00

[52] U.S. Cl. 428/224, 428/288; 428/296; 428/373; 428/401 523/522

[58] Field of Search 428/221, 224, 428/373, 288, 296, 373, 401 520/407-523/522

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[57] ABSTRACT

A stretchable nonwoven fabric manufactured by using a hydrogenated block copolymer obtained by hydrogenating a block copolymer including polymer blocks A constituted mainly by a vinyl aromatic compound and a polymer block B constituted mainly by a conjugated diene compound, at least one polymer block B being arranged on an end of a polymer chain of the block copolymer, as a raw material. The spinning property and characteristics of the nonwoven fabric can be further improved by adding a polyolefin to the above raw material.

The obtained stretchable nonwoven fabric has a superior strength, extension characteristics, i.e., elongation and extension recovery, and weathering resistance, and can be broadly used for many applications due to these characteristics.

6 Claims, 3 Drawing Sheets

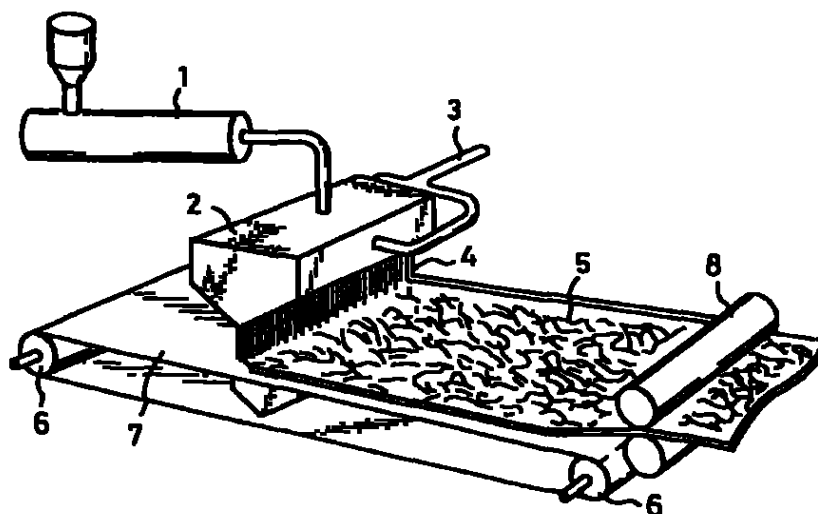


Fig. 1

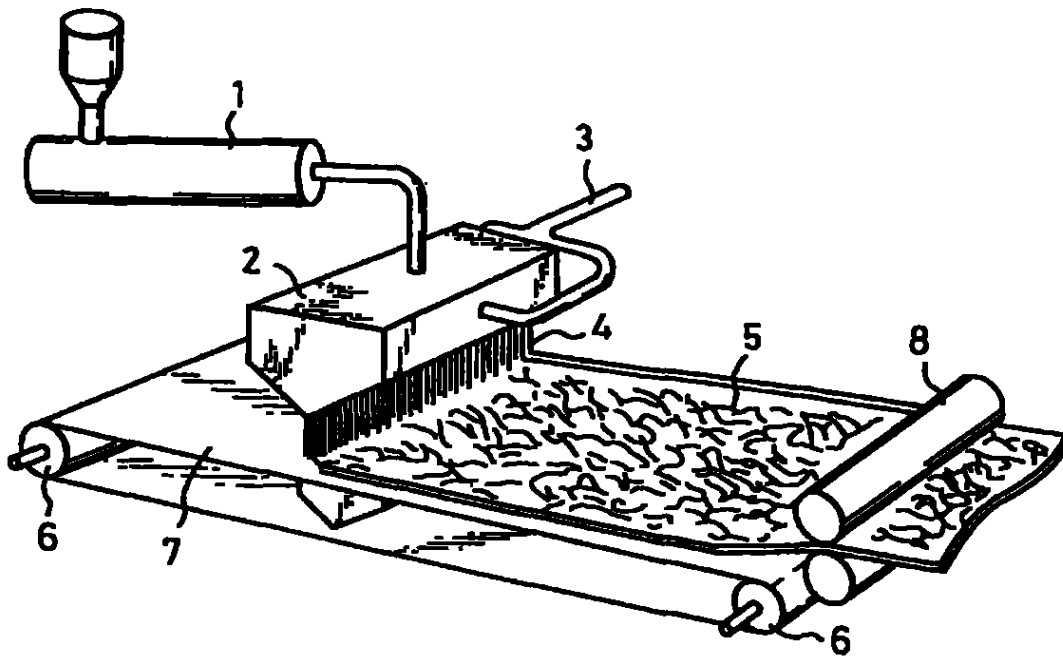
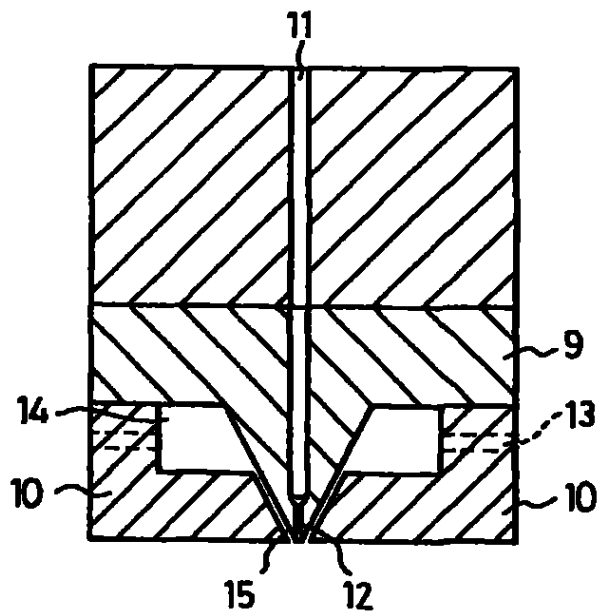
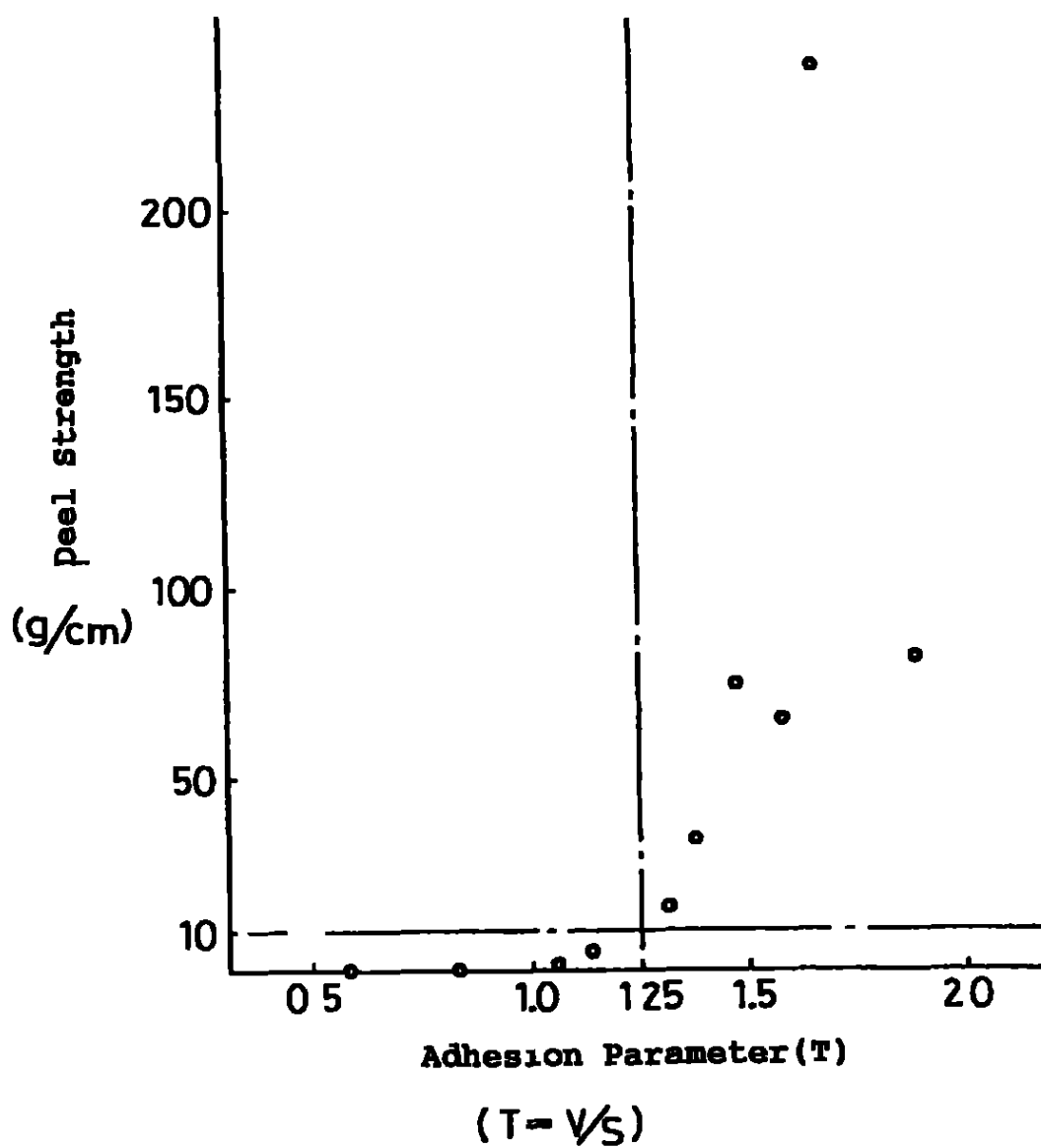


Fig. 2



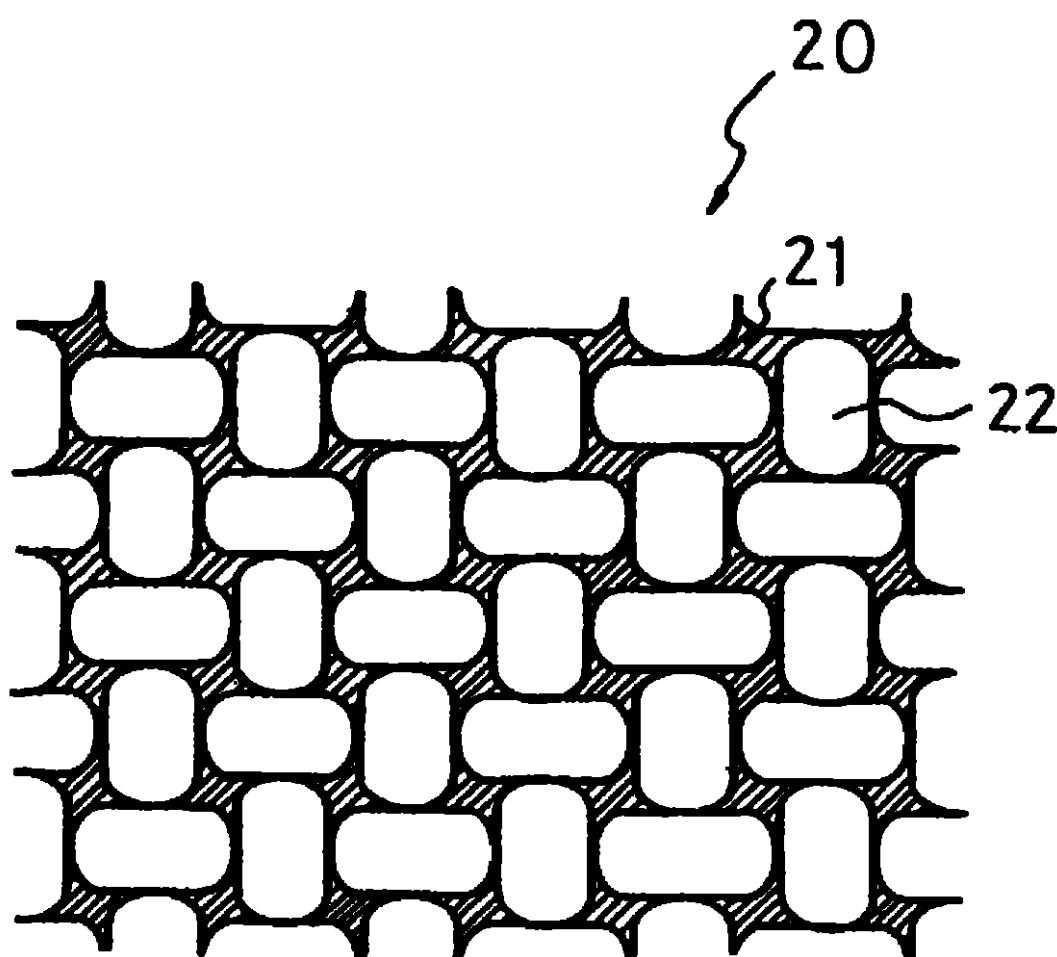
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Fig. 3



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Fig. 4



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STRETCHABLE NONWOVEN FABRIC AND METHOD OF MANUFACTURING THE SAME

RELATED APPLICATIONS

This application is a continuation of application Ser. No. 08/027,606, filed Mar. 5, 1993, now abandoned, which is in turn a continuation of Ser. No. 07/691,056, filed as PCT/JP89/01294, Dec. 25, 1989 published as WO90/07602, Jul. 12, 1990, also abandoned.

TECHNICAL FIELD

This invention relates to a stretchable nonwoven fabric and a method of manufacturing the same. More particularly, this invention relates to a stretchable nonwoven fabric manufactured by using a hydrogenated block copolymer as a main material and having a superior strength, extension characteristics, i.e., elongation and extension recovery properties, weathering resistance, light resistance, heat resistance, chemical resistance and electrical resistance, and a soft handling, and a method of manufacturing the same.

PRIOR ART

Nonwoven fabrics of various synthetic fibers including a nonwoven fabric obtained by spinning a thermoplastic resin by using a melt blown method are known.

An essential technique for the melt blown spinning method and an apparatus therefor is disclosed in "Industrial and Engineering Chemistry", volume 48, No. 8, 1956, from pages 1342 to 1346. Further, stretchable nonwoven fabrics manufactured by the melt blown method are known, as described hereafter.

Japanese Unexamined Patent Publication (Kokai) No. 59-223447 discloses a melt blown nonwoven fabric composed of a polyurethane elastic filament; Japanese Unexamined Patent Publication (Kokai) No. 1-132858 discloses a melt blown nonwoven fabric composed of a polyurethane using a polyester diol, U.S. Pat. No. 4,692,371 discloses a melt blown nonwoven fabric composed of an A-B-A' block polymer and Japanese Unexamined Patent Publication (Kokai) No. 62-84143 discloses a melt blown nonwoven fabric composed of an A-B-A' block polymer and a polyolefin.

