

## DESCRIPTION

## TITLE

## ABSORBENT ARTICLE

## FIELD

5 [0001]

The present invention relates to an absorbent article.

## BACKGROUND

[0002]

10 Absorbent articles that are put on a body and include an absorbent body for absorbing a liquid are already well known. A disposable diaper is one example of such an absorbent article.

[0003]

15 Some of such absorbent articles include insect repellent microcapsules that have an insect repellent fragrance and a containing member that contains the insect repellent fragrance.

[CITATION LIST]

[PATENT LITERATURE]

[0004]

20 Patent Literature 1: Japanese Unexamined Patent Application Publication (Translation of PCT Application) No. 2012-522618

## SUMMARY

[TECHNICAL PROBLEM]

[0005]

25 Conventionally, there is a case where insect repellent microcapsules come into contact with the wearer's skin of an absorbent article

[0006]

30 The present invention was achieved in light of problems that described above and an aspect of the present invention is to reduce the possibility that insect repellent microcapsules come into contact with the wearer's skin.

[SOLUTION TO PROBLEM]

[0007]

A main aspect of the present invention for achieving the above-

described aspect is an absorbent article that is configured to be put on a body, the absorbent article including:

a hydrophobic nonwoven fabric sheet; and

an insect repellent microcapsule disposed on a non-skin side  
5 of the nonwoven fabric sheet,

the insect repellent microcapsule including an insect repellent fragrance and an containing member that contains the insect repellent fragrance, the insect repellent microcapsule is embedded inside of the nonwoven fabric sheet in a state of not  
10 reaching a skin-side surface of the nonwoven fabric sheet.

[0008]

Features of the present invention other than the above will become clear by reading the description of the present specification with reference to the accompanying drawings.

15 [ADVANTAGEOUS EFFECT OF THE INVENTION]

[0009]

According to the present invention, it is possible to reduce the possibility that the insect repellent microcapsules come into contact with the wearer's skin.

20 BRIEF DESCRIPTION OF DRAWINGS

[0010]

FIG. 1 is a plan view of a diaper 1 according to the present embodiment in an unfolded state.

FIGS. 2A to 2C are exploded illustrative views of portions of  
25 the diaper 1 according to the present embodiment.

FIG. 2A is an exploded illustrative view of a front portion 3.

FIG. 2B is an exploded illustrative view of a crotch portion 5.

FIG. 2C is an exploded illustrative view of a back portion 7.

FIG. 3 is an enlarged view of a non-skin-side surface of a band-like sheet 33.  
30

FIG. 4 is a schematic diagram that schematically shows the insect repellent microcapsules 50 provided on the non-skin side of the band-like sheet 33.

FIG. 5 is a diagram showing a particle size distribution of the

insect repellent microcapsules 50 according to the present embodiment.

FIG. 6 is a table showing fragrances that can be applied in the diaper 1 and fragrances that cannot be applied.

5 FIG. 7 is a schematic diagram that schematically show the insect repellent microcapsules 50 provided on the non-skin side of the nonwoven fabric sheet 60 according to a variation.

FIG. 8 is a diagram showing a one-side fastening tape portion 140 according to another aspect, when viewed from the non-skin  
10 side.

FIG. 9 is an electron micrograph of a region that includes both damaged capsules DC and undamaged capsules NC in a coated portion.

#### DESCRIPTION OF EMBODIMENTS

[0011]

15 At least following matters will become clear with description of this specification and attached drawings.

[0012]

An absorbent article that is configured to be put on a body, the absorbent article including: a hydrophobic nonwoven fabric sheet;  
20 and an insect repellent microcapsule disposed on a non-skin side of the nonwoven fabric sheet, the insect repellent microcapsule including an insect repellent fragrance and an containing member that contains the insect repellent fragrance, the insect repellent microcapsule is embedded inside of the nonwoven fabric  
25 sheet in a state of not reaching a skin-side surface of the nonwoven fabric sheet.

[0013]

According to the above-described absorbent article, it is possible to reduce the possibility that the insect repellent  
30 microcapsules come into contact with the wearer's skin.

[0014]

In the absorbent article,  
it is desirable that the insect repellent microcapsule embedded inside the nonwoven fabric sheet is located in a range from a

non-skin-side surface of the nonwoven fabric sheet to an middle position in a thickness direction of the nonwoven fabric sheet, the middle position being a position between the skin-side surface and the non-skin-side surface.

