

DESCRIPTION

Title of Invention

OUTER-SURFACE SHEET FOR ABSORBENT ARTICLE

5 Technical Field

[0001]

The present invention relates to a surface sheet for an absorbent article, comprising a nonwoven fabric formed of staple fibers.

10 Background Art

[0002]

In absorbent articles such as disposable diapers, sanitary napkins, panty liners and incontinence pads, the surface sheet that contacts with the skin of the wearer commonly comprises a nonwoven fabric formed of thermoplastic fibers. The nonwoven fabric used is generally a nonwoven fabric formed by a spunbond method with long filaments as the constituent fibers; however, nonwoven fabrics formed by air-through methods, which yield bulky nonwoven fabrics (hereunder referred to as "air-through nonwoven fabrics"), and the like, are also used. Because such an air-through nonwoven fabric is formed of staple fibers, when it is to be used as a surface sheet in an absorbent article, it is usually smoothed with a calender roll on the surface of the side that may contact the skin of the wearer (the skin-contacting surface), as treatment to prevent broken filaments of the staple fibers from standing up on the skin-contacting surface.

30 **[0003]**

On the other hand, when a nonwoven fabric is to be formed having a plurality of raised sections and furrows as disclosed in PTL 1, an air jet is used to partially push aside the staple fibers in the nonwoven fabric, or the surface of the nonwoven fabric is shaped by embossing, for example, causing the staple fibers in the raised sections to become oriented in the thickness

direction of the nonwoven fabric, and therefore the ends of the staple fibers tend to protrude from the surface of the skin side of the surface sheet (i.e., fluffing tends to occur); however, since a nonwoven fabric having such a plurality of raised sections and furrows cannot be smoothed on the surface by calender rolling or the like, fluffing due to the staple fibers cannot be reduced, and this has produced discomfort or unpleasantness for the wearer of the absorbent article.

10 **[0004]**

Also, PTL 2 discloses an absorbent article comprising a liquid-permeable surface sheet composed of a nonwoven fabric, a liquid-impermeable and water-repellent back sheet, and an absorbent body situated between the two sheets, wherein the surface sheet has a plurality of protrusions protruding toward the skin side of the wearer, the protrusions having internal spaces where the absorbent body side is open, the protrusions having a skin care agent applied onto both the skin-facing surface and the non-skin-facing surface at the top sections, where the skin-facing surface has a greater amount of skin care agent per unit area than the non-skin-facing surface at the top sections. According to PTL 2, the absorbent article to which the skin care agent has been applied can stably retain the skin care agent at locations that tend to move on the skin, and therefore an excellent skin care effect is exhibited. However, since the skin care agents to be used in the absorbent article of PTL 2 are liquids with a flow property at ordinary temperature, it is not possible to reduce fluffing due to the staple fibers, even when such skin care agents are coated onto the surface sheet.

Citation List

Patent Literature

35 **[0005]**

[PTL 1] Japanese Patent Publication No. 5328088

[PTL 2] Japanese Unexamined Patent Publication No. 2012-

143543

Summary of Invention

Technical Problem

[0006]

5 It is an object of the present invention to provide
a surface sheet for an absorbent article, employing a
nonwoven fabric comprising staple fibers, the surface
sheet for an absorbent article having reduced fluffing by
staple fibers even without smoothing of the surface by
10 calender rolling or the like.

Solution to Problem

[0007]

 The present invention is a surface sheet for an
absorbent article, the surface sheet including a nonwoven
15 fabric formed of staple fibers and a hydrophobic gel
composition that can maintain a gel state at 38°C, and
having, on the surface of the skin side of the surface
sheet, a coated region that is coated with the gel
composition and a non-coated region that is not coated
20 with the gel composition, the coated region having the
gel composition at least partially filling the gaps
formed between the staple fibers of the nonwoven fabric,
and exposed on the surface of the skin side of the
surface sheet.

[0008]

25 Since the surface sheet of the present invention has
the gel composition at least partially filling the gaps
formed between the staple fibers of the nonwoven fabric
and exposed on the surface of the skin side of the
surface sheet, in the coated region in which the gel
30 composition has been coated, the staple fibers in the
nonwoven fabric cannot become exposed on the surface of
the skin side of the surface sheet, and fluffing by the
staple fibers can be reduced. Furthermore, since the gel
35 composition can maintain a gel state even at 38°C, the gel
composition does not melt by the body temperature of the
wearer even when the absorbent article using the surface

sheet of the present invention is worn, and can be held on the surface of the skin side of the surface sheet, so that the aforementioned fluffing can be persistently and stably minimized. In addition, since the surface of the gel composition exposed on the surface of the skin side of the surface sheet is smooth, it is possible to obtain a smooth feel on the skin for the surface of the skin side of the surface sheet. As a result, an absorbent article employing the surface sheet of the present invention can greatly reduce discomfort and unpleasantness for the wearer, to thereby obtain a comfortable feel during wear.

[0009]

Furthermore, since the gel composition is stably held on the surface of the skin side of the surface sheet and does not permeate to the surface on the side opposite the surface of the skin side of the surface sheet (i.e., the non-skin side surface), liquid excreta permeating from the skin side to the non-skin side of the surface sheet tends to easily diffuse in the in-plane direction of the surface sheet as they approach the non-skin side surface, and therefore liquid excreta that have reached the non-skin side surface of the surface sheet while diffusing in the in-plane direction of the surface sheet can be absorbed into the absorbent core from wide regions through the core wrap sheet that is disposed on the non-skin side surface of the surface sheet, thereby allowing the absorption efficiency of the liquid excreta into the absorbent body to be further improved.

[0010]

Moreover, since the surface sheet of the present invention has a coated region in which the hydrophobic gel composition has been coated and a non-coated region in which the gel composition has not been coated, on the surface of the skin side of the surface sheet composed of hydrophilic staple fibers and the like, synergistic action between the hydrophobic water-repellent action in

the coated region and the hydrophilic water-absorbing action in the interior of the surface sheet can form a state where liquid excreta such as urine introduced onto the surface of the skin side of the surface sheet can be easily drawn into the interior of the surface sheet via the gel composition non-coated region, thereby allowing the liquid drain away property of the surface sheet to be significantly improved while maintaining the liquid permeation property in the thickness direction of the surface sheet. In addition, even when body pressure of the wearer is applied onto the surface sheet and liquid excreta that have permeated to the interior of the surface sheet migrate toward the skin side of the surface sheet, the presence of the hydrophobic gel composition on the surface of the skin side of the surface sheet inhibits seepage of the liquid excreta to the surface of the skin side of the surface sheet, and can therefore effectively prevent rewetting of the liquid excreta that have already permeated into the interior. Thus, using a surface sheet of the present invention will allow the absorbent article to be formed as an absorbent article with a dryness property on the surface and an excellent liquid permeation property in the thickness direction.

Advantageous Effects of Invention

[0011]

According to the present invention it is possible to provide a surface sheet for an absorbent article having reduced fluffing by staple fibers, without smoothing of the surface with a calender roll or the like. Moreover, by using a surface sheet of the present invention it is possible to provide an absorbent article with a dryness property on the surface and an excellent liquid permeation property in the thickness direction.

Brief Description of Drawings

[0012]

Fig. 1 is a plan view of an absorbent article using a surface sheet according to an embodiment of the present

invention, in an extended state.

Fig. 2 is a partial cross-sectional view (schematic view) of gel composition-coated sections of an absorbent article using a surface sheet according to an embodiment of the present invention, in the widthwise direction.

Description of Embodiments

[0013]

The surface sheet of the present invention will now be explained in greater detail with reference to the accompanying drawings.