Also, a thermoplastic material Kraton® known as a typical material having a block copolymer composition and a hydrogenate thereof, and the block copolymer composition and the hydrogenate thereof are disclosed in Japanese Unexamined Patent Publications (Kokai) No. 61-42554 and No. 61-155446.

The thermoplastic material Kraton® is described in detail in the reference "KRATON® THERMOPLASTIC RUBBER Typical Properties 1986" issued by the Shell Chemical Company, the most general structure being a linear A-B-A block type, and Kraton D series such as a styrene-butadiene-styrene (S-B-S) and a styrene-isoprene-styrene (S-I-S), and Kraton G series such as a styrene-ethylene/butylene-styrene (S-EB-S) are included in this type.

Japanese Unexamined Patent Publication (Kokai) No. 61-42554 discloses a composition composed of a hydrogenated block copolymer of 100 parts by weight including at least one polymer block A constituted mainly by a vinyl aromatic compound and at least one polymer block B constituted mainly by a conjugated diene compound, and a hindered ester group compound of 0.01 part by weight to 3 parts by weight.

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Japanese Unexamined Patent Publication (Kokai) No. 61-155446 discloses a composition composed of a hydrogenated block copolymer of 100 weight portion having a block copolymer which includes at least two polymer blocks A constituted mainly by a vinyl aromatic compound and at least two polymer blocks B constituted mainly by a conjugated diene compound, and having a number-average molecular weight of between 20,000 and 100,000 and a polyolefin of 5 parts by weight to 400 parts by weight.

The above known melt blown nonwoven fabric has the following problems.

Namely, the melt blown nonwoven fabrics disclosed in Japanese Unexamined Patent Publications (Kokai) No. 59-223447 and No. 1-132858 are nonwoven fabrics manufactured of polyurethane, and accordingly, these nonwoven fabrics have problems of a poor weathering resistance and light resistance. Further, the polyurethane itself is very expensive, and accordingly, these nonwoven fabrics have a problem in that the price of the nonwoven fabric becomes expensive.

In the melt blown nonwoven fabric disclosed in U.S. Pat. No. 4,692,371 KRATON GK 1657 is used as the A-B-A hydrogenated block copolymer and the hydrogenated block copolymer is individually extruded to form a web. This nonwoven fabric has problems in that a strength of the nonwoven fabric is weak, as shown in the Table II of the above U.S. Patent, and it is impossible to make a mean diameter of fibers in the nonwoven fabric thinner, due to a high melting viscosity thereof.

A nonwoven fabric disclosed in Japanese Unexamined Patent Publication No. 62-84143 and composed of the A-B-A hydrogenated block copolymer and the polyethylene has a problem in that a strength of the nonwoven fabric is weak (see Table 7 in a description of examples described hereafter).

DISCLOSURE OF THE INVENTION

A first object of the present invention is to solve the problems of the prior art and to provide a stretchable nonwoven fabric having a superior strength, extendable characteristics, i.e., elongation and elastic recovery of elongation, weathering resistance, light resistance, heat resistance, chemical resistance and electrical resistance, and a soft handling.

A second object of the present invention is to provide a method of manufacturing a superior stretchable nonwoven fabric composed of a hydrogenated block copolymer.

A third object of the present invention is to provide a stretchable nonwoven fabric having a soft and non-sticky handling and a superior strength, extendable characteristics, weathering, light resistance, and heat resistance.

The nonwoven fabric including a hydrogenated block copolymer of A-B-A' type and manufactured by the melt blown method is known as described before, but in the above known technique, a constitution of the hydrogenated block copolymer i.e., a block structure, a number-average molecular weight, a content of a vinyl aromatic compound, a 1,2-vinyl content of a conjugated diene compound or the like, a spinning ability in the melt blown method, and characteristics of the stretchable nonwoven fabric obtained are synthetically studied, has not been found before.

The inventors in the present application synthetically studied the constitution of the hydrogenated block copolymer the spinning ability in the melt blown method, and the

characteristics of the stretchable nonwoven fabric, and thus accomplished the present invention.

The first object of the present invention can be attained by a stretchable nonwoven fabric composed of a thermoplastic fiber manufactured from a hydrogenated block copolymer obtained by hydrogenating a block copolymer including at least two polymer blocks A constituted mainly by a vinyl aromatic compound and at least two polymer blocks B constituted mainly by a conjugated diene compound, at least one polymer block B being arranged on an end of a polymer chain thereof, a number-average molecular weight of the block copolymer being between 30,000 and 65,000 and a content of the vinyl aromatic compound in the block copolymer being between 15 wt % and 40 wt %.

The second object of the present invention can be attained by a method of manufacturing a stretchable nonwoven fabric, wherein a block copolymer including at least two polymer blocks A of a vinyl aromatic compound and at least two polymer blocks B of a conjugated diene compound, and in which a content of the vinyl aromatic compound is between 15 wt % and 40 wt % and at least one polymer block B is arranged on an end of a polymer chain, a number average molecular weight of which is between 30,000 and 65,000, is manufactured by a sequential block copolymerization, said block copolymer is hydrogenated, the obtained hydrogenated block copolymer is spun; and a spun polymer obtained by a spinning process is accumulated on a collecting face to form a fiber web.

The third object of the present invention can be attained by a stretchable nonwoven fabric composed of a fiber comprising a hydrogenated block copolymer C obtained by hydrogenating a block copolymer including at least two polymer blocks A constituted mainly by a vinyl aromatic compound and at least two polymer blocks B constituted mainly by a conjugated diene compound and on an end of a polymer chain of which at least one polymer block B is arranged, and a polyolefin D, wherein a blending ratio (C/D) of the hydrogenated block copolymer and the polyolefin D is between 40/60 and 99/1.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view illustrating an example of an apparatus for manufacturing a nonwoven fabric by a melt blown method;

FIG. 2 is a cross sectional view illustrating a die used in the melt blown method;

FIG. 3 is a graph illustrating a relationship between a tackiness parameter ($T=V/S$) of a polymer and a peeling strength of a nonwoven fabric; and

FIG. 4 is a plain view illustrating an example of an emboss pattern.

BEST MODE OF CARRYING OUT THE INVENTION

As the vinyl aromatic compound constituting the block copolymer before the hydrogenation (hereinafter referred to as a pre-polymer), for example, styrene, *o*-methylstyrene, vinyltoluene, *p*-tert-butylstyrene and the like can be used, but styrene is most preferred. These compounds can be used alone or as a combination of two or more thereof. Conversely, as the conjugated diene compound constituting the pre-polymer, for example, 1,3-butadiene, isoprene, 1,3-pentadiene, 2,3-dimethyl-1,3-butadiene, or the like can be used, but butadiene and isoprene are most preferred. These com-

pounds can be used alone or as a combination of two or more thereof.

These pre-polymers can be manufactured by a successive block copolymerization, with the aid of a lithium alkyl catalyst, or by a coupling reaction after the successive block copolymerization, and subsequently the thus obtained pre-polymer is selectively hydrogenated. Namely, the hydrogenating reaction can be conducted by the use of known hydrogenating catalysts, for example, precious metallic support catalysts such as platinum and palladium, catalysts such as Raney nickel, organo-nickel compounds, and organocobalt compounds, or a complex catalyst of these compounds and other organometallic compounds. In particular, a titanocene compound is preferable because it has an extremely high activity as a hydrogenating catalyst for the block copolymer a small amount of the catalyst is needed for the hydrogenating reaction, and the catalyst residue does not adversely affect a heat-resistance stability of the hydrogenated block copolymer, and thus there is no need for the removal of the catalyst residue, as disclosed in Japanese Unexamined Patent Publication (Kokai) No. 61-155446.

Preferably, the hydrogenation is selectively conducted for a double bond of the conjugated diene compound. Namely, the hydrogenation should be selectively conducted because a double bonding of the conjugated diene compound leads to a deterioration in the weathering resistance, light exposure resistance, and heat resistance, which is undesirable. Conversely, in the case of a vinyl aromatic compound, the hydrogenation causes a poor fluidity, which is undesirable from the viewpoint of the spinning properties.

Namely, a partial hydrogenation where at least 80%, preferably 90% of the conjugated diene compound is hydrogenated, and at most 20% preferably 5%, of the vinyl aromatic compound is hydrogenated, is preferable with respect to the resistance to weather light and heat, and the spinning properties of the nonwoven fabric.

The number-average molecular weight of a pre-polymer in total (hereinafter abbreviated as M_n) is within the range of 30,000 to 65,000, preferably 35,000 to 60,000, more preferably 40,000 to 55,000. When the M_n is lowered, the strength of the single fiber, and accordingly, the strength of the nonwoven fabric, is lowered. In particular, with an M_n under 30,000, a chip cannot be obtained due to a lowering of a viscosity of the polymer. Also, when the M_n is raised, the spinning properties become unsatisfactory due to a rise in the pressure in the die part, as well as a rise in the melt viscosity of the conjugated diene compound. Further when the M_n is over 65,000, it is impossible to obtain the fiber.

Furthermore, the content of the vinyl aromatic compound in the pre-polymer should be within 15 to 40 percent by weight (hereinafter abbreviated as wt %), preferably 20 to 35 wt %. In the hydrogenated block copolymer, the vinyl aromatic compound serves as a hard segment which contributes to the strength of the material, and the conjugated diene compound serves as a soft segment which contributes to the stretchability. A strength of the polymer increases in accordance with a content of the vinyl aromatic compound, but a strength of the nonwoven fabric has a maximum value with regard to a content of the vinyl aromatic compound. Namely, when the content of the vinyl aromatic compound is under 15 wt %, the strength of the nonwoven fabric becomes too low, and thus a nonwoven fabric having broad application cannot be obtained. In contrast, when the content of the vinyl aromatic compound is over 40 wt %, the strength and the elongation of the nonwoven fabric are lowered, and the nonwoven fabric becomes hard. Also the melt viscosity,

and accordingly the pressure in the die part, are raised, which results in inferior spinning properties. The thus-produced nonwoven fabric includes polymer balls, and has a larger average fiber diameter, poor dispersion properties of the single fiber, and an inferior feeling and appearance, and thus cannot be used as a product. Therefore, within the range of 15 to 40 wt %, the spinning properties are satisfactory, and a soft and high quality nonwoven fabric having a superior strength and elongation can be obtained.

A 1,2-vinyl content of the conjugated diene structure of the conjugated diene compound of the pre-polymer is preferably within the range of 20 to 50 wt % more preferably 25 to 45 wt %. When the bonding amount is less than 20 wt %, a recovery of the elongation of the obtained nonwoven fabric is poor, and the thus obtained nonwoven fabric is poor, and the thus obtained nonwoven fabric cannot be used as a product. In contrast, when the bonding amount is more than 50%, the spinning properties are poor, and a superior web cannot be obtained.

At least one polymer block B must be arranged on an end of a polymer chain of the pre-polymer, because the spinning property and characteristics of the nonwoven fabric depend on a ratio of the polymer block for all ends of the polymer chain.

The ratio of the polymer block B for all ends of the polymer chain in the pre-polymer is preferably within 3 to 25 wt % more preferably 5 to 20 wt %. When the ratio is less than 3%, a superior web cannot be obtained due to a high melt viscosity and an inferior spinning property. In contrast, when the ratio is more than 25 wt %, the strength of the nonwoven fabric is lowered.

As described in detail in the examples given hereafter with reference to Table 2, a comparative experiment is conducted, under the same spinning conditions, using KRATON® G-1652 and KRATON® G 1657X.

The spinning property of G-1652 is poor due to a lower flowability, the fibers cannot be continued and many polymer balls are generated, and thus a sample of the nonwoven fabric cannot be obtained. Although a sample of a nonwoven fabric can be obtained from G-1657X, the strength of the nonwoven fabric is extremely low despite a high value of a strength of the polymer.

As described above, a nonwoven fabric product having a superior appearance and handling, a very high strength, and superior extendable characteristics and softness can be obtained by using the block copolymer including at least two polymer blocks A constituted mainly by the vinyl aromatic compound and at least two polymer blocks B constituted mainly by a conjugated diene compound, at least one polymer block B being arranged on an end of a polymer as the pre-polymer of the hydrogenated block copolymer in the present invention. Further in the manufacture of the nonwoven fabric in the present invention, the spinning property is improved due to the lower melt viscosity and the superior flowability thereof.

The pre-polymer may have a linear, divergent, or radial constitution, examples of which are expressed by the following general formulae.

$(B-A)_n$	$n \geq 2$
$(B-A)_m-B$	$m \geq 2$
$(B-A)_m-X(B-A)_n$	$m, n \geq 1, m+n \geq 2$

As a stabilizer for the hydrogenated block copolymer used in the present invention, a hindered amine compound, hindered phenol compound, phosphorus compound, benzophen-

none compound, benzotriazole compound, and a mixture thereof can be used. An improvement of the heat resistance and weathering resistance of the hindered amine is remarkable, and accordingly more preferably the hindered amine is used as the stabilizer. If the content of the stabilizer is more than 5 parts by weight per 100 parts by weight of the hydrogenated block copolymer, coloring and other drawbacks can arise without a corresponding further improvement in the effects of the stabilizer.

A value of adhesion of the stretchable nonwoven fabric can be widely changed according to the type of pre-polymer used. The peel strength of the nonwoven fabric can be used to measure the adhesion, when the peel strength is high, the adhesion of the nonwoven fabric is also high.

Although a constitution depending on the peel strength of the pre-polymer has been investigated, this cannot be generally determined only by a specific element in the constitution. Accordingly, the inventors of the present invention introduced an adhesion parameter T defined from the following equation, and found that the value of T has a clear relationship to the peel strength, i.e., the adhesion of the nonwoven fabric.

$$T=VS$$

wherein V denotes a 1,2-vinyl content of a conjugated diene structure in a conjugated diene compound and expressed by wt %, and S denotes a content of a vinyl aromatic compound in a pre-polymer and expressed by wt %.

Namely, as shown in FIG. 3, the adhesion can be divided into two portions, from a boundary having a T value of 1.25, i.e., when T is greater than 1.25, the adhesion becomes larger, and when T is lower than 1.25, the peel strength is lower than 10 g/cm and thus there is substantially no adhesion in practical use.