5 [0015]

According to the above-described absorbent article, it is possible to further reduce the possibility that the insect repellent microcapsules come into contact with the wearer's skin. Also, the insect repellent fragrance can be appropriately discharged, and the insect repelling effect can be exhibited effectively.

[0016]

In the absorbent article, it is desirable that a volume of the insect repellent microcapsules embedded inside the nonwoven fabric sheet is larger than a volume of the insect repellent microcapsules located on and above a non-skin-side surface of the nonwoven fabric sheet.

[0017]

According to the above-described absorbent article, it is possible to prevent the case where the insect repellent microcapsules rupture easily (rather easily) and the insect repellent fragrance is discharged immediately, and the insect repelling effect can be appropriately sustained.

[0018]

25 In the absorbent article, it is desirable that the insect repellent microcapsules are not located on and above the non-skin-side surface of the nonwoven fabric sheet.

[0019]

30 According to the above-described absorbent article, the insect repelling effect can be sustained even more appropriately.

[0020]

In the absorbent article, it is desirable that the nonwoven fabric sheet includes a first

nonwoven fabric sheet and a second nonwoven fabric sheet, the first nonwoven fabric sheet being a nonwoven fabric sheet that constitutes the non-skin-side surface and that is not provided with the insect repellent microcapsules, and the second nonwoven  
5 fabric sheet being a nonwoven fabric sheet that is located on a skin side with respect to the first nonwoven fabric sheet and that is provided with the insect repellent microcapsules.

[0021]

According to the above-described absorbent article, it is  
10 possible to reliably realize an effect of sustaining the insect repelling effect even more appropriately.

[0022]

In the absorbent article,  
it is desirable that an average particle size of the insect  
15 repellent microcapsules is smaller than an average fiber diameter of the nonwoven fabric sheet.

[0023]

According to the above-described absorbent article, the insect repellent microcapsules easily become embedded inside the  
20 nonwoven fabric sheet, and the insect repelling effect can be appropriately sustained.

[0024]

In the absorbent article,  
it is desirable that a volume of the insect repellent  
25 microcapsules whose particle size is smaller than an average fiber diameter of the nonwoven fabric sheet is greater than a volume of the insect repellent microcapsules whose particle size is larger than the average fiber diameter.

[0025]

According to the above-described absorbent article, the insect repellent microcapsules easily become embedded inside the  
30 nonwoven fabric sheet, and the insect repelling effect can be appropriately sustained.

[0026]

In the absorbent article,

it is desirable that the insect repellent microcapsule includes an insect repellent microcapsule that discharges the insect repellent fragrance from the containing member when subjected to a pressure  $P$ , and an insect repellent microcapsule that does not discharge the insect repellent fragrance from the containing member even when subjected to a pressure  $2P$  that is twice the pressure  $P$ .

[0027]

According to the above-described absorbent article, the amount of the insect repellent fragrance that is discharged can be adjusted by the user in accordance with the risk of insect bites.

[0028]

In the absorbent article,

it is desirable that the absorbent article further comprises a coated portion that is coated with a plurality of the insect repellent microcapsules, when the absorbent article has been taken out of a packaging material, the plurality of insect repellent microcapsules include a damaged capsule and an undamaged capsule, the damaged capsule being an insect repellent microcapsule that is damaged, the undamaged capsule being an insect repellent microcapsule that is not damaged.

[0029]

According to the above-described absorbent article, the user or the wearer can recognize the effect of the insect repellent fragrance discharged from the damaged capsule when taking the absorbent article out of the packaging material, and is likely to recognize the effect of the insect repellent fragrance during usage due to breaking the undamaged capsule before and during usage.

[0030]

In the absorbent article,

it is desirable that the coated portion has a processing mark portion in which a number of damaged capsules per unit area is

greater than a number of undamaged capsules per unit area.

[0031]

According to the above-described absorbent article, the processing mark portion makes it possible to more reliably provide the damaged capsules and the undamaged capsules in the absorbent article. Therefore, the effect of the insect repellent fragrance is likely to be recognized both before and during usage.

[0032]

In the absorbent article,

it is desirable that the coated portion includes a non-processing mark portion, the non-processing mark portion being a portion in which the number of undamaged capsules per unit area is greater than the number of damaged capsules per unit area when the absorbent article has been taken out of the packaging material, and the non-processing mark portion has a larger area than the processing mark portion.