[0014]

Fig. 1 is a plan view showing an absorbent article (a disposable diaper) using a surface sheet according to an embodiment of the present invention, in an extended state, and Fig. 2 is a partial cross-sectional view (schematic view) of the absorbent article using a surface sheet according to an embodiment of the present invention, in the widthwise direction D_W , at sections coated with a gel composition. The disposable diaper 1 using a surface sheet according to this embodiment of the present invention, in a plane view with the outer shape extended, has a long shape in the lengthwise direction D_L , the center section in the lengthwise direction D_L having an essentially narrow-neck hourglass shape (or reverse crown shape) toward the interior in the widthwise direction D_W . The absorbent article in which the surface sheet of the present invention is to be used is not limited to such an outer shape, and it may have any shape which is longer in the lengthwise direction D_L such as, for example, a gourd shape, a quadrilateral shape such as rectangular, or an ellipsoid or elliptical shape.

[0015]

As shown in Fig. 1 and Fig. 2, the disposable diaper 1 has a layered structure comprising a surface sheet 2 situated on the skin side of the wearer in the thickness direction D_T , a liquid-impermeable back sheet 3 situated on the side opposite the skin side (i.e., the non-skin

side), and an absorbent body 4 situated between the surface sheet 2 and the back sheet 3, and also a pair of side sheet members 5 for formation of gather sections, situated on the skin side of the surface sheet 2 with the surface sheet 2 sandwiched between them on its outer side in the widthwise direction D_w in a plane view. Also, on the surface of the skin side of the surface sheet 2 there are provided a plurality of essentially straight linear coated regions 6 of the gel composition (hereunder referred to as "linear coated regions") which are regions where the gel composition described below has been coated, extending in the lengthwise direction D_L of the disposable diaper 1 and aligned in the widthwise direction D_w , and a non-coated region 7 where the gel composition has not been coated.

[0016]

On the surface sheet of the present invention, the gel composition is a hydrophobic gel composition that can maintain a gel state at 38°C. The gel composition to be used in the surface sheet of the present invention will now be explained in further detail.

[0017]

[Gel composition]

The gel composition to be used in the surface sheet of the present invention is not particularly restricted so long as it can maintain a gel state at 38°C and is hydrophobic, and it may be a composition containing a styrene-based elastomer and a hydrocarbon oil, for example, although preferably a composition containing a styrene-based elastomer, a hydrocarbon oil and a silicone oil is used. Of these, the gel composition is most preferably a composition comprising 100 parts by mass of a styrene-based thermoplastic elastomer mixture (A), having a molecular weight dispersity (M_w/M_n) of 1.25 to 1.60 and containing a styrene-based thermoplastic elastomer (A1) composed of a triblock or more block copolymer with a weight-average molecular weight of

100,000 or greater and less than 180,000, and a styrene-based thermoplastic elastomer (A2) composed of a triblock or more block copolymer with a weight-average molecular weight of 180,000 or greater and 300,000 or less, in a mass ratio of (A1)/(A2) = 95/5 to 50/50, with 500 to 4800 parts by mass of a hydrocarbon oil (B) having a kinematic viscosity of 5 to 50 mm²/s at 37.8°C and 20 to 60 parts by mass of a silicone oil (C) having a kinematic viscosity of 50 to 200 mm²/s at 25°C.

10 **[0018]**

The styrene-based thermoplastic elastomers (A1, A2) used in the gel composition are triblock or more block copolymers comprising a polystyrene-based hard segment and soft segment, preferably block copolymers having two or more block components consisting of styrene-based hard segments in the molecular chain, and more preferably block copolymers wherein the block components at least at both ends of the molecular chain are block components consisting of the aforementioned styrene-based hard segment. There are no particular restrictions on the polystyrene-based hard segment, and for example, it may be a polystyrene-based polymer, such as polystyrene, poly(α -methylstyrene), poly(o-methylstyrene), poly(m-methylstyrene) or poly(p-methylstyrene). There are also no particular restrictions on the soft segment, and for example, it may be a polyolefin-based polymer, such as polyethylene, polypropylene, polybutylene, polybutadiene or polyisoprene.

[0019]

30 The copolymer used as the styrene-based thermoplastic elastomer (A1, A2) is not particularly restricted so long as it is a triblock or more styrene-based block copolymer, and examples include styrene-butadiene-styrene block copolymer (SBS), styrene-ethylene-butylene-styrene block copolymer (SEBS),
35 styrene-isoprene-butylene-styrene block copolymer (SIBS),

styrene-isoprene-styrene block copolymer (SIS), styrene-ethylene-propylene-styrene block copolymer (SEPS), styrene-ethylene-ethylene-propylene-styrene block copolymer (SEEPS), and combinations of any two or more thereof. Preferred among these are styrene-ethylene-butylene-styrene block copolymer (SEBS), styrene-ethylene-propylene-styrene block copolymer (SEPS) and styrene-ethylene/ethylene-propylene-styrene block copolymer (SEEPS), from the viewpoint of retentivity of the gel state after coating onto the surface sheet (especially the retentivity at 38°C), gel hardness and elongation. When diblock copolymers are used as the styrene-based thermoplastic elastomers (A1, A2), interaction (π - π stacking) of the styrene-based hard segments is weakened, and therefore retentivity of the gel state after coating onto the surface sheet (especially the retentivity at 38°C), gel hardness and elongation may not be adequately obtained. Since the styrene-based thermoplastic elastomer has a mesh-like network structure formed by a plurality of aggregate domains created by interaction of the styrene-based hard segments, and olefin-based soft segments linked to the plurality of aggregate domains, it exhibits a function as an elastic solid while being able to maintain a gel state even under temperature conditions of body temperature (about 35°C to about 38°C). Also, presumably such a mesh-like network structure allows moderate sustained-release of the oils described below (i.e., the hydrocarbon oil (B) and silicone oil (C)), while providing a retaining function.

[0020]

Also, the block copolymer includes preferably 10 to 50 mass% of a styrene-based block component, and 50 to 90 mass% of an olefin-based block component, more preferably 15 to 40 mass% of a styrene-based block component and 60 to 85 mass% of an olefin-based block component, and even

more preferably 18 to 35 mass% of a styrene-based block component and 65 to 82 mass% of an olefin-based block component. If the proportion of the styrene-based block component is less than 10 mass%, the amount of styrene-based block component forming the aggregate domains will be reduced, making it difficult to form the aforementioned mesh-like network structure by the styrene-based thermoplastic elastomer. If the proportion of the styrene-based block component is greater than 50 mass%, on the other hand, the amount of olefin-based block component that retains the oils will be reduced, resulting in a smaller amount of oils that can be retained and a larger amount of aggregate domains formed by the styrene-based hard segments, and therefore the gel applied onto the surface sheet will be hard, potentially causing discomfort or unpleasantness for the wearer when the absorbent article is worn.

[0021]

The styrene-based thermoplastic elastomer mixture (A) comprises a mixture of two different styrene-based thermoplastic elastomers (A1, A2) with different weight-average molecular weights. Of the two different styrene-based thermoplastic elastomers (A1, A2), one styrene-based thermoplastic elastomer (A1) (hereunder also referred to as "low-molecular-weight styrene-based thermoplastic elastomer (A1)") has a weight-average molecular weight in the range of 100,000 or greater and less than 180,000, and preferably in the range of 100,000 to 150,000. If the weight-average molecular weight is less than 100,000, the gel hardness and elongation after application onto the surface sheet will be reduced, potentially interfering with the flexibility of the surface sheet. The other styrene-based thermoplastic elastomer (A2) (hereunder also referred to as "high-molecular-weight styrene-based thermoplastic elastomer (A2)") has a weight-average molecular weight in the range of 180,000 or greater and 300,000 or less, and preferably

in the range of 220,000 to 280,000. If the weight-average molecular weight exceeds 300,000, the surface of the gel will tend to exhibit a tack property after application onto the surface sheet, potentially causing a sticky feel or unpleasant feel for the wearer when the absorbent article is worn.