The applications of the nonwoven fabrics can be determined according to the value of the nonwoven fabric, and the nonwoven fabric having an adhesion T of more than 1.25 can be suitably used for applications such as diaper, apparel or the like, as a laminated material formed by piling the nonwoven fabric of the present invention on another nonwoven fabric, a knitted fabric, a woven fabric or the like. In contrast, the nonwoven fabric having an adhesion T of less than 1.25, i.e., a nonwoven fabric having no adhesion, can be used for applications wherein the nonwoven fabric is used alone, e.g., for gloves, hats, stretch tapes used for, example, in a waist band of a diaper, or the like.

It is possible to manufacture a stretchable nonwoven fabric having further improved properties by adding a polyolefin to a hydrogenated block copolymer used to manufacture the stretchable nonwoven fabric of the present invention.

When the polyolefin is blended with the hydrogenated block copolymer, a melt viscosity of the blended polymer becomes lower, and thus the spinning property is improved, and a mean diameter of fibers in the nonwoven fabric becomes smaller and therefore, no adhesion appears. Nevertheless, when the blending ratio of the polyolefin is too high, an elastic recovery from an elongation of the nonwoven fabric is lowered. Accordingly, a blending ratio of the polyolefin to a total weight of the polymer may be determined to be from 1 to 60 wt %, preferably 5 to 50 wt %, more preferably 10 to 40 wt %. When the polyolefin is less than 1%, there is little lowering of the melt viscosity and no improvement of the spinning property. In contrast, when the

5-89

polyolefin is more than 60 wt %, the elongation and elastic recovery from the elongation becomes very poor.

When a number-average molecular weight (M_n) of the polyolefin is small, there is a tendency for the elastic recovery from an elongation to become higher at the same blending ratio.

The reason why the above tendency is generated is not apparent, but it is considered that a microdomain structure formed by the polyolefin and the conjugated diene compound of the hydrogenated block copolymer easily occurs when the number-average molecular weight of the polyolefin is small.

Examples of the polyolefin usable in the present invention are a polyethylene, a polypropylene, and a copolymer of propylene with α -olefin such as ethylene or 1-butene. Most preferably, a block copolymer of propylene with ethylene, the polypropylene and the polyethylene are used.

Preferably, a polypropylene having the number-average molecular weight (M_n) of 2,000 to 60,000 and a melting flow rate (MFR) of 50 to 10,000, more preferably 50 to 150, is used and a polyethylene having M_n of 2,000 to 30,000 is used. The use of the polyethylene is preferable, because this reduces the lowering of the elastic recovery from an elongation.

Three blending states of two polymer exist, i.e., that wherein two polymers are blended in a single fiber, that wherein fibers constituted by a specific polymer, respectively are mixed in a nonwoven fabric, and that wherein the two above states are present in the nonwoven fabric. Most preferably, the first state wherein the two polymers are blended in the single fiber is used.

A method of blending two polymers when spinning the polymers, and a method of using a chip in which the two polymers are previously blended by melting the two polymers or the like, can be used as the method of blending the hydrogenated block copolymer with the polyolefin. Although the method of blending the two polymers is not especially limited, the latter method is preferred.

A third polymer may be added to a fiber of the stretchable nonwoven fabric within a range which does not adversely affect the object of the present invention. Further, another fiber may be blended with the nonwoven fabric of the present invention, within a range which do not adversely affect the object of the present invention. As described hereafter, the stretchable nonwoven fabric of the present invention can be manufactured by a melt blown method, but when the nonwoven fabric is manufactured only from the hydrogenated block copolymer, i.e., without the polyolefin, the use of a heated gas having a high speed and high pressure, i.e., 1.2 kg/cm²G or more produces a poor blowability, and thus the manufacturing of the fiber becomes difficult. Accordingly, an optimum pressure of the heated and high speed gas must be between 0.1 and 1.2 kg/cm²G, and accordingly, a fiber in the nonwoven fabric obtained must have a relatively thick diameter, e.g., about 10 μ m or more.

Nevertheless, where a polypropylene is used as the polyolefin and two polymers are blended in a chip to make a nonwoven fabric, when a blending ratio of the polypropylene is increased, a blowing operation under a high pressure e.g., 3 kg/cm²G, becomes possible due to a lowering of the melt viscosity, and the blowability is abruptly improved from a blending ratio of around 10 wt %. Further, a fiber in the obtained nonwoven fabric becomes an extra fine fiber, and thus a nonwoven fabric having an extremely soft handling is obtained. An elastic recovery from elongation, which is a superior feature of the stretchable nonwoven

fabric of the present invention, is maintained up to a blending ratio of 30 wt % of the polypropylene, without any substantial change. The blending ratio of the polypropylene may be increased to 60 wt %, in practical use. As described above, when the polypropylene is blended with the hydrogenated block copolymer, as the polyolefin, a melt viscosity of the blended polymer becomes lower, the spinning property is remarkably improved, and it becomes possible to raise a pressure of the gas, and thus the present invention has a feature that an extra fine fiber having a mean diameter of less than 10 μ m can be obtained. Further, an effect that a strength of the nonwoven fabric is further improved by blending the polypropylene, and an adhesion of the nonwoven fabric is lowered, is obtained.

A mean diameter of a fiber constituting the stretchable nonwoven fabric of the present invention is less than 50 μ m, preferably 0.5 to 30 μ m. When the mean diameter is less than 0.5 μ m, the obtained nonwoven fabric is soft but has a lower strength and poor air permeability and moisture permeability. In contrast, when the mean diameter is more than 50 μ m, the nonwoven fabric has a rough feel and a hard handling, and a waterproof pressure and bacteria barrier property of the nonwoven fabric become poor. In particular, when the mean diameter is less than 10 μ m, and further is between 1.0 and 6.0 μ m, a collective efficiency, air permeability, moisture permeability and handling of the nonwoven fabric are improved, and the nonwoven fabric has a preferable high waterproof resistance and superior bacteria barrier and dust collecting properties.

Preferably, the nonwoven fabric in the present invention has a weight per unit area of 5 to 500 g/m², more preferably 10 to 200 g/m². When the weight per unit area is lower than 5 g/m², the strength of the stretchable nonwoven fabric is lowered.

A staple fiber and a filament may be used as the fiber constituting the stretchable nonwoven fabric of the present invention, but in view of a strength of the nonwoven fabric, the filament is preferable. The thus-obtained stretchable nonwoven fabric of the present invention has a superior extensibility (elongation, and extension recovery), a superior resistance to weather, light, heat, and chemicals, and superior electrical insulating properties, as well as a soft feel. The resistance to weather thereof is superior in particular to the polyurethane stretchable nonwoven fabric now on the market (for example, HSPANSORB®).

As a method of manufacturing the stretchable nonwoven fabric of the present invention, a melt blown method, a spun bond method, and a method in which a fiber obtained by the melt spinning method is sheeted out by an ordinary dry process or wet process, can be used, but in view of the spinning properties, the melt blown method is most preferable.

An example of the melt blown method of the present invention will be described with reference to FIGS. 1 and 2.

A hydrogenated block copolymer is melted by an extruder 1 to be fed into a die 2, and extruded from multiple spinning orifices arranged in a line on a nozzle. The molten polymer is extruded from the orifice 12 through a polymer flow path 11, and at the same time, a heated high-speed gas, supplied through a gas inlet 13, is injected from slits 15 provided on both sides of the orifice 12 through a gas header 14, and blown onto the flow of the extruded molten polymer. The gas header 14 and the injection slit 15 can be provided between the nozzle 9 and a lip 10. The molten polymer extruded with the aid of the high-speed air flow is drawn, thinned, and hardened into extra fine fibers 4, and the thus-produced extra fine fibers are deposited on a screen (a collector) 7 circu-

ff 90

ling between a pair of revolving rollers 6, 6, to thus form a random web. As the gas steam or air or the like is preferred, and the gas conditions are a temperature of 300° to 450° C., preferably 350° to 420° C., and a pressure of 0.1 kg/cm²G or more, preferably 0.2 to 5.0 kg/cm²G, which differs depending on the discharge rate. The temperature of the spinner is 260° to 330° C., preferably 260° to 330° C., and the temperature of the die is 260° to 330° C., preferably 270° to 320° C.

A strength of a raw web i.e., a web to which an after-treatment is not applied, has a high strength obtained due to an entanglement of fibers, and a self-heat bonding property without the after-treatment. Accordingly, it is important to actually determine a distance between a distance between a die 2 and a collector 7 for an improvement of the strength of the nonwoven fabric caused by bonding the fibers having the self-heat bonding property, i.e., when the distance is shortened, the strength is increased. Further, it is preferable to shorten the distance to increase the dispersion of the fibers in the nonwoven fabric. Namely, the distance is preferably 70 cm or less, more preferably 50 cm or less, most preferably 40 cm or less.

As described above, preferably a self-heat bonding method is used as a method of bonding the fibers in the stretchable nonwoven fabric of the present invention, because this self-heat bonding method can improve the quality of the nonwoven fabric product due to an improved dispersion of the fibers, and has a lower cost.

Further, other heat bonding methods such as a heat embossing method, a heated roll method, a heated air method, an ultrasonic bonding method or the like can be used. In particular, the heat embossing method and the heated roll method using, for example, an upper metal roller and a lower rubber roll is more preferable, because a bonding between the fibers of the nonwoven fabric is thus increased and the strength, water proof bacteria barrier, dust proof properties and a surface smoothness, are improved by using this method. A treatment by the heat embossing method or the heated roll method may be conducted continuously without applying a winding process to the obtained web, or may be conducted as a separate process after the web is wound.

Preferably, the heat embossing treatment or the heated roll treatment are conducted at a temperature of 130° C. or lower, preferably 50° to 130° C., more preferably 60° to 120° C. and under a pressure of 0.5 to 100 kg/cm, preferably 1 to 75 kg/cm. When the treatment is conducted under a temperature and pressure higher than the above range, the fiber is melted and a nonwoven fabric having a film-like form and a lower air permeability is obtained. Conversely, when the treatment is conducted at a temperature and pressure lower than the above range, the heat bonding effect becomes poor, and thus it is impossible to improve the strength and the surface smoothness of the nonwoven fabric.

Either a continuous pattern or a discontinuous pattern can be used as an embossing pattern using in the heat-embossing treatment. Further, various patterns such as a line, a dotted line, a lattice, a diagonal lattice, a circle, a diamond, or a woven fabric-like pattern, or the like, can be used.

An electret treatment may be applied to improve a filtering property of the stretchable nonwoven fabric of the present invention.

Further, the stretchable nonwoven fabric of the present invention can be used by piling or laminating same with a sheet-like material such as another nonwoven fabric manufactured by a spun bond method, a carding method, a wet method or the like, a knitted fabric, a woven fabric, a film

or the like. After these materials are piled, if necessary, the stretchable nonwoven fabric and the sheet-like material may be bonded by a heat bonding method, or an entanglement method or the like.

Various examples of the stretchable nonwoven fabric of the present invention, and comparative examples, will be described hereafter.

Before describing the examples, however, a definition of the physical properties of this specification, and the methods of measuring of same, are shown as follows.

Average fiber diameter (μm)

Ten randomly selected points of the samples are photographed by an electron microscope at a magnification of 200-2000, which value is determined by a diameter of the fiber. The diameters of random ten fibers are measured per one photograph, and this is repeated for the ten photographs. Then the measured diameter values for 100 fibers in total are found, to thus calculate a mean value.

Polymer ball, this is a ball-like polymer having a diameter of 50 to 1000 times the diameter of the fiber constituting the web, or a beaded polymer produced at the end or the intermediate part of the fiber. These polymer balls can be visible to the naked eye.

Strength and elongation; in accordance with JIS L-1096, a 2 cm wide sample is drawn at a grasp interval of 5 cm and a pulling rate of 10 cm/minute, to measure the strength and elongation per 1 cm width at the time of breaking.

(A measured value is expressed as a mean value of a value in a lengthwise direction and a value in a lateral direction.)

Extension recovery rate; a 2 cm wide sample of is stretched in accordance with JIS L-1096 at a grasp interval of 12 cm and a pulling rate of 10 cm/min, by an extension ratio of 50%, and immediately allowed to recover to the original length at the same rate. A difference (a) in length before and after an extension is found, based on a 10 cm line marked in the direction of extension prior to the extension. Accordingly, the recover is given as a 100% elastic recovery from as

$$\text{elongation (\%)} = \frac{100 - a}{100} \times 100$$

(A measured value is expressed as a mean value of a value in a lengthwise direction and a value in a lateral direction.)

Stiffness, this is done in accordance with the JIS L-1096, 45° cant-lever method. (A measured value is expressed as a mean value of a value in a lengthwise direction and a value in a lateral direction.)

When this value is small, the handling of the fabric becomes soft method.

Extension stress; a stress at a 100% extensions taken as the extension stress, based on a chart used for the breaking strength and elongation. (A measured value is expressed as a mean value of a value in a lengthwise direction and a value in a lateral direction.)

Peel strength; a sample having a length of 10 cm and a width of 2 cm is prepared from the nonwoven fabric, and two samples are piled. A weight of 13 kg is laid on a central portion having a length of 2.7 cm and a width of 2 cm, of the piled samples, and left for 16 hours. The weight is removed from the sample, and the sample stretched in accordance with JIS L-1096. Namely, each end of one sample of the piled samples is grasped by a clamp of a tester, and each end is stretched at a pulling rate of 10 cm/min in such a manner that the two samples are separated, and a maximum strength required to completely peel the two samples apart is measured, and the peeling strength per 1 cm width is calculated from the maximum strength. (A measured value is expressed as a mean value of a value in a lengthwise direction and a value in a lateral direction.)

4291

Collecting efficiency first, a measurement by a PARTICLE COUNTER KC-01A supplied from Rion Co. Ltd. is conducted under the conditions of a flow rate of 500 cc per minute, and a diameter of a particle of 0.3 μ m or more, for 30 sec without a sample, to obtain a value A (number), and then the sample is arranged on the counter to measure a number B of particles passed through the sample. The collecting efficiency is measured by the following equation.

$$\text{Collecting efficiency (\%)} = (1 - A/A_0) \times 100$$

Water resistance pressure (in H_2O), carried out in accordance with JIS L-1092B

Air permeability carried out in accordance with JIS L-1096 (Fragility method)

The light resistance is measured in accordance with JIS L-1096, whereby a sample subjected to light radiation in a fade meter for 40 hours, and a fading of the sample and a strength retention ratio of a radiated sample are measured in comparison with a non-radiated sample.