[0033]

According to the above-described absorbent article, the effect of the insect repellent fragrance can be further exhibited during usage by the wearer or the like damaging the undamaged capsules for example in accordance with the desired extent of the effect of the insect repellent fragrance.

[0034]

In the absorbent article,

it is desirable that when the absorbent article has been taken out of the packaging material, at least a portion of the absorbent article has been folded at a fold line portion, the processing mark portion is the fold line portion, and at least a part of the damaged capsules is provided in the fold line portion.

[0035]

According to the above-described absorbent article, the damaged capsule is likely to be formed by pressure from folding, and therefore the processing mark portion can be easily formed during manufacturing. Consequently, the effect of the insect repellent

fragrance is likely to be more reliably exhibited while contained in the packaging material.

[0036]

In the absorbent article,

5 it is desirable that when the absorbent article is in an unfolded state, at least a part of the damaged capsules is provided in an outer end portion of the absorbent article.

[0037]

10 According to the above-described absorbent article, the damaged capsule are more likely to be formed by impact in a cutting step for forming the outer end portion of the absorbent article provided with the coated portion. Consequently, the effect of the insect repellent fragrance is likely to be more reliably exerted exhibited while contained in the packaging material.

15 [0038]

In the absorbent article,

it is desirable that the absorbent article further comprises a fastening tape portion, and the coated portion is provided in the fastening tape portion.

20 [0039]

According to the above-described absorbent article, the fastening tape portion is a portion that has a highly possibility of being grabbed by a hand in particular when the absorbent article is put on, and therefore the damaged capsules are likely to be more reliably formed when the absorbent article is put on. Consequently, the effect of the insect repellent fragrance is likely to be exhibited in the put-on state.

[0040]

In the absorbent article,

30 it is desirable that at least a part of the damaged capsules is provided in a leading end portion of the fastening tape portion.

[0041]

According to the above-described absorbent article, the damaged capsules are likely to be formed by impact in the cutting step

performed during formation of the fastening tape portion. Consequently, the effect of the insect repellent fragrance is likely to be more reliably exhibited while contained in the packaging material.

5 [0042]

In the absorbent article,

it is desirable that when the absorbent article has been taken out of the packaging material, the fastening tape portion has been folded at a tape fold line with a skin-side surface of the fastening tape portion being on an inward side, the tape fold line extending along a vertical direction, the fastening tape portion has a compressed portion for maintaining a folded state, and at least a part of the damaged capsule is provided in the compressed portion.

15 [0043]

According to the above-described absorbent article, the damaged capsules are likely to be formed by pressure for forming the compressed portion. Consequently, the effect of the insect repellent fragrance is likely to be more reliably exhibited while contained in the packaging material.

20 [0044]

Overview of disposable Diaper of Embodiment

A disposable diaper (corresponding to the absorbent article) of the present embodiment is a tape-type (open-type) disposable diaper (hereinafter, also simply referred to as the diaper 1).

25 [0045]

FIG. 1 is a plan view of the diaper 1 according to the present embodiment in an unfolded state (i.e., the state where the diaper 1 has been stretched to eliminate wrinkles). FIGS. 2A to 2C are exploded illustrative views of portions of the diaper 1 according to the present embodiment. FIG. 2A is an exploded illustrative view of a front portion 3. FIG. 2B is an exploded illustrative view of a crotch portion 5. FIG. 2C is an exploded illustrative view of a back portion 7.

[0046]

As shown in FIG. 1, the diaper 1 of the present embodiment includes a front portion 3, a crotch portion 5, and a back portion 7. The front portion 3 is a portion (waist portion) that is located at the wearer's front portion (stomach side). Also, the back portion 7 is a portion (waist portion) that is located the wearer's back portion (back side). The crotch portion 5 is a portion that is located between the front portion 3 and the back portion 7.

[0047]

As shown in FIG. 1, the directions used in the following description are defined as follows. The direction from the front portion 3 toward the back portion 7 is a "product longitudinal direction L", and the direction that intersects the product longitudinal direction L is a "product width direction W". A line CL shown in FIG. 1 indicates the center of the diaper 1 in the product longitudinal direction L (diaper center CL). Also, as shown in FIG. 2, the direction intersecting the product longitudinal direction L and the product width direction W is the "thickness direction", the side facing the wearer's skin (the side that is close to the wearer's skin when the diaper 1 is put on a human body (corresponding to a body)) is the "skin side", and the opposite side (the side that is distant from the wearer's skin when the diaper 1 is put on a human body) is the "non-skin side".