[0022]

The styrene-based thermoplastic elastomer mixture (A) has a dispersity (i.e., a ratio of weight-average molecular weight (M_w) and number-average molecular weight (M_n) (M_w/M_n)) in the range of 1.25 to 1.60, and preferably in the range of 1.35 to 1.55. If the dispersity is less than 1.25, the physical properties of the gel composition will be no different from using a simple styrene-based thermoplastic elastomer, and therefore the gel elongation after application onto the surface sheet may be insufficient and the flexibility of the surface sheet may be impaired. If the dispersity exceeds 1.60, on the other hand, the difference in cooling solidification time between two different styrene-based thermoplastic elastomers (A1, A2) will result in non-uniformity of the gel after it has been applied onto the surface sheet, potentially lowering the physical properties of the gel such as elongation and fragility, and producing variation in the quality of the absorbent article.

[0023]

The weight-average molecular weights (M_w) of the styrene-based thermoplastic elastomers (A1, A2) and styrene-based thermoplastic elastomer mixture (A), and the dispersity (M_w/M_n) of the styrene-based thermoplastic elastomer mixture (A), can be determined in terms of polystyrene, by GPC measurement under the following conditions using tetrahydrofuran (THF) as the mobile phase.

[0024]

[GPC measuring conditions]

Apparatus: GPC-8220 (product of Tosoh Corp.)

Column: SHODEX KF-804 (product of Showa Denko K.K.)

Temperature: 40°C.

Solvent: THF

5 Flow rate: 1.0 mL/min

Sample concentration: 0.05 to 0.6 mass%

Injection rate: 0.1 mL

Detection: RI (differential refractometer)

[0025]

10 As mentioned above, when the gel composition
comprises a mixture of two different styrene-based
thermoplastic elastomers (A1, A2) with different weight-
average molecular weights, the mixing ratio is in the
range of (A1)/(A2) = 95/5 to 50/50, preferably 90/10 to
15 60/40 and more preferably 80/20 to 70/30, as the mass
ratio of the low-molecular-weight styrene-based
thermoplastic elastomer (A1) and the high-molecular-
weight styrene-based thermoplastic elastomer (A2). For
the mass ratio, a mixing ratio of greater than 95 for the
20 low-molecular-weight styrene-based thermoplastic
elastomer (A1) will result in insufficient gel hardness
and elongation after application onto the surface sheet,
and may therefore impair the flexibility of the surface
sheet, while if the mixing ratio is lower than 50, the
25 surface of the gel applied onto the surface sheet will
tend to be tacky, causing a sticky feel for the wearer
and creating unpleasantness.

[0026]

Also, the gel composition may further comprise a
30 hydrocarbon oil (B) having a kinematic viscosity of 5 to
50 mm²/s at 37.8°C. The hydrocarbon oil (B) is not
particularly restricted so long as it is a compound
comprising carbon and hydrogen, and it may have a
straight-chain, branched or cyclic structure, and have
35 either saturated or unsaturated bonds. Examples for the
hydrocarbon oil (B) include olefin-based hydrocarbons
(alkenes with one double bond), paraffinic hydrocarbons

(alkanes containing no double bonds or triple bonds), acetylene-based hydrocarbons (alkynes containing one triple bond), hydrocarbons with two or more double bonds and/or triple bonds, and cyclic hydrocarbons such as aromatic hydrocarbons and alicyclic hydrocarbons. More specifically, there may be mentioned hydrogenated polyisobutene, liquid paraffin, squalane, squalene and the like, with hydrogenated polyisobutene being particularly preferred for use because it does not produce tack in the gel after application onto the surface sheet, and also does not produce stickiness by the controlled-release oils.

[0027]

The hydrocarbon oil (B) has a 37.8°C kinematic viscosity in the range of 5 to 50 mm²/s, preferably in the range of 10 to 30 mm²/s and more preferably in the range of 10 to 20 mm²/s. If the kinematic viscosity is less than 5 mm²/s, the hydrocarbon oil (B) will tend to volatilize off during production of the gel composition, and therefore variation may be produced in the physical properties of the gel after application onto the surface sheet. If the kinematic viscosity exceeds 50 mm²/s, on the other hand, the gel will become hard after application onto the surface sheet, tending to result in a tacky property. The kinematic viscosity of the hydrocarbon oil (B) can be obtained by measurement according to JIS K 2283:2000, "5. Kinematic Viscosity Test Method", using a Cannon-Fenske reverse-flow viscometer, at a testing temperature of 37.8°C.

[0028]

The content of the hydrocarbon oil (B) is in the range of 500 to 4800 parts by mass, preferably in the range of 800 to 3000 parts by mass and even more preferably in the range of 1000 to 1500 parts by mass, with respect to 100 parts by mass of the styrene-based thermoplastic elastomer mixture (A). If the content is less than 500 parts by mass, the gel may become hard and

have reduced elongation after application onto the surface sheet, and the flexibility of the surface sheet may be impaired. If the content is greater than 4800 parts by mass, on the other hand, the gel will become too soft, and after application onto the surface sheet the gel will tend to permeate to the non-skin side of the surface sheet.

[0029]

Also, the gel composition may further comprise a silicone oil (C) with a kinematic viscosity of 50 to 200 mm²/s at 25°C. The silicone oil (C) used may be any known silicone oil without any particular restrictions, so long as it is a silicone oil. Examples for the silicone oil (C) include diorganopolysiloxanes such as dimethylpolysiloxane and methylphenylpolysiloxane, and cyclic siloxanes such as cyclopentasiloxane. Dimethylpolysiloxane is particularly preferred for use since it allows a moderate sustained-release property for the oils to be imparted to the gel composition.

[0030]

The silicone oil (C) has a 25°C kinematic viscosity in the range of 50 to 200 mm²/s, preferably in the range of 70 to 150 mm²/s, and more preferably in the range of 80 to 120 mm²/s. If the kinematic viscosity is less than 50 mm²/s, the silicone oil (C) will tend to volatilize off during production of the gel composition, and therefore variation may be produced in the physical properties of the gel after application onto the surface sheet. If the kinematic viscosity exceeds 200 mm²/s, on the other hand, the amount of sustained release of the oils will be reduced, and a tacky property will tend to result. The kinematic viscosity of the silicone oil (C) can also be obtained by measurement according to JIS K 2283:2000, "5. Kinematic Viscosity Test Method", using a Cannon-Fenske reverse-flow viscometer, at a testing temperature of 25°C.

[0031]

The content of the silicone oil (C) is in the range of 20 to 60 parts by mass and preferably in the range of 30 to 50 parts by mass, with respect to 100 parts by mass of the styrene-based thermoplastic elastomer mixture (A).

5 If the content is less than 20 parts by mass, the amount of sustained release of the oils will be reduced. If the content is greater than 60 parts by mass, on the other hand, the amount of sustained release of the oils will be too high and the gel surface will become oily.

10 **[0032]**

Depending on the desired product properties, the gel composition may also contain one or more of any desired additives such as stabilizers, antioxidants (for example, BHT (2,6-di-t-butyl-p-cresol), BHA (butylated
15 hydroxyanisole), propyl gallate or the like), light stabilizers, coloring agents, pigments (for example, titanium oxide, zinc oxide or the like), aromatics, inorganic powders (for example, alumina, talc, mica, calcium carbonate, clay or the like) or organic powders
20 (for example, PE, PP, silicone resin powder or the like), or other components, in ranges that do not impede the object of the present invention.