Number-average molecular weight (M_n); the M_n is obtained from a styrene reduced molecular weight by Gel Permeation Chromatography (GPC)

Content of vinyl aromatic compound (wt %); a content of a vinyl aromatic polymer block in all of the polymers is measured in accordance with a method shown in J. Polymer Science Vol. 1 P 429 1946 by L. M. Kolthoff et al., and a value S thereof is expressed as weight %.

Binding amount of 1,2 of a conjugated diene in the conjugated diene compound (wt %); a measurement is conducted of a sample of a polymer before hydrogenation is applied by an infrared spectrophotometry in accordance with the Hampton method, and is expressed as V

Strength of Polymer the measurement is conducted by using a dumbbell No. 3 in accordance with JIS K-6301

Elongation of Polymer the measurement is conducted by using a dumbbell No. 3, in accordance with JIS K-6301

Melting viscosity the measurement is conducted in a flow tester CFT 500 supplied by SHIMAZU SEISAKUSHO CO., equipped with a 0.5 MM diameter spinneret, 1.0 ml and one hole under the conditions of a weight of 10 kg, and a preheating for 6 minutes at a temperature of 300° C.

EXAMPLE 1

A successive block copolymerization is performed by using a lithium alkyl catalyst, to synthesize a butadiene-styrene-butadiene-styrene type block copolymer having a composition ratio wt % of 10-12.5-65-12.5, as a pre-polymer, whereby a pre-polymer having an M_n of 47,000, a polystyrene content S of 25 wt %, and a binding amount V of 1,2 of a conjugated diene of 31 wt % is obtained. Hydrogenation is applied to this pre-polymer, and a hindered amine oxide stabilizer of 0.5 wt % is added to produce a hydrogenated block copolymer as a new material a pellet.

The thus-obtained hydrogenated block copolymer has a melt viscosity of a pellet thereof of 520 poise, and is fed to the extruder and heat-melted at an extruder temperature of 290° C. The molten copolymer then is fed into a nozzle having 200 orifices with a diameter of 0.4 MM diameter and aligned at a pitch of 1 mm, and extruded as a high speed fluid at an extruding rate of 0.2 g per minute. A super heated steam controlled to a temperature of 380° C. is used as the fluid, and this super-heated steam is injected from slots of a melt blown nozzle onto a molten copolymer at a pressure of 0.6 kg/cm²G, to thereby draw and thin the molten polymer. Then thinned fibers are sequentially collected on a running net conveyor, in which a distance between a die and a collector is 15 cm, to form a web. The obtained web is a nonwoven

fabric having a superior stretchability and a soft handling. Tests of the physical properties of the obtained nonwoven were performed, and the results are shown in Table 1

TABLE 1

Structure (Ratio of Composition)		B-A-B-A (10-12.5-65-12.5)
Physical properties of Nonwoven Fabric	Weight per unit area	101 g/m ²
	Mean diameter of fiber	12.7 μ m
	Strength	424 g/cm
	Elongation	571%
	Extension recovery	99%
	Elongation stress	62 g/cm
	Stiffness	3.3 cm
	Peel strength	3 g/cm
	Light resistance (Fading)	40-5 grade
	Water resistance pressure	60 mm H_2O
	Collecting efficiency	28%

COMPARATIVE EXAMPLES 1 AND 2

Tests are performed under the same conditions as in Example 1 except that Kraton G-1657X and G-1652 supplied from Shell Chemical are used as a raw material. Note, when using G-1652 the yarn is not tied, and thus a nonwoven fabric cannot be obtained. A constitution of a polymer, physical properties of the polymer, and physical properties of the nonwoven fabric of Comparative Example 1 are shown in Table 2, in comparison to Example 1

Although a strength of the polymer of Kraton G-1657X is higher than that of Example 1 it was found that a strength of the nonwoven fabric is lower.

Further, it appears that a reason why a sample of Kraton G-1652 cannot be obtained is that a melt viscosity of Kraton G-1652 is relatively high, i.e., 1905 poise at 300° C.

TABLE 2

		Example 1	Comparative example 1 Kraton G1657X	Comparative example 2 Kraton G1652
Polymer consti- tution	M_n (1000)	47	64	5.0
	S (wt %)	25	14	20
	V (wt %)	31	33	33
	Strength (g/cm ²)	112	159	275
	Physical propert- ies of polymer			
	Elongation	644	820	520
	Melting viscosity (poise)	520	930	1905
	Mean diameter of fiber (μ m)	12.7	15.0	Sample cannot be obtained due to wetting of yarn
	Strength/ weight per unit area (g/cm ²)	42	1.0	
	Elongation (%)	571	437	
	extension recovery rate %	99	100	
	Peeling strength (g/cm)	3	40	

93

13
EXAMPLES 2 TO 4, COMPARATIVE
EXAMPLES 3 AND 4

Stretchable nonwoven fabrics are manufactured under the same conditions as in Example 1 except that a prepolymer having a different number-average molecular weight M_n was used. The physical properties of the nonwoven fabric were investigated. The results are shown in Table 3.

The polymer in Comparative Example 3 is not solidified when forming a chip, and accordingly, a chip cannot be obtained, and thus the test was stopped. The melt viscosity in Comparative Example 4 is high, and a spinning property thereof is poor, and thus a web cannot be obtained.

14
the test was stopped. The melt viscosity in Comparative Example 6 is high, a spinning property thereof is poor, and many polymer balls are generated, and thus a satisfactory web cannot be obtained.

TABLE 3

	Comparative 3	Example 2	Example 3	Example 4	Comparative 4
M_n (1000)	2.5	3.7	4.6	5.4	6.8
S (wt %)	26	28	26	24	25
V (wt %)	33	32	36	38	34
Weight per unit area (g/m^2)	Chip cannot be obtained due to	182	186	113	Spinning is impossible due to high melting viscosity
Strength (g/cm)	impossibility of setup	289	482	361	
Strength/weight per unit area ($g/cm^2/gm^2$)		2.6	4.5	3.2	
Elongation at break (%)		516	783	441	
Extension recovery rate (%)		98	100	94	
Peeling strength (g/cm)		4	30	67	

EXAMPLES 5 TO 7 COMPARATIVE
EXAMPLES 5 AND 6

Pre-polymers having different content(s) of styrene are synthesized to obtain block copolymers, stretchable nonwoven fabrics are manufactured under the same conditions

TABLE 4

	Comparative Example 5	Example 5	Example 6	Example 7	Comparative Example 6
M_n (1000)	4.8	5.1	4.6	4.7	4.6
S (wt %)	11	19	25	24	42
V (wt %)	32	36	37	38	33
Weight per unit area (g/m^2)	Chip cannot be obtained due to	90	104	101	Polymer balls are generated due to high melting viscosity
Strength (g/cm)	impossibility of setup	281	344	272	
Strength/weight per unit area ($g/cm^2/gm^2$)		3.1	3.5	2.7	
Elongation (%)		887	649	456	
Extension recovery rate (%)		100	99	96	
Peeling strength (g/cm)		82	34	1	

as in Example 1 and the physical properties are investigated. The results are shown in Table 4. The polymer in Comparative Example 5 is not solidified when forming a chip, and accordingly, the chip cannot be obtained, and thus

9/5 94

15 EXAMPLES 8 TO 10, COMPARATIVE EXAMPLES 7 AND 8

Pre-polymers having different 1,2-vinyl contents (V) of conjugated diene structures in a conjugated diene compound are synthesized to obtain block polymers, and stretchable nonwoven fabrics are manufactured under the same conditions as in Example 1. The physical properties are investigated, and the results shown in Table 5. In Comparative Example 8, a spinning property thereof is poor, a length of fiber obtained is short, and balls or powder-like materials exist in the web, and thus a satisfactory web cannot be obtained.

TABLE 5

	Compara- tive Example 7	Exem- ple 8	Exem- ple 9	Exem- ple 10	Compara- tive Example 8
Mn (10000)	4.3	4.2	4.2	4.6	4.1
S (wt %)	23	28	23	23	29
V (wt %)	15	23	33	42	35
Weight per unit area (g/cm ²)	95	98	101	109	Short length of fiber ball or powder like materials
Strength (g/cm)	141	253	364	341	
Strength/weight per unit area (g/cm ² /g/cm ²)	1.5	2.6	3.6	3.3	
Elongation (%)	102	394	300	738	
Extrusion recovery rate (%)	44	87	99	100	
Feeling strength (g/cm)	0	0.5	16	238	

EXAMPLES 11 TO 13, COMPARATIVE EXAMPLE 9

A raw material is prepared by hydrogenating a pre-polymer having Mn of 51000, S of 25.5 wt % and V of 36 wt %, and stretchable nonwoven fabrics are manufactured under the same conditions as in Example 1 except that the extruder temperature is 300° C., the gas temperature is 400° C., the gas pressure is 0.5 kg/cm²G and the distance between a die and a collector is 10 cm. The stretchable nonwoven fabric in Example 11 is treated by a pair of heated roller an upper roller of which is a metal roller and a lower roller of which is a rubber roller, under conditions of a temperature and a pressure as shown in Table 6. The results are shown in Table 6. The nonwoven fabric in Comparative Example 9 became a film-like form, and accordingly, a measurement of the physical properties was not performed.

TABLE 6

	Exem- ple 11	Exem- ple 12	Exem- ple 13	Compara- tive Example 9
Condition of Treatment	Temperature (C.) Pressure	110 6	100 40	140 40
Weight per unit area (g/cm ²)	116	134	124	Film-like material
Strength (g/cm)	522	718	740	
Strength/weight per unit area (g/cm ² /g/cm ²)	4.5	5.4	6.0	
Elongation (%)	726	782	784	

16

TABLE 6-continued

	Exem- ple 11	Exem- ple 12	Exem- ple 13	Compara- tive Example 8
Extrusion recovery rate (%)	100	99	100	
Settlement (cm)	2.9	2.7	1.9	

EXAMPLE 14 COMPARATIVE EXAMPLES 10 AND 11

A hydrogenated block copolymer is manufactured by hydrogenating a pre-polymer having an Mn of 49,000, S of 29 wt %, and V of 36 wt %, and sequentially, a chip is made from the hydrogenated block copolymer. Further, a polyethylene having an Mn of 2880 and the density of 0.930 is added to the chip of the hydrogenated block copolymer by 30 wt %, and then a raw material is prepared by melting and blending the two materials in a double-screw extruder. A stretchable nonwoven fabric of Example 14 is manufactured from the raw material under the same conditions as in Example 1 except that a gas pressure is 0.5 kg/cm²G and a distance between the die and the collector is 10 cm, and physical properties thereof investigated. Stretchable nonwoven fabrics in Comparative Examples 10 and 11 are manufactured under the same conditions as in Example 14, except that Kronton G1657X and G-1652 supplied from Shell Chemical Co. are used in place of the hydrogenated block copolymer of the present invention, and the physical properties thereof investigated. The results are shown in Table 7. The nonwoven fabrics prepared from Kronton G-1657X and G-1652 have a lower strength and elongation than the nonwoven fabric of Example 14.

TABLE 7

	Example 14	Comparative example 10 Kronton G-1657X	Comparative example 11 Kronton G-1652
Additional amount of Polyethylene (wt %)	30	30	30
Weight per unit area (g/cm ²)	98	90	94
Strength (g/cm)	291	68	141
Strength/weight per unit area (g/cm ² /g/cm ²)	3.0	0.8	1.5
Elongation (%)	526	308	360
Extrusion recovery rate (%)	97	97	97
Extrusion starts (g/cm)	102	60	69
Feeling strength (g/cm)	0	43	0
Collecting efficiency (%)	19.8	11.4	6.6

EXAMPLES 15, 16 AND 17, COMPARATIVE EXAMPLE 12

Stretchable nonwoven fabrics are manufactured under the same conditions as in Example 14, except that added amount of the polyethylene is 5 wt %, 15 wt %, 45 wt % and 70 wt %, the gas pressure is 0.6 kg/cm²G and the distance between

17

the die and the collector is 7 cm, and physical properties thereof investigated. The results are shown in Table 8.

TABLE 8

	Example 15	Example 16	Example 17	Comparative Example 12
Additional amount of polyethylene (wt %)	5	15	45	70
Weight per unit area (g/cm ²)	96	96	101	99
Strength (g/cm)	265	388	455	460
Strength/weight per unit area (g/cm ² /g/cm ²)	2.8	4.0	4.5	4.6
Elongation (%)	434	383	310	142
Extension recovery rate (%)	98	99	92	87
Elongation stress (g/cm)	79	91	240	310
Peeling strength (g/cm)	0	0	0	0

EXAMPLES 18 TO 21

Stretchable nonwoven fabrics are manufactured under the same conditions as in Example 16, the added amount of the polyethylene being 15 wt %, except that the Mn of the polyethylene is made 2800 (density of 0.930), 3400 (density of 0.928), 12000 (density of 0.918) and 17000 (density of 0.929) and the gas pressure is 0.7 kg/cm²G, and physical properties thereof investigated. The results are shown in Table 9.

TABLE 9

	Example 18	Example 19	Example 20	Comparative Example 21
Polyethylene (Mn)	2800	3400	12000	17000
Weight per unit area (g/cm ²)	100	99	94	102
Strength (g/cm)	292	369	226	236
Strength/weight per unit area (g/cm ² /g/cm ²)	2.9	3.7	2.4	2.3
Elongation (%)	366	558	320	270
Extension recovery rate (%)	99	99	97	96
Elongation stress (g/cm)	65	69	82	120
Peeling strength (g/cm)	0	0	0	0

EXAMPLES 22 AND 23

Stretchable nonwoven fabrics are manufactured under the same conditions as in Example 14, except that two types of polypropylenes having an Mn of 40,000 (MFR of 240) and an Mn of 50,000 (MFR of 80) are added by 12 wt %, in place of the polyethylene, and physical properties thereof investigated. The results are shown in Table 10.

TABLE 10

	Example 22	Example 23
polypropylene (Mn)	40,000	50,000
mean diameter of fiber (μm)	18.5	19.6

18

TABLE 10-continued

	Example 22	Example 23
Weight per unit area (g/cm ²)	99	102
Strength (g/cm)	335	300
Strength/weight per unit area (g/cm ² /g/cm ²)	3.4	2.9
Elongation (%)	436	431
Extension recovery rate (%)	95	95
Elongation stress (g/cm)	109	115
Peeling strength (g/cm)	0	0

EXAMPLE 24

A stretchable nonwoven fabric is manufactured under the same conditions as in Example 14, except that a polypropylene having an Mn of 50,000 (MFR of 80) is added by 20 wt %, and a new material is prepared by a chip blending operation, the gas pressure is 3.0 kg/cm²G and the distance between the die and the collector is 30 cm, and the physical properties thereof investigated. The results are shown in Table 11. A mean diameter of fibers constituting this nonwoven fabric is extremely thin, and thus the nonwoven fabric has an extremely soft handling.