[0048]

The diaper 1 includes an absorbent body 21, a top sheet 22, a leak-proof sheet 23, a back sheet 24, a skin-side sheet 26, a waist gather film 28, fastening tape portions 30, and a target tape 29. These members are joined to their adjacent members using a hot-melt adhesive.

[0049]

The absorbent body 21 is for absorbing a liquid. Specifically, the absorbent body 21 is a member (absorbent core) constituted

by depositing liquid absorbent materials that can absorb an excrement such as urine, and is arranged extending over the front portion 3, the crotch portion 5, and the back portion 7. The region shown by shading in FIG. 1 is the region occupied by the absorbent body 21.

[0050]

The absorbent body 21 of the present embodiment has an hourglass shape, with a width that is shorter in the central portion in the product longitudinal direction L. Note that the shape of the absorbent body 21 is not limited to the shape shown in FIG. 1, and may be a simple rectangular shape. Also, it is sufficient that the absorbent body 21 is provided in at least the crotch portion 5.

[0051]

The absorbent body 21 is wrapped in a core wrap 25 that is made of a liquid-permeable sheet (nonwoven fabric sheet), and is sandwiched between the top sheet 22 and the leak-proof sheet 23 in the thickness direction. The liquid-absorbent material that forms the absorbent body 21 can be made of liquid-absorbent fibers such as pulp fibers, and a liquid-absorbent particulate matter such as superabsorbent polymer. It may also contain a liquid-absorbent material other than the liquid-absorbent fibers and the liquid-absorbent particulate matter.

[0052]

The top sheet 22 is a liquid-permeable member arranged on the skin side of the absorbent body 21.

[0053]

The leak-proof sheet 23 is a liquid-impermeable member arranged on the non-skin side of the absorbent body 21.

[0054]

The back sheet 24 is a member (exterior sheet) that constitutes the non-skin-side exterior of the diaper 1, and is made of nonwoven fabric, for example. The back sheet 24 is arranged on the non-skin side of the leak-proof sheet 23 (see FIGS. 2A to

2C).

[0055]

Also, a flap portion 14 is provided in each of two side portions of the back portion 7 in the product width direction W of the  
5 diaper 1. The flap portions 14 are mainly constituted by the skin-side sheet 26 and the back sheet 24 (see FIG. 2C). The skin-side sheet 26 is a skin side member that extends over the front portion 3, the crotch portion 5, and the back portion 7, and is constituted by a nonwoven fabric sheet, for example. The  
10 skin-side sheet 26 is a member that constitutes later-described leg side gathers 16 (corresponding to barrier cuffs), and the outer portions of the skin-side sheet 26 constitute the flap portions 14.

[0056]

Also, the end edge portions that form the leg openings of the  
15 diaper 1 are provided with a pair of leg gathers 15 that stretch and contract in the product longitudinal direction L (leg stretchable portions) and that extend along the product longitudinal direction L. In the present embodiment, the leg  
20 gathers 15 are constituted by elastic strings provided between the skin-side sheet 26 and the back sheet 24, and the elastic strings give stretchability to the skin-side sheet 26 and the back sheet 24. Also, these elastic strings extend from the front portion 3 to the back portion 7 in the product longitudinal  
25 direction L. It should be noted that the leg gathers 15 are not limited to being constituted by elastic strings, and may be constituted by a stretchable sheet (film) , for example.

[0057]

Also, a pair of leg side gathers 16 that stretch and contract in  
30 the product longitudinal direction L are provided extending along the product longitudinal direction L at positions inside the leg gather 15 in the product width direction W. The leg side gathers 16 are for preventing the leakage of a liquid from gaps around the wearer's legs, and are mainly constituted by inner portions

of the skin-side sheet 26.

[0058]

The leg side gathers 16 (portions of the skin-side sheet 26) are joined in end joining portions 17 located at the two end portions in the product longitudinal direction L (rectangular portions in FIG. 1). Also, in the portion between the pair of the end joining portions 17 (hereinafter referred to as a main body portion 18 for convenience), only the outer portions in the product width direction W are joined (referred to as main-body joining portions 18a). For this reason, the main body portion 18 is shaped as a pocket surrounded by the pair of end joining portions 17 and the main-body joining portions 18a, and rises from the main-body joining portion 18a. It should be noted that stretchable members (elastic strings 19 in the present embodiment) are provided in an inner portion of the main body portion 18 in the product width direction W, and therefore the inner portion has stretchability. In this way, the leg side gathers 16 are constituted by the end joining portions 17 and the main body portion 18, and, similar to the leg gathers 15, are provided extending from the front portion 3 to the back portion 7 in the product longitudinal direction L.