[0033]

Examples of other components include oils with skin
25 care functions (for example, jojoba oil or camellia oil), vitamins, various amino acids, peptides, zeolite, cholesterol, hyaluronic acid, lecithin, ceramide, skin astringents, anti-pimple medications, anti-wrinkle agents, anti-cellulite agents, skin whiteners,
30 antimicrobial agents, antifungal agents, anti-inflammatory components, pH regulators, humectants and the like.

[0034]

Since the gel composition can maintain its gel state
35 even under temperature conditions of 38°C, an absorbent article having such a gel composition coated on the surface of the skin side of the surface sheet can

persistently and stably minimize fluffing by staple fibers as described below, without melting of the gel composition by body temperature of the wearer, for example, when the absorbent article is worn.

5 Furthermore, since the gel composition is stably held on the surface of the skin side of the surface sheet and does not permeate to the surface on the side opposite the surface of the skin side of the surface sheet (i.e., the non-skin side surface), liquid excreta permeating from
10 the skin side to the non-skin side of the surface sheet tends to easily diffuse in the in-plane direction of the surface sheet as it approaches the non-skin side surface, and therefore liquid excreta that has reached the non-skin side surface of the surface sheet while diffusing in
15 the in-plane direction of the surface sheet can be absorbed into the absorbent core from wide regions through the core wrap sheet that is disposed on the non-skin side surface of the surface sheet, thereby allowing the absorption efficiency of the liquid excreta into the absorbent body to be further improved. As a result, it
20 is possible to obtain an absorbent article with an excellent absorption property.

[0035]

Furthermore, the gel composition can be produced by
25 mixing each of the aforementioned compounding ingredients using any known mixing means. For example, the different compounding ingredients may be supplied into a mixer either simultaneously or in any desired order, and melt mixed in the mixer for production. There are no
30 particular restrictions on the melt mixing means, and any known mixing means may be applied. Examples of such mixing means include mixers such as single-screw extruders, twin-screw extruders, rollers, Banbury mixers, kneaders or mixing kilns.

35 **[0036]**

Since the gel composition has a sustained-release property in addition to suitable hardness and elongation,

its adhesion to the coating apparatus or molding apparatus can be inhibited, while allowing its coating onto the surface sheet. Furthermore, if the gel composition contains more low-molecular-weight styrene-based thermoplastic elastomer than high-molecular-weight styrene-based thermoplastic elastomer, it will exhibit a suitable flow property even under temperature conditions of near 100°C, making it possible for its coating on surface sheets made of nonwoven fabrics to be accomplished with various coating patterns and in a facilitated manner.

[0037]

The coating pattern for the gel composition on the surface sheet of the present invention is not particularly restricted so long as there are formed a coated region in which the gel composition has been coated and a non-coated region in which the gel composition has not been coated, and coating on the surface of the skin side of the surface sheet may be carried out with any desired coating pattern within a range that does not interfere with the liquid drain away property and liquid permeation property of the surface sheet, or the function of the gel composition.

[0038]

The surface sheet of the present invention has coated regions 6 in which the gel composition is coated as shown in Fig. 1 and Fig. 2, on the surface of the skin side of the surface sheet, by intermittent coating of the aforementioned hydrophobic gel composition on the surface of the skin side of the surface sheet that is composed of hydrophilic staple fibers, and non-coated regions 7 where the gel composition is not coated. Since the coated regions 6 have the gel composition at least partially filling the gaps formed between the staple fibers of the nonwoven fabric composing the surface sheet 2, and exposed on the surface of the skin side of the surface sheet 2, as shown in Fig. 2, the staple fibers in the

nonwoven fabric cannot become exposed on the surface of the skin side, and fluffing by the staple fibers can be reduced. In addition, since the surface of the gel composition exposed on the surface of the skin side of the surface sheet 2 is smooth, it is possible to obtain a smooth feel on the skin for the surface of the skin side of the surface sheet 2. As a result, an absorbent article employing the surface sheet of the present invention can greatly reduce discomfort and unpleasantness for the wearer.

[0039]

Moreover, if the gel composition is coated on the surface of the skin side of the surface sheet, hydrophobic gel composition-coated regions 6 will be formed as shown in Fig. 2, and since the interior of the surface sheet 2 is hydrophilic, synergistic action between the hydrophobic water-repellent action in the coated regions 6 and the hydrophilic water-absorbing action in the interior of the surface sheet 2 allows a state to be formed in which liquid excreta U such as urine introduced onto the surface of the skin side of the surface sheet 2 are easily drawn into the interior of the surface sheet 2 via the non-coated regions 7 where the gel composition has not been coated, thereby allowing the liquid drain away property of the surface sheet 2 to be significantly improved while maintaining the liquid permeation property in the thickness direction D_T . In addition, even when body pressure of the wearer is applied onto the surface sheet 2 and liquid excreta U that has permeated to the interior of the surface sheet 2 migrates toward the skin side of the surface sheet 2, the presence of the hydrophobic gel composition on the surface of the skin side of the surface sheet 2 inhibits seepage of the liquid excreta U to the surface of the skin side of the surface sheet 2, and can therefore effectively prevent rewetting of the liquid excreta U that have already permeated into the interior. As a

result, an absorbent article using the surface sheet of the present invention has an excellent dryness property on the surface and an excellent liquid permeation property in the thickness direction.

5 **[0040]**

Throughout the present description, the term "liquid drain away property" means the ease with which liquid excreta introduced onto the surface of the skin side of the surface sheet is drained away when drained from the surface of the skin side to the non-skin side, and it can be quantified and evaluated based on the time required for liquid excreta to be drained from the surface of the skin side of the surface sheet to the non-skin side, and be removed from the surface sheet (i.e. the "draining away rate"). Also throughout the present description, the term "liquid permeation property" means the ease with which liquid excreta introduced onto the surface of the skin side of the surface sheet permeate when permeating from the surface of the skin side into the surface sheet, and it can be quantified and evaluated based on the time required for liquid excreta to completely permeate from the surface of the skin side of the surface sheet into the surface sheet (i.e. the "liquid permeation rate").

[0041]

25 The draining away rate and liquid permeation rate can be measured by the following absorption property evaluation test. For the absorption property evaluation test, first the surface sheet is removed from a commercially available infant paper diaper (Moony "Air-Fit" S-size, by Unicharm Corp.), and the surface sheet to be evaluated (for example, a gel composition-coated surface sheet) is attached to the section where the surface sheet was removed, to produce a sample for absorption property evaluation testing. On the surface sheet of the sample for absorption property evaluation testing, 40 ml of artificial urine is dropped once, and the time (sec) until all of the artificial urine migrates

into the surface sheet is measured, recording the measured time as the liquid permeation rate (sec). Similarly, the time (sec) until the artificial urine migrates through the surface sheet to the absorbent body side is measured and the measured time is recorded as the draining away rate (sec). The artificial urine is prepared by dissolving 200 g of urea, 80 g of sodium chloride, 8 g of magnesium sulfate, 3 g of calcium chloride and approximately 1 g of dye (Blue #1) in 10 L of ion-exchanged water.

[0042]

As with the embodiment shown in Fig. 1, the gel composition may be coated on the surface of the skin side of the surface sheet in a coating pattern with a plurality of essentially straight lines lying along the lengthwise direction D_L of the absorbent article and arranged in the widthwise direction D_W , when the absorbent article is viewed flat in the extended state, although there is no limitation to this aspect for the surface sheet of the present invention. For example, the essentially straight linear shapes may be linear in a waveform, zigzag or dotted line manner. Throughout the present description, the regions where the gel composition is thus coated in a linear manner will be referred to as "linear coated regions". Also, the intervals for the linear coated regions arranged in the widthwise direction D_W are not particularly restricted, but from the viewpoint of effects for the liquid drain away property of the surface sheet and liquid permeation property in the thickness direction, they are preferably 1 mm to 10 mm and more preferably 2 mm to 5 mm. The linear coated intervals may be equal intervals or different intervals.