TABLE 11

	Example 24
Weight per unit area (g/cm ²)	123
Mean diameter of fiber (μm)	3
Strength (g/cm)	742
Elongation (%)	280
Extension recovery rate (%)	93
Elongation stress (g/cm)	169
Water resistant pressure (mmHg)	540
Air Permeability (cc/min/cm ²)	10
Collecting efficiency (%)	55
Light resistance	Retaining ratio of strength (%)
	Peeling (g/cm)
	4-5

Further the obtained nonwoven fabric is applied with the voltage of 19 KV to perform an electric treatment, and the collecting efficiency thus improved to 86%.

EXAMPLES 25 TO 27 COMPARATIVE EXAMPLES 13 AND 14

Stretchable nonwoven fabrics are manufactured under the same conditions as in Example 24, except that an amount of the polypropylene chip to be blended are changed, and the physical properties thereof investigated. The results are shown in Table 12.

When the spinning operation is performed without the addition of polypropylene, a material similar to a powder, compared with a fiber is obtained and many polymer balls are found, and thus a nonwoven fabric having a good quality cannot be obtained (refer to Comparative Example 13).

7796

TABLE 12

	Comparative example 13	Ex- am- ple 25	Ex- am- ple 26	Ex- am- ple 27	Com- par- ative ex- am- ple 14
Blending ratio of PP (wt %)	0	15	30	50	70
Weight per unit area (g/m ²)	Sample cannot be obtained due to power- line flame	102	108	105	102
Mean diameter of fiber (μm)		3.9	2.5	2.0	1.7
Strength (g/cm)		508	626	546	490
Strength/weight per unit area (g/cm/g/m ²)		5.0	5.8	5.2	4.8
Elongation (%)		394	188	82	44
Extension recovery rate (%)		98	92	78	No measur- ment

EXAMPLES 28 TO 30

Stretchable nonwoven fabrics are manufactured under the same conditions as in Example 1, except that a hydrogenated block copolymer is manufactured by hydrogenating a pre-polymer having an Mn of 53,000, an S of 20 wt % and a V of 36 wt %, and sequentially, a chip is made from the hydrogenated block copolymer, three types of polypropylenes having an Mn of 45,000 (MFR of 140), an Mn of 50,000 (MFR of 80) or an Mn of 53,000 (MFR of 40) are added to the chip, to blend the polypropylene with the hydrogenated block copolymer in the chip state, and the obtained chip is fed to an extruder under the conditions of a gas pressure of 2.5 kg/cm²G and a distance between the die and the collector of 50 cm. The physical properties thereof were investigated, and the results are shown in Table 13.

TABLE 13

	Example 28	Example 29	Example 30
Polypropylene (10,000)	4.5	5.0	5.5
Weight per unit area (g/m ²)	38	42	38
Strength (g/cm)	182	239	188
Strength/weight per unit area (g/cm/g/m ²)	2.7	6.2	5.0
Elongation (%)	158	160	124
Extension recovery rate (%)	84	92	90

EXAMPLES 31 32 AND 33

A raw web is manufactured under the same conditions as in Example 24, except that a distance between the die and the collector is 50 cm, and sequentially, a heat bonding treatment is applied by a heat embossing roll, and the physical properties of the obtained nonwoven fabric investigated. The results are shown in Table 14.

An embossing pattern applied with the heat embossing roll is a pattern 20 having a compressed portion 21, an unpressed portion 22, and an area ratio of the compressed portion of 22%, as shown in FIG. 4.

TABLE 14

	Example 31	Example 32	Example 33
Condition of Treatment	un- treated	70	90
Temperature (C.)		6	15
pressure (kg/cm)			
weight per unit area (g/m ²)	116	119	125
strength (g/cm)	381	351	780
Strength/weight per unit area (g/cm/g/m ²)	3.3	4.6	6.1
Elongation (%)	192	233	304
Extension recovery rate (%)	98	94	93
Elongation stress (g/cm)	213	245	285
water resistant pressure (mm/Hg)	420	640	820
collecting efficiency (%)	52	58	63

The nonwoven fabric in Example 24 is stretched to a length twice that of an original length, and then inserted between two spun-bonded nonwoven fabrics of polypropylene, and further, a heat bonding treatment is applied to the piled nonwoven fabrics by an embossing roll having a discontinuously arranged circular pattern. The obtained composite nonwoven fabric is a nonwoven fabric with gathers, and an elongation thereof is 100%.

EXAMPLE 34

The hydrogenated block copolymer obtained in Example 1 is fed into an extruder, and the copolymer is melted under a superheated heated condition at 300° C., and is extruded from 100 orifices at an individual extruding amount of 0.7 g/min. The fibers are drawn by an air sucker arranged below the extruder and are piled on a net conveyor arranged below the sucker, to form a web. A dispersion property of the web just after spinning is not good. This web is applied with a heat bonding treatment by a heat roll, an upper roll of which is a metal roll and a lower roll of which is a rubber roll, having a temperature of 110° C. and at a pressure of 15 kg/cm, to obtain nonwoven fabric. The obtained nonwoven fabric having a weight per unit area of 130 g/m² has a strong strength, i.e., 11 g/cm, and a superior stretchability.

EXAMPLES 35 AND 36

Stretchable nonwoven fabrics are manufactured under the same conditions as that in Example 1, except that two pre-polymers of a butadiene-styrene-butadiene-styrenebutadiene type block copolymer having a composition ratio (wt %) of 10-15-50-15-10 and having a different Mn are used, and various tests of the physical properties thereof are applied. The results are shown in Table 15.

TABLE 15

	Example 35	Example 36
Mn (10000)	4.4	5.3
Weight per unit area (g/m ²)	105	103
Strength (g/cm)	356	297
Strength/weight per unit area (g/cm/g/m ²)	3.4	2.9
Elongation (%)	682	160
Extension recovery rate (%)	95	95

97

21

CAPABILITY OF EXPLOITATION IN
INDUSTRY

Since the stretchable nonwoven fabric in accordance with the present invention is constituted as described above, the stretchable nonwoven fabric of the present invention has a superior strength, extension characteristics i.e., elongation and extension recovery, weathering resistance, light resistance, heat resistance, chemical resistance and electrical resistance, and a soft handling.

Accordingly, the stretchable nonwoven fabric in accordance with the present invention can be broadly used as a medical and sanitary material, for articles as such a compress, a stretchable tape, a bandage, a diaper or the like, an apparel such as surgical wear, working wear, caps or hats or the like, or as industrial goods such as gloves, a covering material for an electric wire, or the like.

The stretchable nonwoven fabric in accordance with the present invention and having the above described characteristics can be stably manufactured by the manufacturing method in accordance with the present invention.

We claim:

1. A stretchable meltblown nonwoven fabric having a weight per unit area of 5 to 500 g/m², a mean diameter of fibers of 0.5 to 30 μm, and a strength per weight per unit area of 2.4 g/cm/g/m² or more, composed of a thermoplastic fiber comprising a hydrogenated block copolymer C obtained by hydrogenating a block copolymer including two to about four polymer blocks A composed mainly of a vinyl aromatic

22

compound and two to about four polymer blocks B constituted mainly of a conjugated diene compound, at least one polymer block B being arranged on an end of a polymer chain thereof, the number-average molecular weight of said block copolymer being between 30,000 and 65,000 and the content S of the vinyl aromatic compound in the block copolymer being between 15 wt % and 40 wt % and the remaining content being the conjugated diene compound, the content V of a 1,2-vinyl structure of the conjugated diene compound being between 20 wt % and 50 wt % and the remaining content of the conjugated diene compound being structures other than the 1,2-vinyl structure, and a polyolefin D, wherein a blending ratio (C/D) of the hydrogenated block copolymer and the polyolefin D is between 40/60 and 99/1.

2. A stretchable nonwoven fabric according to claim 1, wherein said blending ratio (C/D) is between 50/50 and 95/5.

3. A stretchable nonwoven fabric according to claim 1, wherein said polyolefin is a polyethylene.

4. A stretchable nonwoven fabric according to claim 1, wherein said polyolefin is a polypropylene.

5. A stretchable nonwoven fabric according to claim 1, wherein the mean diameter of fibers constituting said nonwoven fabric is 10 μm or less.

6. A stretchable nonwoven fabric according to claim 1, wherein the mean diameter of fibers is 1 to 6 μm.

* * * * *



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Tanzer et al.

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(45) **Date of Patent** **Aug. 6, 2002**

(54) **ABSORBENT ARTICLE HAVING
SUPERABSORBENT POCKETS IN A
NON-ABSORBENT CARRIER LAYER**

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(52) **U.S. CL** --- 604/368; 604/367

(58) **Field of Search** --- 604/385 16, 364,
604/367, 368, 378

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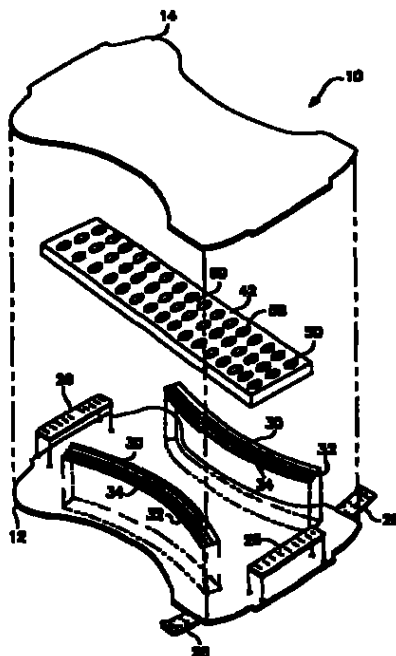
Assistant Examiner—Michael Bogart

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(57) **ABSTRACT**

An absorbent article having relatively light weight and less bulk includes a liquid permeable top layer an inner surge layer and a substantially liquid-impermeable outer cover. A plurality of pockets are formed in at least one of the surge layer and the outer cover material. The pockets contain a superabsorbent material. The surge layer or outer cover material containing the pockets functions as an absorbent layer, thereby eliminating the need for a separate (often bulky) absorbent layer between the surge layer and the outer cover.

27 Claims, 4 Drawing Sheets



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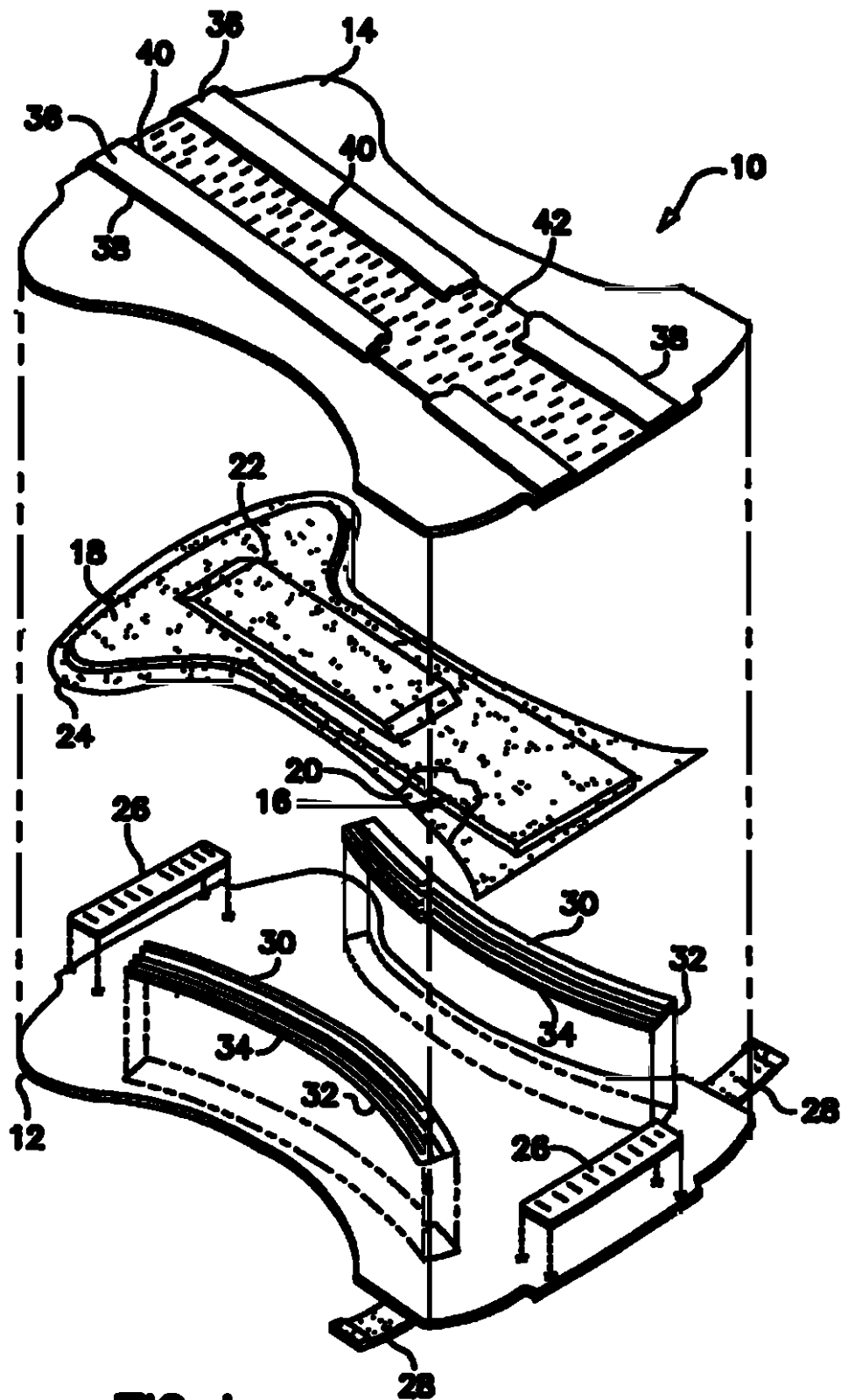