[0043]

Also, the direction in which the linear shapes extend may be a direction other than the lengthwise direction D_L of the absorbent article (for example, the

widthwise direction D_w), or directions such that different linear patterns cross (i.e. directions for a grid-like coating pattern). In addition, the coating pattern of the gel composition may be in the form of a plurality of dots spread over a specific region of the surface of the skin side of the surface sheet (throughout the present description, a region in which the gel composition is coated in a dot-like fashion will be referred to as "punctiform coated region"), or it may have a geometrical or design-like pattern. By appropriately adjusting the coating pattern of the gel composition in this manner, it is possible to set the locations with a high liquid drain away property to any desired sections in the surface sheet, allowing a design property to be provided and allowing product designs suitable for a variety of needs.

[0044]

Furthermore, the gel composition coating means for the surface sheet of the present invention is not particularly restricted, and any publicly known coating means may be employed. Examples of such coating means include extrusion devices comprising a die or discharge nozzle; non-contact coaters such as spiral coaters, curtain coaters, spray coaters and dip coaters; and contact coaters.

[0045]

The region in which the gel composition is to be coated on the surface sheet (i.e., the proportion of the area of the coated regions with respect to the area on the surface of the skin side of the surface sheet) is preferably an area ratio of about 1% to about 50%, more preferably an area ratio of about 5% to about 30% and most preferably an area ratio of about 10% to about 15%, with respect to the area on the surface of the skin side of the surface sheet (hereunder referred to simply as "surface sheet area"). If the gel composition is coated to an area ratio of less than 1% with respect to the surface sheet area, there will be fewer coated regions of

the gel composition and the hydrophobicity on the surface of the skin side of the surface sheet will be insufficient, thus making it difficult to obtain an effect on the liquid drain away property and the liquid permeation property in the thickness direction, while the amount of gel composition on the surface sheet will also be lower, making it impossible to sufficiently exhibit the effect of the gel composition. On the other hand, if the gel composition is coated to an area ratio exceeding 50% of the surface sheet area, the regions of the surface sheet that are not coated with the gel composition (i.e. the non-coated regions) will be reduced, such that it will be difficult for the liquid excreta supplied onto the surface of the skin side of the surface sheet to permeate into the surface sheet.

[0046]

Furthermore, the coating amount of the gel composition coated onto the surface of the skin side of the surface sheet will usually be in the range of 1 to 30 g/m², preferably in the range of 6 to 15 g/m² and more preferably in the range of 6 to 10 g/m². If the gel composition coating amount is less than 6 g/m², the amount of gel composition coated will be low and the hydrophobicity on the surface of the skin side of the surface sheet will be insufficient, making it difficult to obtain the effect of the liquid drain away property and the liquid permeation property in the thickness direction, while if the gel composition coating amount is greater than 15 g/m², the degree of repellency by the hydrophobicity of the gel composition will increase, making it difficult to obtain the effect of the liquid permeation property in the thickness direction. Throughout the present description, the gel composition coating amount is determined in the following manner.

(1) A prescribed region of the gel composition-coated surface sheet that is to be measured is cut out using a sharp blade such as a cutter replacement blade,

while avoiding any alteration in thickness, to obtain a sample for measurement of the coating amount.

(2) The area of the cut out sample: SA (m^2) and the mass: SM_0 (g) are measured.

5 (3) The measured sample is dipped in a solvent in which the gel composition is soluble, such as an aromatic solvent (for example, toluene) and stirred for at least 3 minutes for elution of the gel composition into the solvent.

10 (4) The sample in the solvent is filtered using mass-measured filter paper, and the sample is thoroughly rinsed with the solvent on the filter paper. Each rinsed sample filter paper sheet is thoroughly dried in an oven at $100^\circ C$.

15 (5) The masses of the dried filter paper and the sample are measured, and the pre-measured mass of the filter paper is subtracted from that value to calculate the dry sample mass: SM_1 (g).

20 (6) The gel composition coating amount G_{BS} (g/m^2) is calculated by the following formula (1).
[Formula 1]

$$G_{BS} (g/m^2) = [SM_0 (g) - SM_1 (g)] / SA (m^2) \quad (1)$$

[0047]

25 In order to reduce measurement error for the gel composition coating amount, multiple samples are cut out from multiple absorbent articles, so that the total area of the sample exceed 100 cm^2 , and each sample is measured according to (2) to (6) above, employing the average value for the coating amount G_{BS} obtained from the measuring operations.

30

[0048]

In addition, the gel composition may be coated either during production of the nonwoven fabric used to form the surface sheet, or after production of the

nonwoven fabric. From the viewpoint of minimizing equipment investment, the gel composition may be coated on the surface sheet in the manufacturing line for the absorbent article, in which case, from the viewpoint of minimizing contamination by shedding of the oils, it is preferably coated on the surface sheet during a downstream step of the manufacturing line (for example, just before the step of separately packaging the product).

10 **[0049]**

As shown in Fig. 1, the surface sheet 2 according to one embodiment of the present invention is a liquid-permeable nonwoven fabric situated on the skin side in the thickness direction D_T of the disposable diaper 1, at the center axis line C_L extending in the lengthwise direction D_L of the disposable diaper 1, and is capable of direct contact with the skin surface of the wearer. The nonwoven fabric used to compose the surface sheet of the present invention will now be described in detail.

20 **[0050]**

[Nonwoven fabric]

The nonwoven fabric composing the surface sheet 2 of this embodiment may employ an air-through nonwoven fabric formed of staple fibers. The air-through nonwoven fabric is a nonwoven fabric obtained by passing hot air through a web containing thermally fusible composite fibers, and thermally fusing the intersections of the thermally fusible composite fibers. The web containing thermally fusible composite fibers may be formed by a known web forming method using a carding machine or the like. The web forming method may be, for example, a method of transporting the staple fibers by an air stream and accumulating them on a net (airlay method). The web formed in such a manner is an aggregate of fibers before formation of the nonwoven fabric, and it has not been subjected to treatment applied in the nonwoven fabric production process (for example, heat fusion treatment in

an air-through method, calender method or the like), and has its fibers very loosely entangled. Air-through treatment of a web containing thermally fusible composite fibers can be accomplished with a hot air blaster, for example. In the air-through treatment, hot air heated to a prescribed temperature (for example, 120 to 160°C) is blasted onto the web, the hot air passing through the web, to cause heat fusion of the intersections between the thermally fusible composite fibers in the web. The nonwoven fabric produced by such air-through treatment may be, for example, a nonwoven fabric composed of core-sheath composite fiber which is a composite fiber with high-density polyethylene as the sheath component and polyethylene terephthalate as the core component, with fiber lengths of 20 to 80 mm and preferably 35 to 65 mm, and a size of 1.1 to 8.8 dtex and preferably 2.2 to 5.6 dtex.

[0051]

The nonwoven fabric in the surface sheet of the present invention is not limited to the air-through nonwoven fabric described above so long as it is a nonwoven fabric formed of staple fibers, and any nonwoven fabric known in the prior art may be used. Examples of such nonwoven fabrics include, in addition to air-through nonwoven fabrics, also staple fiber nonwoven fabrics such as spunlace nonwoven fabrics or wetlaid nonwoven fabrics. There are no particular restrictions on the fiber lengths of the staple fibers composing such a staple fiber nonwoven fabric, but from the viewpoint of feel on the skin, and liquid permeability, flexibility, air permeability, bulk and strength of the nonwoven fabric, they are preferably 20 mm to 80 mm and more preferably 35 mm to 65 mm. If the fiber lengths are smaller than 20 mm, the fibers will be too short making it difficult for the fibers to become tangled together, such that the resulting strength may be insufficient for a surface sheet and it may be difficult to actually form a sheet.