FIG. 1

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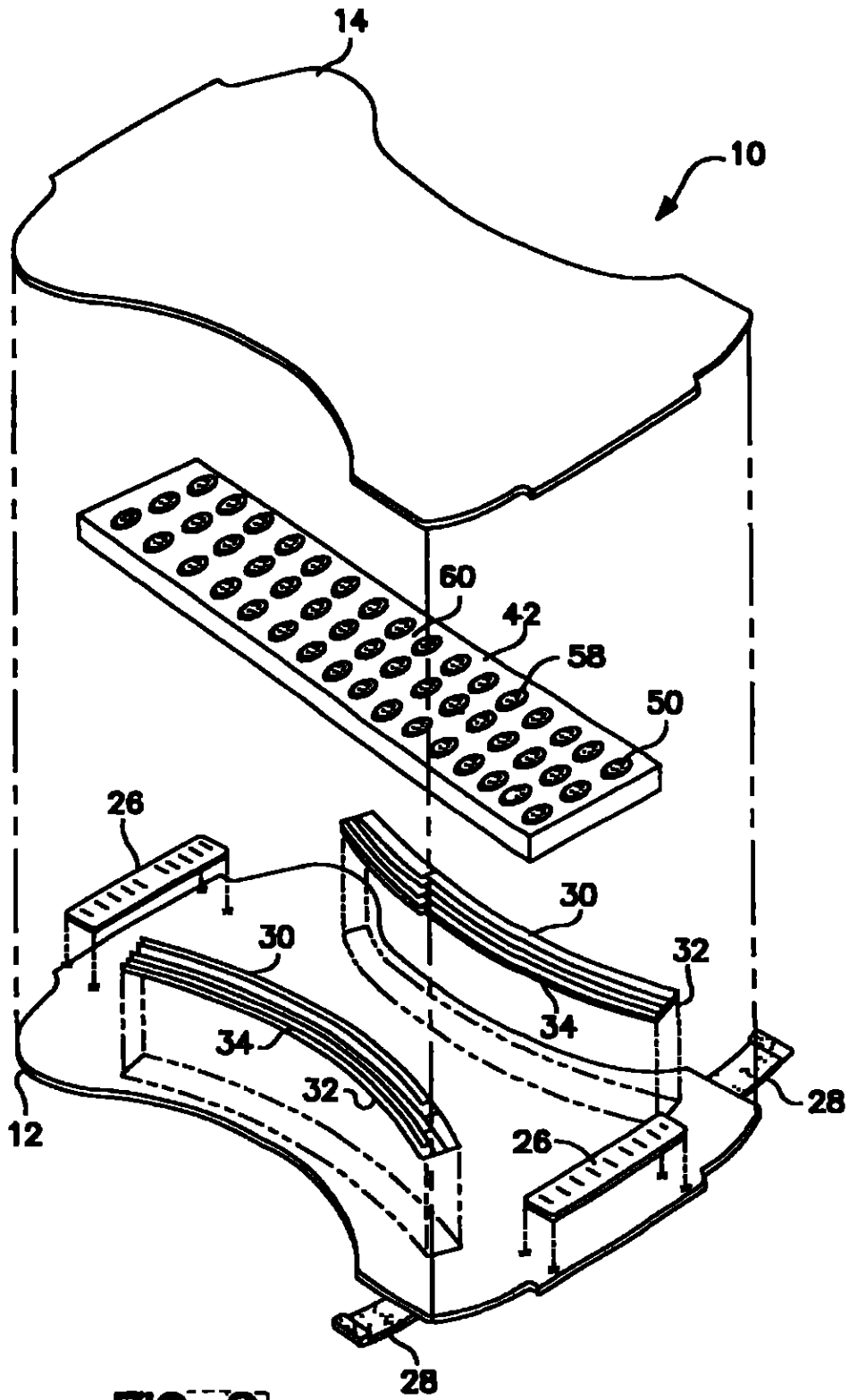


FIG. 2'

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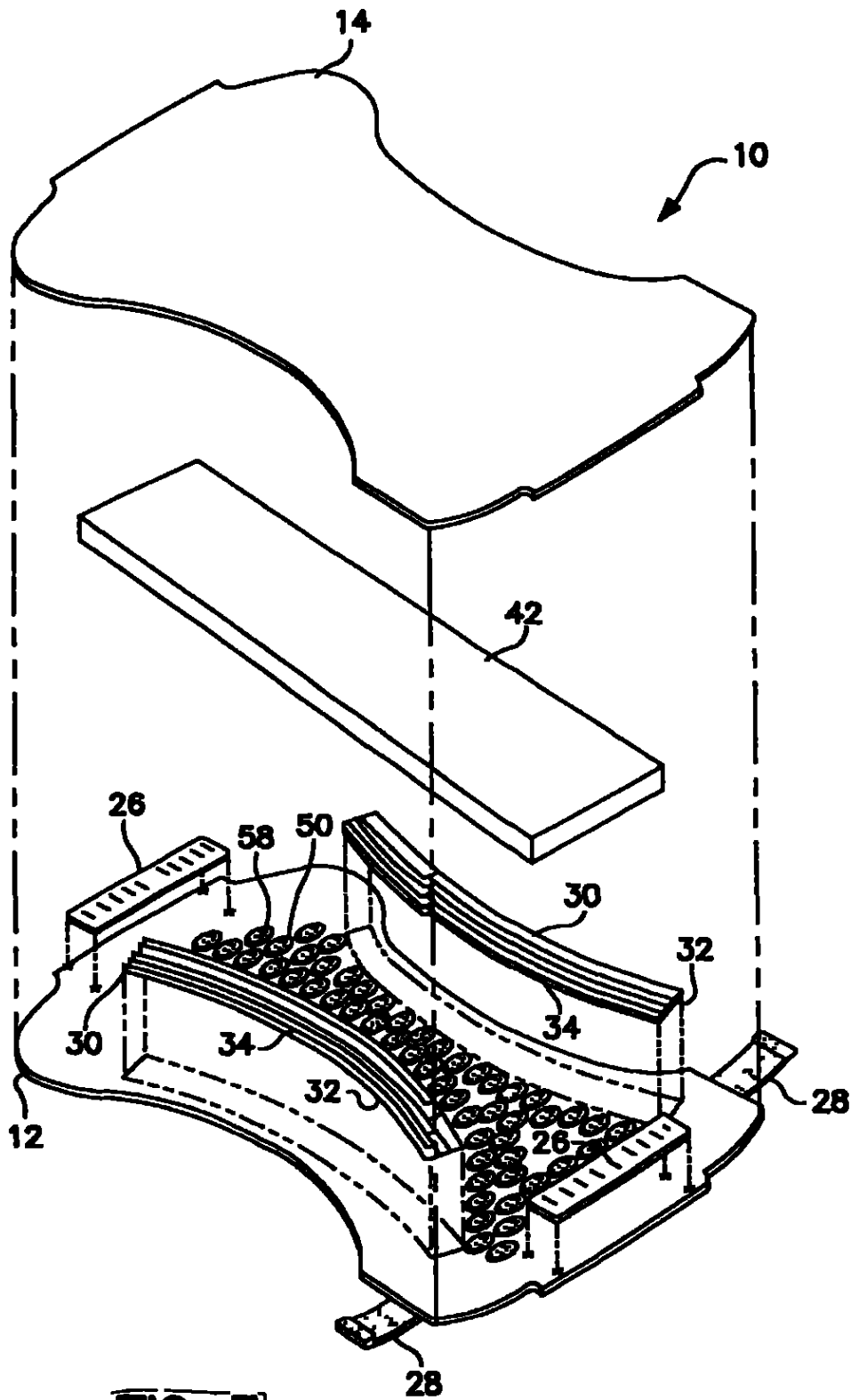


FIG. 3

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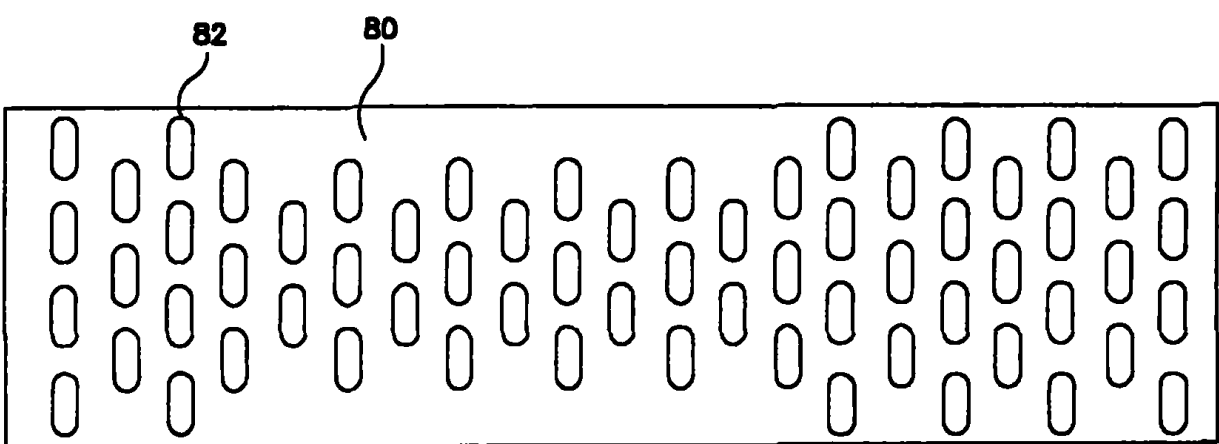


FIG. 4

(105)
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ABSORBENT ARTICLE HAVING SUPERABSORBENT POCKETS IN A NON- ABSORBENT CARRIER LAYER

FIELD OF THE INVENTION

This invention relates to an absorbent article in which superabsorbent material is contained in pockets of another, non-absorbent layer. The invention eliminates the need for a separate absorbent layer, and reduces the total number of layers required in the article.

BACKGROUND OF THE INVENTION

Absorbent composites suitable for use in disposable absorbent garments such as diapers, adult incontinent products, and the like, are known. Such absorbent composites are described, for example, in U.S. Pat. No. 4,699,619 issued Oct. 13, 1987 to Bernardin, U.S. Pat. No. 4,798,603 issued Jan. 17, 1989 to Meyer et al., U.S. Pat. No. 4,834,735 issued May 30, 1989 to Alemany et al., U.S. Pat. No. 5,147,343 issued Sep. 15, 1992 to Kallenberger and U.S. Pat. No. 5,149,335 issued Sep. 22, 1992, to Kallenberger et al.

Generally such absorbent composites comprise a matrix for containing a high-absorbency material in another absorbent material. Suitable matrices for containing the high-absorbency material include absorbent fibrous matrices, such as those formed from air-laid cellulosic fibers or a conformal material comprising cellulosic fibers and meltblown polyolefin fibers. A wide variety of high absorbency materials (also known as superabsorbent materials) are known to those skilled in the art. See, for example, U.S. Pat. No. 4,076,663 issued Feb. 28, 1978 to Masuda et al., U.S. Pat. No. 4,286,082 issued Aug. 25, 1981 to Tsubakimoto et al., U.S. Pat. No. 4,062,817 issued Dec. 13, 1977 to Westerman and U.S. Pat. No. 4,340,706 issued Jul. 20, 1982 to Obayashi et al.

Many known absorbent composites comprising a high-absorbency material employ the high-absorbency material in relatively low concentrations. That is, many of the absorbent composites comprise air-laid cellulosic fibers and less than about 20 weight percent of high-absorbency material. This is due to several factors.

Many high-absorbency materials are unable to absorb a liquid at the rate at which the liquid is applied to the absorbent composites during use. Accordingly, a relatively high concentration of fibrous material is desirable to temporarily hold the liquid until the high-absorbency material can absorb it. Further the fibers serve to separate the particles of high-absorbency material so that gel-blocking does not occur. Gel-blocking refers to the situation wherein particles of high-absorbency material deform during swelling and block the interstitial spaces between the particles, or between the particles and fibers, thus preventing the flow of liquid through the interstitial spaces.

The presence of a relatively low concentration of high-absorbency material and a relatively greater concentration of fibrous materials has resulted in the production of absorbent composites which tend to be relatively thick. In some instances, the use of a relatively thick absorbent composite in a disposable absorbent garment is acceptable. However in recent years it has become increasingly desirable to produce absorbent composites which are thin compared to the more traditional absorbent composites but which still possess the same absorbent capacity. The desire to produce relatively thin absorbent composites has resulted in the desire to incorporate ever-increasing amounts of high-absorbency

2

material into the absorbent composites. This is because the absorbent capacity of such high-absorbency materials is generally many times greater than the absorbent capacity of fibrous materials. For example, a fibrous matrix of wood pulp fluff can absorb about 7-9 grams of a liquid, (such as 0.9 weight percent saline) per gram of wood pulp fluff, while the high-absorbency materials can absorb at least about 15, preferably at least about 20, and often at least about 25 grams of liquid, such as 0.9 weight percent saline, per gram of the high-absorbency material.

U.S. Pat. No. 5,601,542, issued to Melms et al. discloses an absorbent article in which superabsorbent material is contained in layers of discrete pouches. The pouches are adjacent one another and are formed in one or more substrate layers. The patent illustrates a diaper which includes a substantially liquid impermeable outer cover, a liquid permeable body-side liner and an absorbent composite between the outer cover and body-side liner. A surge management layer positioned adjacent to the body-side liner in the crotch region of the latter, regulates the flow of liquid surging into the absorbent composite. The surge management layer may be above (on the outside of) the body-side liner, or may be between the body-side liner and the absorbent composite.

There is a need or desire in the industry to provide diapers and other absorbent articles having fewer layers, lighter construction, and lower production costs, without losing any of the functions provided by the conventional layers.

SUMMARY OF THE INVENTION

The present invention is an absorbent article, such as a diaper in which the functions of plural layers are combined into a single layer thereby reducing the total number of layers without yielding any functions. Specifically, the present invention is directed to an absorbent article, such as a diaper in which the absorbent function is integrated into either the surge material or the outer cover material thus eliminating the need for a separate central absorbent composite. The objective of the invention is accomplished by forming a plurality of small pockets in the surge material and/or the outer cover material. A superabsorbent material is added to the pockets, causing the surge layer and/or the outer cover to perform an absorbent function.

More specifically the present invention is directed to an absorbent article including a liquid-permeable body-side liner, a surge layer adjacent to the body-side liner and a substantially liquid-impermeable outer cover adjacent to the surge layer. At least one of the surge layer and the outer cover includes a plurality of pockets, and a quantity of superabsorbent material within the pockets. Put another way, the pockets containing the superabsorbent can be in the surge layer, in the outer cover, or in both the surge layer and the outer cover material, thus eliminating the need for a separate absorbent composite layer between the surge layer and the outer cover material.