If the fiber lengths are larger than 80 mm, the long fibers will result in excessively high strength as a surface sheet, making it difficult to form a structure composed of protrusions and recesses or potentially creating a poor feel on the skin.

[0052]

The fibers composing the nonwoven fabric are not particularly restricted and may be natural fibers or chemical fibers, for example, and more specifically, cellulose fibers such as ground pulp or cotton; regenerated cellulose such as rayon or fibril rayon; semi-synthetic cellulose such as acetate or triacetate; thermally fusible composite fibers or thermoplastic hydrophobic chemical fibers; or hydrophilicized thermoplastic hydrophobic chemical fibers. Also, examples of thermoplastic hydrophobic chemical fibers include polyethylene (PE), polypropylene (PP) and polyethylene terephthalate (PET) monofilaments, and fibers composed of PE and PP graft polymers. The nonwoven fabric may be subjected to hydrophilicizing treatment after formation of the nonwoven fabric.

[0053]

Furthermore, the fiber size of the fibers composing the nonwoven fabric is not particularly restricted, but from the viewpoint of feel on the skin, liquid permeability, air permeability, bulk and strength of the nonwoven fabric, it is preferably 0.5 dtex to 10.0 dtex and more preferably 1.0 dtex to 5.0 dtex. If the fiber size is less than 0.5 dtex, the fibers will be too thin and will have insufficient strength for a surface sheet, while the lightness of the fibers will tend to result in more tangling between the fibers, potentially making it difficult to accomplish layering in an air-through method, for example. If the fibers size is greater than 10.0 dtex, the surface sheet will become hard, potentially impairing the feel on the skin. The fiber size can be determined by magnified observation of the

fibers using a scanning electron microscope or the like.

[0054]

As shown in Fig. 1, the nonwoven fabric in the surface sheet 2 of this embodiment has an essentially rectangular outer shape with the lengthwise direction D_L as the long sides in a plane view; however, the surface sheet of the present invention is not limited to such a shape, and the nonwoven fabric may be in a quadrilateral shape other than rectangular, or it may include curves, such as an ellipsoid, elliptical or gourd shape. Moreover, the nonwoven fabric in the surface sheet of the present invention may be a nonwoven fabric with a monolayer structure formed of staple fibers, or a nonwoven fabric having a layered structure of two or more layers with other nonwoven fabrics stacked on the non-skin side of the nonwoven fabric formed of staple fibers.

[0055]

Also, the size of the surface sheet is not particularly restricted so long as it is a size that can cover the entire surface on the skin side of the absorbent body that is situated on the non-skin side of the surface sheet, and any desired size may be employed, depending on the size and gender of the intended wearer of the absorbent article, and the purpose of use. Also, the thickness of the surface sheet is not particularly restricted so long as the absorbent article can have the necessary liquid-permeable property, strength and flexibility, and any desired thickness may be employed. For example, the thickness of the surface sheet may be in the range of 0.001 mm to 5.0 mm; however, from the viewpoint of suitable liquid permeability, cushioning properties and feel on the skin, it is preferably 0.01 mm to 3.0 mm and more preferably 0.1 mm to 1.0 mm.

[0056]

For this embodiment, the surface sheet 2 has a flat structure for at least the surface on the skin side; however, there is no limitation to such a structure for

the surface sheet of the present invention. For example, the surface sheet used may be one with a structure in which the surface of the skin side has either or both a plurality of protrusions and a plurality of recesses.

5 When the surface sheet used has a plurality of protrusions on the surface of the skin side, preferably at least some of the protrusions among the plurality of protrusions are coated with the gel composition. The plurality of protrusions are the sections that directly
10 contact with the skin of the wearer, and when these sections are coated with the gel composition they become hydrophobic, thereby inhibiting liquid excreta such as urine from residing in or rewetting those sections, so that it is possible to effectively prevent adhesion of
15 discharged liquid excreta onto the wearer.

[0057]

The protrusions may have any desired structure depending on the desired liquid drain away property, liquid permeation property, cushioning properties and
20 feel on the skin, and for example, the protrusions may be ridges (elevations) extending in the lengthwise direction of the surface sheet, or they may be protrusions with three-dimensional shapes, such as flat rectangular solid or truncated square pyramids having rounded edge lines,
25 pyramidal shapes (for example, triangular pyramids or square pyramids) having rounded apexes, or conical or arched shapes having rounded apexes.

[0058]

The structures at the sections other than the
30 protrusions mentioned above are not particularly restricted and may be either furrowed or flat sections, and for example, in a surface sheet according to another embodiment of the present invention, a structure including either or both the aforementioned plurality of
35 protrusions and plurality of recesses is a structure including a plurality of ridges and a plurality of furrows (a "ridge-furrow structure"). An example of such

a ridge-furrow structure is a structure in which a plurality of ridges are formed as a plurality of straight linear ridges extending in parallel along the lengthwise direction of the surface sheet and aligned at essentially equal intervals in the widthwise direction D_w , with the sections between every two adjacent ridges formed as furrows extending along the lengthwise direction of the surface sheet.

[0059]

In an embodiment employing a ridge-furrow structure of an aspect in which ridges and furrows extend in a straight linear manner along the lengthwise direction D_L of the absorbent article, liquid excreta such as urine introduced onto the surface sheet tend to diffuse in the lengthwise direction D_L of the absorbent article along the ridges and furrows, so that spreading of the liquid excreta in the widthwise direction D_w of the absorbent article is minimized, and the resulting leakage of the liquid excreta from the widthwise direction D_w can be prevented. In addition, since liquid excreta that have penetrated the surface sheet while diffusing in the lengthwise direction D_L of the absorbent article can be absorbed through a wide region of the absorbent body, the absorption efficiency of the liquid excreta can be drastically improved.

[0060]

In the ridge-furrow structure described above, the heights of the ridges, i.e. the distance between the horizontal plane containing the top sections of the ridges and the horizontal plane containing the bottom sections of the furrows, will usually be in the range of 0.1 to 1.2 mm, preferably in the range of 0.2 mm to 1.0 mm and more preferably in the range of 0.4 mm to 0.8 mm, from the viewpoint of allowing liquid excreta such as urine introduced onto the surface sheet to be directed in the prescribed direction, and not producing a feeling of discomfort or unpleasantness for the wearer when the

ridges contact with the wearer. The heights of the ridges can be measured using a laser displacement gauge (for example, an LJ-G Series high-precision two-dimensional laser displacement gauge (Model: LJ-G030) by Keyence Corp.), in the following non-contact system. A sample of the surface sheet cut to a 100 mm x 100 mm size is placed on a horizontal measuring stage and the displacements of five different ridges from the measuring stage are measured with a laser displacement gauge, recording the average value of the five measured values as the ridge thickness (mm). Similarly, the displacements of five different furrows from the measuring stage are measured with a laser displacement gauge, recording the average value of the five measured values as the furrow thickness (mm). The ridge height (mm) is calculated from the ridge thickness (mm) and the furrow thickness (mm).

[0061]

Also, each width at the ridges and furrows of the ridge-furrow structure may be such that the widths of the ridges are in the range of 1.0 to 5.0 mm; however, they are preferably 2.0 to 4.0 mm from the viewpoint of the diffusibility and liquid drain away property for liquid excreta, as well as cushioning properties and feel on the skin. If the ridge widths exceed 5.0 mm, liquid excreta will tend to reside in the ridges and the liquid drain away property may be reduced. Similarly, the widths of the furrows may be in the range of 1.0 to 3.0 mm, but are preferably 1.0 to 2.0 mm.