With the foregoing in mind, it is a feature and advantage of the invention to provide an absorbent article having three essential layers, namely a body-side liner, a surge layer, and an outer cover wherein at least one of the surge layer and outer cover contains a superabsorbent material.

It is also a feature and advantage of the invention to provide an absorbent article having lower cost, simpler construction and lighter weight than conventional absorbent articles.

It is also a feature and advantage of the invention to provide an absorbent article having less bulk than conventional absorbent articles.

It is also a feature and advantage of the invention to provide a highly water vapor breathable absorbent garment, promoting skin wellness.

The foregoing and other features and advantages of the invention will become further apparent from the following detailed description of the presently preferred embodiments. This detailed description is exemplary and should be construed as illustrating rather than limiting the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG 1 is an exploded perspective view of a prior art absorbent article, in this case a diaper

FIG 2 is an exploded perspective view of a diaper according to the invention

FIG 3 is an exploded perspective view of another embodiment of the invention.

FIG 4 illustrates one embodiment of a template for forming pockets in a layer of material

DETAILED DESCRIPTION OF THE PRESENTLY PREFERRED EMBODIMENTS

The present invention is an absorbent article in which the functions of plural layers are combined into a single layer, thus eliminating the need for a separate absorbent core layer. The absorbent article includes a liquid-permeable body-side liner 14, a surge material adjacent the body-side liner, and a substantially liquid-impermeable outer cover adjacent the surge layer. Pockets are formed in at least one of the surge layer and outer cover and a superabsorbent material is present in the pockets.

The features and advantages of the invention will be described with reference to a prior art disposable diaper. FIG. 1 illustrates an exploded perspective view of a disposable diaper of the prior art. Referring to FIG. 1, disposable diaper 10 includes an outer cover 12, a body-side liner 14, and an absorbent composite 16 located between the body-side liner 14 and the outer cover 12. The absorbent composite 16 comprises an air-laid mixture of wood pulp fibers and superabsorbent material. The absorbent composite is surrounded by a two-piece wrap sheet comprising upper wrap sheet layer 18 and lower wrap sheet layer 20. The absorbent composite 16 has a profiled thickness to define an area 22 of increased mass weight. The two-piece wrap sheet extends beyond the edges of the absorbent composite 16 to define perimeter 24 which can be sealed to prevent superabsorbent material from migrating out of the diaper.

Attached to outer cover 12 are waist elastics 26, fastening tapes 28 and leg elastics 30. The leg elastics 30 comprise a carrier sheet 32 and individual elastic strands 34.

The body-side liner 14 includes containment flaps 36 having proximal edges 38 and distal edges 40. A surge management layer 42 is located between the proximal edges 38 of the containment flaps 36.

The exact construction method and materials of the diaper illustrated in FIG. 1 are set forth in greater detail in commonly assigned U.S. Pat. No. 5,509,915 issued Apr. 23, 1996 in the name of Hinson et al., incorporated herein by reference. Possible modifications to the diaper illustrated in FIG. 1 are set forth in commonly assigned U.S. Pat. No. 5,509,915 referenced above and in commonly assigned U.S. Pat. No. 5,364,382, issued Nov. 15, 1994 to Latimer et al. Such possible modifications include positioning the surge management layer 42 between the body-side liner 14 and the absorbent composite 16 and reducing the length of the surge management layer to extend the length of the absorbent

composite or massing (reduce length and increase mass weight) the surge management layer in the area of the diaper where liquid waste initially accumulates (target zone).

FIG. 2 illustrates one embodiment of a disposable diaper of the invention. In the diaper of FIG. 2, the absorbent composite 16 has been eliminated and the surge layer 42 has been placed between the liquid-permeable body-side liner 14 and the substantially liquid-impermeable outer cover 12. In accordance with the invention, a plurality of pockets 50 are formed in the surge layer 42. Pockets 50 each contain a quantity of superabsorbent material 58, thereby enabling the surge layer 42 to perform the dual functions of surge and absorbency. Surge layer 42 has an operable level of density and mass weight to quickly collect and temporarily hold liquid surges, to transport the liquid from its initial entrance point and to substantially completely release the liquid to pockets 50 and superabsorbent 58. This configuration can help prevent the liquid from pooling and collecting on the portion of the absorbent garment positioned against the wearer's skin, thereby reducing the feeling of wetness by the wearer.

The pockets 50 are spaced apart by distances 60. The spacings 60 between the pockets may be at least about 0.05 inch (1.3 mm), alternatively at least about 0.10 inch (2.5 mm), suitably at least about 0.15 inch (3.8 mm). Moreover the spacings 60 are suitably not more than about 1.5 inch (38 mm), alternatively not more than about 1.0 inch (25 mm), alternatively not more than about 0.5 inch (13 mm).

The depths of pockets 50 may be at least about 0.1 inch (2.5 mm), preferably about 0.15-0.50 inch (3.8-13 mm), more preferably about 0.20-0.30 inch (5.1-7.6 mm). The pockets may have a circular or elliptical configuration, with diameters ranging from about 0.20-1.0 inch (5.1-25 mm), preferably about 0.25-0.75 inch (6.4-19.1 mm), more preferably about 0.40-0.60 inch (10.2-15.2 mm).

As explained further below with respect to FIG. 3, pockets 50 may be variously configured with respect to the non-absorbent materials. For example, pockets 50 containing superabsorbent may exist between the surge management layer 42 and outer cover 12, or between two surge management layers.

The term "superabsorbent" or "superabsorbent material" refers to a water-swellaible, water-insoluble organic or inorganic material capable, under the most favorable conditions, of absorbing at least about 20 times its weight and, more desirably at least about 30 times its weight in an aqueous solution containing 0.9 weight percent sodium chloride. The superabsorbent materials can be natural, synthetic, and modified natural polymers and materials. In addition, the superabsorbent materials can be inorganic materials, such as silica gels, or organic compounds such as cross-linked polymers. The term "cross-linked" refers to any means for effectively rendering normally water-soluble materials substantially water insoluble but swellable. Such means can include, for example, physical entanglement, crystalline domains, covalent bonds, ionic complexes and associations, hydrophilic associations, such as hydrogen bonding, and hydrophobic associations of Van der Waals forces.

Examples of synthetic superabsorbent material polymers include the alkali metal and ammonium salts of poly(acrylic acid) and poly(methacrylic acid), poly(acrylamides), poly(vinyl ethers), maleic anhydride copolymers with vinyl ethers and alpha-olefins, poly(vinyl pyrrolidone), poly(vinylmorpholinone), poly(vinyl alcohol), and mixtures and copolymers thereof. Further superabsorbent materials include natural and modified natural polymers, such as

FIG 105

hydrolyzed acrylonitrile grafted starch, acrylic acid grafted starch, methyl cellulose, chitosan, carboxymethyl cellulose, hydroxypropyl cellulose, and the natural gums, such as alginates, xanthan gum, locust bean gum and the like. Mixtures of natural and wholly or partially synthetic superabsorbent polymers can also be useful in the present invention. Other suitable absorbent gelling materials are disclosed by Assarsson et al. in U.S. Pat. No. 3,901,236 issued Aug. 26, 1975. Processes for preparing synthetic absorbent gelling polymers are disclosed in U.S. Pat. No. 4,076,663 issued Feb. 28, 1978 to Masuda et al. and U.S. Pat. No. 4,286,082 issued Aug. 25, 1981 to Tsubakimoto et al.

Superabsorbents may be particulate or fibrous, and are preferably particulate. Superabsorbents are generally available in particle sizes ranging from about 20 to about 1000 microns. Examples of commercially available particulate superabsorbents include SANWET® IM 3900 and SANWET® IM-5000P available from Hoechst Celanese located in Portsmouth, Va., DRYTECH® 2035LD available from Dow Chemical Co. located in Midland, Mich., and FAVOR® 880 available from Stockhausen, located in Sweden. FAVOR® 880 is presently preferred because of its high gel strength. An example of a fibrous superabsorbent is OASIS® 101, available from Technical Absorbents, located in Grimsby, United Kingdom.

Depending on the size of pockets 50 and density of the superabsorbent, each pocket 50 may contain about 25-500 mg of superabsorbent, preferably about 50-300 mg, more preferably about 100-200 mg. The number and size of pockets 50 may be such that surge layer 42 contains about 1-100 grams of total superabsorbent, preferably about 3-50 grams, more preferably about 5-15 grams. Of course, the total amount of superabsorbent 58 may vary depending on the size and intended use of the absorbent article. Furthermore, the superabsorbent 58 may be present in pockets formed in more than one non-absorbent layer of the diaper as explained below.

In addition to the superabsorbent material, each pocket 50 may contain, if desired, a fibrous absorbent material such as pulp fibers, a filler material, an odor absorbent material, a fragrant material, or another suitable material. When combinations of materials are employed, the superabsorbent should constitute at least 30% of the total material in pockets 50, preferably at least 50%, more preferably at least 70%, most preferably at least 90%. Additionally, some of the pockets, preferably fewer than 50%, may contain no superabsorbent. The pockets without superabsorbent may contain odor absorbent materials, fragrances, lotions, emollients, antimicrobials and the like.

Pockets 50 will expand toward each other when the superabsorbent 58 becomes wet. Preferably, pockets 50 are shaped so that they may touch each other during expansion without closing all of the space between them. When viewed from above, as in FIG. 2, pockets 50 preferably have a circular, oval or elliptical shape. Pockets having these shapes are also less likely to rupture due to stresses caused by swelling or stretching of the superabsorbent, and other forces experienced during product manufacture and use. Square and rectangular shapes are less preferred, because these shapes would permit substantially continuous contact along the edges of adjacent pockets 50. Also, pockets having these shapes are more easily ruptured.

Alternatively, the pockets 50 containing the superabsorbent 58 may be formed in another otherwise non-absorbent layer in the diaper. The term "non-absorbent" refers to any material which absorbs not more than about 5 times its

weight in an aqueous solution containing 0.9% by weight sodium chloride. INDA Standard Test Method IST 10.1 (95), "Standard Test Method for Absorbency Time, Absorbency Capacity, and Wicking Time," published by INDA, Association of the Nonwoven Fabrics Industry, Cary, N.C., provides the basis for a suitable test method to measure absorbency. The "Absorptive Capacity Test (for small specimens)" may be used to determine the absorbency of a material for the purpose of the subject invention with the following two modifications. (i) IST 10.1 (95) specifies that water is to be used; substitute a 0.9% aqueous solution, (ii) IST 10.1 (95) specifies that a 5 gram sample is used. If necessary, a smaller sample, obtained from an absorbent product may be used instead.

FIG. 3 illustrates a second embodiment of the invention, in which pockets 50 containing superabsorbent 58 are formed and located in the substantially liquid impervious outer cover material 12. In the embodiment shown, the pockets 50 are located beneath the surge layer 42, are between the two leg elastics 30, and are between the two waist elastics 24. One feature of this second embodiment, versus the first embodiment described above, is that the formation of pockets in the outer cover causes the outer surface of the outer cover material to have a dimpled, more textured feeling. The second embodiment also places the superabsorbent material as far as possible from the wearer's skin, thereby reducing skin irritation following liquid surges into the absorbent article.

The body-side liner 14, surge layer 42 and outer cover 12 are constructed of conventional non-absorbent materials. By "non-absorbent" it is meant that these materials, excluding the pockets filled with superabsorbent, have an absorptive capacity not exceeding 5 grams of 0.9% aqueous saline solution per gram of material, using the absorption test described above. Both the surge layer 42 and body-side liner 14 are constructed from highly liquid pervious materials. These layers function to transfer liquid from the wearer to the interior of absorbent article 10, ultimately to the superabsorbent 58 in pockets 50. Suitable liquid pervious materials include porous woven materials, porous nonwoven materials, films with apertures, open-celled foams, and batting. Examples include, without limitation, any flexible porous sheets of polyolefin fibers, such as polypropylene, polyethylene or polyester fibers, webs of spunbonded polypropylene, polyethylene or polyester fibers; webs of rayon fibers, bonded carded webs of synthetic or natural fibers or combinations thereof. U.S. Pat. No. 5,904,675 issued May 18, 1999 to Lenz et al. and incorporated by reference provides further examples of suitable surge materials. Either layer may also be an apertured plastic film. Suitable batting includes certain air formed thermomechanical and chemithermomechanical wood pulps. The various layers of article 10 have dimensions which vary depending on the size and shape of the wearer.

The outer cover material 12 should be breathable to water vapor. Generally the outer cover 12 will have an MVTR of at least about 300 grams/m² 24 hours using the test procedure described below, preferably at least about 1000 grams/m² 24 hours, more preferably at least about 3000 grams/m² 24 hours using the test procedure described below. Outer cover 12 shown in FIGS. 1-3 may include two layers, joined by thermal or ultrasonic bonding, or an adhesive. One of the layers can be a nonwoven filament web. The other layer can be a breathable film. Outer cover 12 can be positioned with the nonwoven web facing outward, and with the breathable film facing inward toward the surge layer 42.

Nonwoven filament webs can be used in the body-side liner 14, surge layer 42, and/or outer cover 12. Each non-

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The pans are placed in a forced air oven at 100° F (32° C.) for 1 hour to equilibrate. The oven is a constant temperature oven with external air circulating through it to prevent water vapor accumulation inside. A suitable forced air oven is, for example, a Blue M Power-O-Matic 60 oven distributed by Blue M Electric Company of Blue Island, Ill. Upon completion of the equilibration, the pans are removed from the oven, weighed and immediately returned to the oven. After 24 hours, the pans are removed from the oven and weighed again. The preliminary test water vapor transmission rate values are calculated as follows:

$$\text{Test MVTR} = (\text{gross weight loss over 24 hours}) / (315.5 \text{ g/m}^2 \cdot 24 \text{ hours})$$

The relative humidity within the oven is not specifically controlled.

Under predetermined test conditions of 100° F (32° C.) and ambient relative humidity, the MVTR for the CIEL-GARD® 2500 control has been defined to be 5000 grams per square meter for 24 hours. Accordingly, the control sample is run with each test and the preliminary test values are corrected to test conditions using the following equation:

$$\text{MVTR} = (\text{Test MVTR} / \text{control MVTR}) \times (5000 \text{ g/m}^2 \cdot 24 \text{ hours})$$

While the embodiments disclosed herein are presently considered preferred, various modifications and improvements can be made without departing from the spirit and scope of the invention. The scope of the invention is indicated by the appended claims, and all changes that fall within the meaning and range of equivalency are intended to be embraced therein.