[0062]

Also, the pitch of the ridge-furrow structure (i.e., the interval (mm) between the centers of the top sections of two adjacent ridges) may be in the range of 2.0 mm to 8.0 mm; however, it is preferably 2.0 mm to 6.0 mm from the viewpoint of the diffusibility and liquid drain away property for liquid excreta, as well as the cushioning properties and feel on the skin. The width of a ridge

can be measured as the distance between the border lines between the ridge and the two furrows situated on either side of the ridge, based on a flat photograph or flat image of the surface sheet in an unpressed state. The same applies for the furrow widths.

[0063]

In the surface sheet of the present invention, the ridge-furrow structure that can be applied for the structure of the surface sheet is not limited to the aspect described above, and for example, it may be an aspect in which the ridges and furrows in the ridge-furrow structure lie at least partially in a direction other than the lengthwise direction D_L of the absorbent article (for example, the widthwise direction D_W of the absorbent article), an aspect in which they lie at least partially in altering directions (for example, an undulating or zigzag form), an aspect in which they lie at least partially in a discontinuous (i.e., intermittent) manner in the lengthwise direction D_L of the absorbent article, an aspect in which at least in some sections the spacings between two adjacent ridges are not constant, or an aspect in which two or more of these aspects are in any desired combination. By appropriately setting the direction and form in which the ridges and furrows lie, it is possible to control the diffusion direction for liquid excreta introduced onto the surface sheet, and to realize a product design suited for a variety of needs.

[0064]

The method of forming the ridge-furrow structure on the surface sheet is not particularly restricted, and it may be known method such as a method of forming a ridge-furrow structure by continuously blasting gas (usually air) onto the fiber web as disclosed in Japanese Unexamined Patent Publication No. 2008-25079, Japanese Unexamined Patent Publication No. 2008-23326 or Japanese Unexamined Patent Publication No. 2009-30218, for

example, a method of utilizing vacuum forming, a method utilizing gear stretching, or a method utilizing heat extension of heat-extendable fibers and/or heat shrinkage of heat-shrinkable fibers.

5 **[0065]**

When a surface sheet having such a ridge-furrow structure is to be used, preferably the gel composition is present in linear coated regions or punctiform coated regions along the ridges, for at least some of the
10 plurality of ridges. The plurality of ridges are the sections that contact with the skin of the wearer, and when these sections are coated with the gel composition they become hydrophobic, thereby inhibiting liquid excreta such as urine from residing in or rewetting those
15 sections, so that it is possible to effectively prevent adhesion of discharged liquid excreta onto the wearer, while also providing the effect exhibited by the ridge-furrow structure, i.e. the effect of inhibiting leakage of liquid excreta and significantly increasing absorption
20 efficiency for liquid excreta.

[0066]

The basis weight of the surface sheet in the absorbent article of the present invention is not particularly restricted and may be any desired basis
25 weight in a range such that the liquid permeability, strength and flexibility are not impaired. The basis weight may be, for example, 10 g/m² to 100 g/m², and is preferably 20 g/m² to 50 g/m². If the basis weight is less than 10 g/m² it will not be possible to obtain
30 sufficient surface strength as a surface sheet, and the absorbent article may tear when worn. If the basis weight is greater than 100 g/m², excessive stiffness may result, causing unpleasantness or discomfort for the wearer of the absorbent article.

35 **[0067]**

Other structural members of the absorbent article in which the surface sheet of the present invention is

employed will now be described.

[0068]

As shown in Fig. 1 and Fig. 2, in the disposable
diaper 1 using a surface sheet according to one
5 embodiment of the present invention, the absorbent body 4
is situated on the non-skin side of the surface sheet 2,
and it absorbs and retains liquid excreta such as urine
that has permeated the surface sheet 2. An absorbent
body is generally preferred to be bulky and resistant to
10 deformation and have low chemical irritation, in
consideration of water absorption and comfort during
wear. From this viewpoint, the absorbent body 4 used may
be one comprising an absorbent core 41, for absorption
and retention of liquid excreta, and a core wrap sheet 42
15 enclosing the absorbent core 41, as shown in Fig. 2. For
this embodiment, the surface sheet 2 and core wrap sheet
42 situated on the skin side of the absorbent body 4 are
at least partially bonded with any desired adhesive, such
as a hot-melt adhesive.

20 **[0069]**

The absorbent core may be one containing a fiber
material, such as fluff pulp, a spunbond nonwoven fabric,
an airlaid nonwoven fabric, hydrophilic fiber such as
cellulosic fiber, or hydrophilicized thermoplastic fiber,
25 and a superabsorbent polymer such as sodium acrylate
copolymer. The absorbent core does not have to contain a
superabsorbent polymer, and for example, a core wrap
sheet enclosing only the fiber material mentioned above
may be used as the absorbent body.

30 **[0070]**

The core wrap sheet is not particularly restricted
so long as it has sufficient liquid permeability to allow
permeation of liquid excreta such as urine and a
sufficient barrier property to prevent permeation of the
35 enclosed absorbent core components (i.e., to prevent
leakage of the fiber material composing the absorbent
core), and examples include sheet-like fiber structures

such as nonwoven fabrics, woven fabrics and knitted fabrics made of natural fibers or chemical fibers, and more specifically, tissues or liquid-permeable nonwoven fabrics and hydrophilic nonwoven fabrics having basis weights of about 10 g/m² to about 30 g/m².

[0071]

The structure of the absorbent body is not particularly restricted, and any structure may be employed according to the desired absorption performance and size, and the purpose of use.

[0072]

The liquid-impermeable back sheet 3 in the disposable diaper 1 is not particularly restricted, and any publicly known sheet member of the prior art may be used. Examples of such sheet members include films comprising PE, PP and the like, resin films with air permeability, multilayer articles combining air permeable resin films with nonwoven fabrics such as spunbond or spunlace fabrics, and multilayer nonwoven fabrics such as SMS.

[0073]

The absorbent article in which the surface sheet of the present invention is used may further contain any desired structural members, depending on the desired product properties and the purpose of use. The surface sheet of the present invention can be applied not only to a disposable diaper as with this embodiment, but also to various types of absorbent articles such as incontinence pads, sanitary napkins and panty liners. Furthermore, the surface sheet of the present invention is not restricted by the embodiment described above and can be appropriately modified within a range that is not outside of the object and gist of the present invention.

Examples

[0074]

The present invention will now be explained in greater detail using examples and comparative examples,

with the understanding that the present invention is not limited only to the examples.

[0075]

Example 1

5 A surface sheet comprising a nonwoven fabric with a
3 mm-pitch ridge-furrow structure was coated with a gel
composition comprising 5 mass% of polystyrene-block-
poly(ethylene-co-butylene)-block-polystyrene (SEBS), 2
10 mass% of polystyrene-block-polyethylene-block-
poly(ethylene-co-propylene)-block-polystyrene (SEPS), 90
mass% of PARLEAM 6 (product of NOF Corp.: a branched
chain hydrocarbon produced by copolymerizing liquid
isoparaffin, isobutene and n-butene and then
hydrogenating the copolymer, polymerization degree:
15 approximately 5 to 10, weight-average molecular weight:
approximately 330) and 3 mass% of silicone oil (100 cst),
at a coating width of 2 mm and a coated interval of 2 mm,
to prepare a surface sheet sample having multiple linear
coated regions. The prepared surface sheet sample was
20 attached using a hot-melt adhesive onto the section of a
commercially available infant paper diaper (Moony "Air-
Fit" S-size, by Unicharm Corp.) from which the surface
sheet had been removed, to fabricate an absorbent article
for Example 1.

25 **[0076]**

Comparative Example 1

An absorbent article for Comparative Example 1 was
fabricated in the same manner as Example 1, except that
no gel composition was coated onto the surface sheet.

30 **[0077]**

For the absorbent articles of Example 1 and
Comparative Example 1, the draining away rate, liquid
permeation rate and rewetting amount were measured by the
following procedures, and the feel on the skin of the
35 surface sheet for each absorbent article was
organoleptically evaluated by 10 evaluators. The
measured values are shown in Table 1.

[0078]

The liquid permeation rate was determined by dropping 40 ml of artificial urine once on the surface sheet of each absorbent article, measuring the time (sec) until all of the artificial urine migrated into the surface sheet, and recording the measured time as the liquid permeation rate (sec). Similarly, the draining away rate was determined by measuring the time (sec) until the artificial urine migrated through the surface sheet to the absorbent body side, and recording the measured time as the draining away rate (sec). Measurement of the draining away rate and liquid permeation rate was conducted 3 times successively. The artificial urine was prepared by dissolving 200 g of urea, 80 g of sodium chloride, 8 g of magnesium sulfate, 3 g of calcium chloride and approximately 1 g of dye (Blue #1) in 10 L of ion-exchanged water.

[0079]

The absorbent articles of Example 1 and Comparative Example 1 were used for measurement of the rewetting amount (g) by the following test method.

(1) The artificial urine dropping location on the sample is marked.

(2) The sample weight and artificial urine dropping location thickness are measured. A thickness gauge PEACOCK PIAL THICKNESS GAUGE, diameter: 50 mm) is used for the thickness measurement.

(3) The sample is anchored.

(4) A burette is anchored at a location 10 mm above the artificial urine dropping location.

(5) The burette is temporarily removed, and a cylinder (diameter: 60 mm, weight: 200 g) is placed on the sample with the artificial urine dropping location mark situated at the center.

(6) The burette is returned to the artificial urine dropping location (the center of the cylinder) and the first artificial urine dropping is commenced (T = 0).

(7) The artificial urine is dropped in an amount of 70 mL.

5 (8) The procedure is paused until the artificial urine disappears from the surface of the surface sheet inside the cylinder.

(9) The weight (g) of filter paper (Advantech, Inc. No.2, 100 mm × 100 mm) is measured and recorded as "weight A (g)".

10 (10) After 5 minutes from the start of artificial urine dropping (T = 5 min), the weight-measured filter paper (Advantech, Inc. No.2, 100 mm × 100 mm) is placed on the sample with the center of the filter paper aligned with the artificial urine dropping location, and a weight (3.5 kg) is set on it.

15 (11) After 8 minutes from the start of artificial urine dropping (T = 8 min) (3 minutes after setting the weight), the weight is removed, and the weight (g) of the filter paper is measured and recorded as "weight B (g)".

20 (12) The change in the filter paper weight (weight B (g) - weight A (g)) is calculated and recorded as the "first rewetting amount (g)".

(13) After 10 minutes from the start of the first artificial urine dropping (T = 10 min), a second artificial urine dropping is commenced.

25 (14) The artificial urine is dropped in an amount of 70 mL.

30 (15) In the same manner as (8) to (12) above, the procedure is paused until the artificial urine disappears from the surface of the surface sheet inside the cylinder, and the change in filter paper weight (g) is calculated and recorded as the "second rewetting amount (g)".

35 (16) After 10 minutes from the start of the second artificial urine dropping (T = 20 min), a third artificial urine dropping is commenced.

(17) The artificial urine is dropped in an amount of 70 mL.

(18) In the same manner as (8) to (12) above, the procedure is paused until the artificial urine disappears from the surface of the surface sheet inside the cylinder, and the change in filter paper weight (g) is calculated and recorded as the "third rewetting amount (g)".

(19) Measurement of the first to third rewetting amounts is repeated 5 times, and the average value is calculated.

[0080]

[Table 1]

		Example 1	Comparative Example 1
Coating width/interval (mm/mm)		2/2	-
Coating amount (g/m ²)		8	0
Permeation rate (sec)	1st time	6	6
	2nd time	9	9
	3rd time	14	15
Draining away rate (sec)	1st time	17	19
	2nd time	62	88
	3rd time	128	272
Rewetting amount (g)	70 mL	0	0
	140 mL	21	29
	210 mL	40	46

[0081]

As shown in Table 1, the absorbent article of Example 1 maintained a liquid permeation rate equivalent to that of the absorbent article of Comparative Example 1 that was not coated with a gel composition, while also exhibiting a more excellent draining away rate and rewetting rate compared to the absorbent article of Comparative Example 1. Also, in the organoleptic evaluation of the feel on the skin of the surface sheet, the absorbent article of Comparative Example 1 had more evaluators reporting an itchy feel of the surface sheet on the skin, while the absorbent article of Example 1 had more evaluators reporting a smooth feel of the surface sheet on the skin.

Reference Sign List

[0082]

- 1 Disposable diaper
- 2 Surface sheet
- 3 Back sheet
- 5 4 Absorbent body
- 41 Absorbent core
- 42 Core wrap sheet
- 5 Side sheet member
- 6 Coated region
- 10 7 Non-coated region

CLAIMS

1. A surface sheet for an absorbent article,
the surface sheet including a nonwoven
fabric formed of staple fibers and a hydrophobic gel
composition that maintain a gel state at 38°C, and having,
5 on a surface of a skin side of the surface sheet, a
coated region that is coated with the gel composition and
a non-coated region that is not coated with the gel
composition, and
10 the coated region having the gel
composition at least partially filling gaps formed
between the staple fibers of the nonwoven fabric, and
exposed on the surface of the skin side of the surface
sheet.
- 15 2. The surface sheet according to claim 1, wherein
the surface sheet has a structure including either or
both a plurality of protrusions and a plurality of
recesses on the surface of the skin side.
- 20 3. The surface sheet according to claim 2, wherein
the structure including either or both a plurality of
protrusions and a plurality of recesses is a ridge-furrow
structure including a plurality of ridges and a plurality
of furrows, and the gel composition is coated onto at
least some of the plurality of ridges.
- 25 4. The surface sheet according to any one of
claims 1 to 3, wherein fiber size of the staple fibers is
0.5 dtex to 10.0 dtex.
- 30 5. The surface sheet according to any one of
claims 1 to 4, wherein fiber lengths of the staple fibers
are 20 mm to 80 mm.
- 35 6. The surface sheet according to any one of
claims 1 to 5, wherein the coated region is a plurality
of linear coated regions extending parallel to a
lengthwise direction of the surface sheet, and an
interval between the linear coated regions is 1 mm to 10
mm.
7. The surface sheet according to any one of

claims 1 to 6, wherein the gel composition comprises a composition containing a styrene-based elastomer and a hydrocarbon oil.

5 8. The surface sheet according to claim 7, wherein
the gel composition comprises a composition containing
100 parts by mass of a styrene-based thermoplastic
elastomer mixture (A), having a molecular weight
dispersity (M_w/M_n) of 1.25 to 1.60 and including a
styrene-based thermoplastic elastomer (A1) composed of a
10 triblock or more block copolymer with a weight-average
molecular weight of 100,000 or greater and less than
180,000, and a styrene-based thermoplastic elastomer (A2)
composed of a triblock or more block copolymer with a
weight-average molecular weight of 180,000 or greater and
15 300,000 or less, in a mass ratio of $(A1)/(A2) = 95/5$ to
50/50, with 500 to 4800 parts by mass of a hydrocarbon
oil (B) having a kinematic viscosity of 5 to 50 mm^2/s at
37.8°C and 20 to 60 parts by mass of a silicone oil (C)
having a kinematic viscosity of 50 to 200 mm^2/s at 25°C.

20 9. An absorbent article including the surface
sheet according to any one of claims 1 to 8.