We claim:

1. An absorbent article, comprising:
 - a liquid-permeable body-side liner;
 - a non-absorbent surge material abutting the body-side liner;
 - an outer cover of a substantially liquid-impermeable non-absorbent outer cover material abutting the surge material;
 - a plurality of pockets in at least one of the surge material or the outer cover material; and
 - a superabsorbent material in at least some of the pockets.
2. The absorbent article of claim 1 wherein the pockets are formed in the surge material.
3. The absorbent article of claim 1 wherein the pockets have depths of at least about 0.1 inch (2.5 mm), and diameters of about 0.2–1.0 inch (5–25 mm).
4. The absorbent article of claim 1 wherein the pockets have depths of about 0.15–0.50 inch (3.8–13 mm), and diameters of about 0.25–0.75 inch (6.4–19 mm).
5. The absorbent article of claim 1 wherein the pockets have depths of about 0.20–0.30 inch (5.1–7.6 mm), and diameters of about 0.40–0.60 inch (10–15 mm).
6. The absorbent article of claim 1 wherein the pockets are spaced apart at distances of about 0.05–1.5 inch (1.3–38 mm).
7. The absorbent article of claim 1 wherein the pockets are spaced apart at distances of about 0.10–1.0 inch (2.5–25 mm).

8. The absorbent article of claim 1, wherein the pockets are spaced apart at distances of about 0.15–0.50 inch (3.8–13 mm).

9. The absorbent article of claim 1, wherein each pocket comprises about 25–500 mg of the superabsorbent.

10. The absorbent article of claim 1 wherein each pocket comprises about 50–300 mg of the superabsorbent.

11. The absorbent article of claim 1, wherein each pocket comprises about 100–200 mg of the superabsorbent.

12. An absorbent article, comprising:

- a liquid permeable body-side liner;
- a surge material, formed of a non-absorbent material, a substantially liquid-impermeable outer cover, formed of a non-absorbent outer cover material,
- a plurality of pockets in at least one of the surge material and the outer cover material; and
- a superabsorbent material in at least some of the pockets, wherein the absorbent article is devoid of a separate absorbent layer between the surge material and the outer cover material.

13. The absorbent article of claim 12, wherein the pockets are formed in the surge material.

14. The absorbent article of claim 12, wherein the material in which the pockets are formed comprises a thermoplastic polymer.

15. The absorbent article of claim 12, wherein the material in which the pockets are formed comprises a thermoplastic nonwoven fibrous web.

16. The absorbent article of claim 15, wherein the nonwoven web comprises a neck-stretched nonwoven web.

17. The absorbent article of claim 13, wherein the surge material comprises a nonwoven fibrous web.

18. The absorbent article of claim 12, wherein the outer cover material comprises a nonwoven fibrous web and a breathable thermoplastic film.

19. An absorbent article, comprising:

- a non-absorbent surge material including at least one layer of a fibrous non-absorbent material;
 - a non-absorbent outer cover material abutting the surge material and including at least one other layer of a fibrous non-absorbent material;
 - a plurality of pockets in at least one of the surge material or the outer cover material; and
 - a superabsorbent material in at least some of the pockets.
20. The absorbent article of claim 19, comprising a diaper.
21. The absorbent article of claim 19 comprising training pants.

22. The absorbent article of claim 19 comprising swim wear.

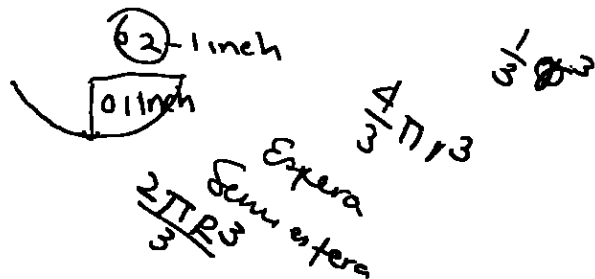
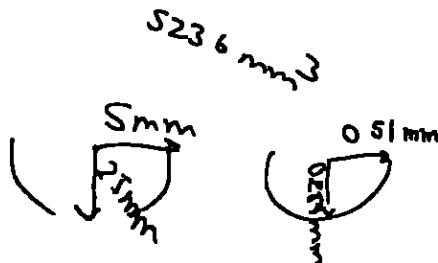
23. The absorbent article of claim 19 comprising absorbent underpants.

24. The absorbent article of claim 19 comprising a baby wipe.

25. The absorbent article of claim 19, comprising an adult incontinence product.

26. The absorbent article of claim 19 comprising a feminine hygiene product.

27. The absorbent article of claim 19, comprising a medical absorbent product.



UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. 6,429,350 B1
DATED August 6, 2002
INVENTOR(S) Richard Warren Tanzer et al

Page 1 of 1

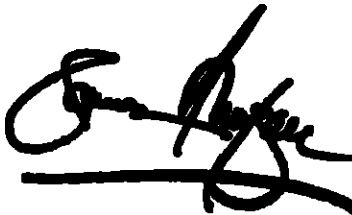
It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below

Title page, Item [54], and Column 1, lines 1-3,
delete in their entirety and in its place insert.

-- ABSORBENT ARTICLE HAVING SUPERABSORBENT POCKETS IN A
NON-ABSORBENT LAYER. --

Signed and Sealed this

Twenty-ninth Day of April, 2003



JAMES E. ROGAN
Director of the United States Patent and Trademark Office

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Case # 14729
COLOMBIA

CERTIFICATION

STATE OF WISCONSIN)
) SS
COUNTY OF WINNEBAGO)

I hereby certify that the attached paper constitutes a true copy of the original of a certain
Assignment to KIMBERLY-CLARK WORLDWIDE, INC by Eugenio Go Varona of the
subject matter disclosed in an application for Letters Patent of the United States entitled

NONWOVEN COMPOSITE WITH HIGH PRE- AND POST-WETTING PERMEABILITY

which was signed by the said Eugenio Go Varona on August 22, 2001

November 4, 2003
Date

Melissa A. Blob
Melissa A Blob, Notary Public
My Commission Expires August 1, 2004

(Legalization required)



110
UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
ASSISTANT SECRETARY AND COMMISSIONER
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JBR/FF
KIMBERLY-CLARK WORLDWIDE, INC
JAMES B ROBINSON
401 NORTH LAKE STREET
NEENAH, WI 54956

14729

UNITED STATES PATENT AND TRADEMARK OFFICE
NOTICE OF RECORDATION OF ASSIGNMENT DOCUMENT

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RECORDATION DATE 08/22/2001

REEL/FRAME 012131/0906
NUMBER OF PAGES 2

BRIEF ASSIGNMENT OF ASSIGNOR'S INTEREST (SEE DOCUMENT FOR DETAILS)

ASSIGNOR
VARONA, EUGENIO G

DOC DATE 08/22/2001

ASSIGNEE
KIMBERLY-CLARK WORLDWIDE, INC
401 NORTH LAKE STREET
NEENAH, WISCONSIN 54956

SERIAL NUMBER 09935088
PATENT NUMBER

FILING DATE 08/22/2001
ISSUE DATE

JEEVON JONES, EXAMINER
ASSIGNMENT DIVISION
OFFICE OF PUBLIC RECORDS

111

In the United States Patent and Trademark Office

Applicant: Eugenio Go Varona **Docket No.** 14729
Serial No. **Group.**
Filed: **Examiner**
For **NONWOVEN COMPOSITE WITH HIGH PRE- AND POST-WETTING PERMEABILITY**
Express Mail No. **EL 154 776 824 US**

Assignment – Sole Inventor

ASSISTANT COMMISSIONER OF PATENTS
Washington D C 20231

Sir

WHEREAS Eugenio Go Varona residing at 3309 Woodrun Trail Marietta Georgia 30062 (hereinafter referred to as Assignor) has made an invention and has either (1) previously executed an application for Letters Patent of the United States of America therefor or (2) is contemporaneously executing an application for Letters Patent of the United States of America for the invention which is entitled

NONWOVEN COMPOSITE WITH HIGH PRE- AND POST-WETTING PERMEABILITY

AND WHEREAS Kimberly-Clark Worldwide Inc a corporation of the State of Delaware having offices at 401 North Lake Street, Neenah, Wisconsin 54956, United States of America (hereinafter referred to as "Assignee") is desirous of acquiring the entire right, title and interest in and to said invention and under said Letters Patent or similar legal protection to be obtained therefor in the United States and in any and all foreign countries

NOW THEREFORE TO ALL WHOM IT MAY CONCERN Be it known that in consideration of the payment by the Assignee to the Assignor of the sum of One U S Dollar (\$1 00 U S) and for other good and valuable consideration the receipt and sufficiency of which is hereby acknowledged Assignor hereby sells assigns and transfers to Assignee the full and exclusive right title and interest to said invention and in and to any and all Letters Patent or similar legal protection in the United States and its territorial possessions and in any and all foreign countries to be obtained for said invention by said application or any continuation continuation-in-part, divisional renewal, substitute re-examination conversion or reissue thereof, including any extensions thereof or any legal equivalent thereof in any foreign country for the full term or terms for which the same may be granted including any and all convention rights

Assignor hereby covenants that no assignment, sale, agreement or encumbrance has been or will be made or entered into which would conflict with this assignment and sale

Assignor further covenants that Assignor will promptly provide, upon written request, Assignee with all pertinent facts and documents relating to said application, said invention and said Letters Patent and legal equivalents in foreign countries as may be known and accessible to Assignor and Assignor will promptly execute and deliver to Assignee or its legal representatives any and all papers instruments or affidavits required to apply for obtain maintain issue extend and enforce said application said invention and said Letters Patent and said equivalents thereof in any foreign country which may be necessary or desirable to carry out the purposes thereof

IN WITNESS WHEREOF Assignor has executed this document on the date indicated below



Eugenio Go Varona

Date 8/22/01

THE STATE OF WISCONSIN

Office of the
Secretary of State

APOSTILLE

(Convention de La Haye du 5 octobre 1961)

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Country: United States of America

This public document has been signed by Melissa A Blob
acting in the capacity of Notary Public, State of Wisconsin
bears the seal/stamp of Notary Public, State of Wisconsin

CERTIFIED

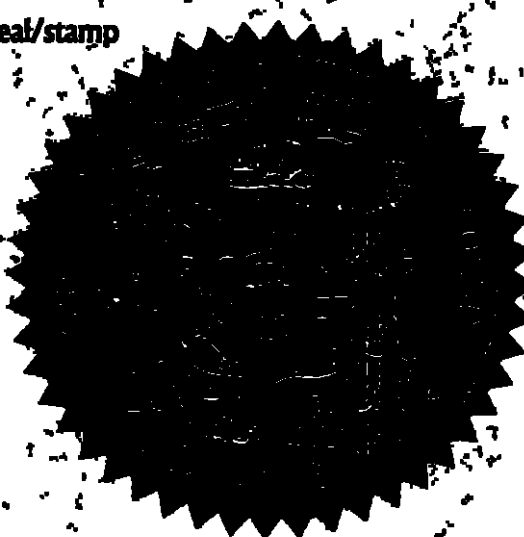
at Madison, Wisconsin

November 11, 2003

by the Secretary of State of Wisconsin

No 92826

Seal/stamp



Signature

Douglas La Follette

DOUGLAS LA FOLLETTE
Secretary of State

SECRETARIA DE ECONOMIA
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Fecha (Ano): 2004-02-06 16:44:56
Tramite: 011 PAT 001 01 079, 054 0001 011 000 0110

REQUISITOS NECESARIOS PARA PRESENTACION Y AGILIZACION DEL TRAMITE

	USUARIO	RADICADOR
PATENTE DE INVENCIÓN	()	(X)
MODELO DE UTILIDAD	()	(X)
Indicación de que se solicita la concesion de una patente	()	(X)
Datos de identificación del solicitante o de la persona que se presenta la solicitud	()	(X)
Descripción de la invención	()	(X)
Dibujos de ser estos pertinentes	()	(X)
Comprobante de Pago de las tasas establecidas	()	(X)
COMPLETA ()	INCOMPLETA ()	()
DISEÑO INDUSTRIAL ()		
- Indicación de que se solicita el registro de Diseño Industrial	()	()
- Datos de identificación del solicitante o de la persona que presenta la solicitud	()	()
- Representacion grafica y fotografica del Diseño Industrial o muestra del Material que incorpora el diseño	()	()
- Comprobante de pago de las tasas establecidas	()	()
COMPLETA ()	INCOMPLETA ()	()
ESQUEMA DE TRAZADO ()		
- Indicación de que solicita el registro de un Esquema de trazado	()	()
- Datos de identificación del solicitante o de la persona que presenta La solicitud	()	()
- Representacion grafica del esquema de trazado	()	()
- Comprobante de pago de las tasas establecidas	()	()
COMPLETA ()	INCOMPLETA ()	()

Firma Responsable
Federico Narvaiz
Fecha 06-02-2004



114

Industria y Comercio

SUPERINTENDENCIA

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SUPERINDUSTRIA Y COMERCIO		SISTEMA DE REGISTRO	
Fecha 07/05/2004			

MANTENIMIENTO DE PROTOCOLOS			
Numero 17397			
Fecha 15/04/1997			
Conferido KIMBERLY CLARK WORLDWIDE, INC			
Pais US ESTADOS UNIDOS DE AMERICA			
Ciudad 136 NEENAH, WISCONSIN			
Represent: S Sustituir S Desistir S			
No Radicacion 97 19642 Clase 0 Secv 0 Seac. 0			

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Encontrados (1/1) registro(s)			
+-----+		+-----+	

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Industria y Comercio
SUPERINTENDENCIA

2020
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FOLIO: 115

Doctor(a)
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Apoderado
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REFERENCIA.

Radicación N°	04-09604
Solicitud internacional	PCT/US02/10680
Fecha inicio fase nacional	22/03/2004
Trámite	011
Evento	379
Actuación	416
Oficio N°	646
Folios	001

Teniendo en cuenta que la solicitud de privilegio de patente que se tramita bajo el expediente indicado en la referencia, reúne los requisitos de forma establecidos en la Decisión 486 de la Comisión de la Comunidad Andina, el Tratado de Cooperación en Materia de Patentes (PCT), el Reglamento y la Circular Unica de la Superintendencia de Industria y Comercio, se envía el extracto de la solicitud a la Oficina de Comunicaciones para efecto de su publicación en la Gaceta de Propiedad Industrial

Cúmplase
Dado en Bogotá DC,

19 7 MAYO 2004

ALIX CARMENZA CESPEDES DE VERGEL
Jefe de la División de Nuevas Creaciones

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