[0059]

Also, in the back portion 7, a waist gather film 28 is arranged between the absorbent body 21 and the back sheet 24 (see FIG. 2C). The waist gather film 28 is a band-shaped member that stretches and contracts along the product width direction W. The waist gather film 28 gives stretchability to the back sheet 24 and the like, thus forming the waist gather. The waist gather film 28 has a longer length in the product width direction W than the absorbent body 21. For this reason, the waist gather protrudes outward from the absorbent body 21 in the product width direction W.

[0060]

The pair of fastening tape portions 30 each include: a

rectangular band-like sheet 33 that is made of hydrophobic spunbond nonwoven fabric; and a hook-and-loop fastener 35.

[0061]

5 The inward portions (substantially the inner halves in the present embodiment) of the fastening tape portions 30 (band-like sheets 33) in the longitudinal direction (product width direction W) serve as fixed portions 32. The fastening tape portions 30 are fixed to the flap portions 14 of the back portion 7 by the fixed portions 32. In the present embodiment, the fastening tape  
10 portions 30 are attached due to portions of the fastening tape portions 30 being sandwiched between the skin-side sheet 26 and the back sheet 24 that form the flap portions 14 (see FIG. 2C).

[0062]

15 Also, the outward portion (substantially the outer halves in the present embodiment) of the fastening tape portions 30 (band-like sheets 33) in the longitudinal direction (product width direction W) serves as engaging portions 31. The diaper 1 can be put on the wearer by engaging the engaging portions 31 with later-described target tape 29.

20 [0063]

More specifically, the engaging portions 31 of the fastening tape portions 30 (band-like sheets 33) are provided with the hook-and-loop fasteners 35, and the engaging portions 31 are engaged with the target tape 29 due to the hook-and-loop fasteners 35  
25 becoming caught on the target tape 29.

[0064]

It should be noted that the hook-and-loop fasteners 35 are fixed to the skin-side surfaces of the band-like sheets 33. Also, rather than the hook-and-loop fasteners 35 being fixed to the  
30 entirety of the outward portions (engaging portions 31) of the band-like sheet 33, the outward portions (engaging portions 31) have portions where the hook-and-loop fasteners 35 are not provided. In the present embodiment, in the outward portions (engaging portions 31), the inner portions, which are located

inside the hook-and-loop fasteners 35 in the longitudinal direction of the band-like sheet 33, and the outer portions, which are located outside, are a no-hook-and-loop-fastener portions 31a where the hook-and-loop fasteners 35 are not provided.

5 [0065]

In addition, the outermost ends of the fastening tape portions 30 (band-like sheets 33, engaging portions 31) are wavy portions 31b that have a wave-like shape. This wavy portions 31b are cut edges formed when the band-like sheets are cut to form the fastening tape portions 30. It should be noted that the wavy portions 31b are also portions of the no-hook-and-loop-fastener portions 31a.

[0066]

The target tape 29 is arranged on the non-skin side of the back sheet 24 in the front portion 3 (see FIG. 2A). The target tape 29 is a member that can engage with the fastening tape portions 30, and is formed by nonwoven fabric, for example. Also, as shown in FIG. 1, the target tape 29 of the present embodiment is a rectangular member that is elongated along the product width direction W.

[0067]

Insect repellent microcapsules 50

The diaper 1 of the present embodiment is provided with insect repellent microcapsules 50. The insect repellent microcapsules 50 are constituted by a membrane (corresponding to a containing member) that contains an insect repellent fragrance (in the present embodiment, an insect-repellent fragrance composition made up of multiple types of fragrances) that has an insect repelling effect (insect control effect, repelling effect). In other words, the insect repellent microcapsules 50 include: an insect repellent fragrance (insect-repellent fragrance composition); and a membrane that contains (holds) the insect repellent fragrance (insect-repellent fragrance composition).

[0068]

The insect repellent microcapsules 50 are configured such that when the user touches the diaper 1 or grabs the diaper 1 in order to put the diaper 1 on a human body, for example, the membranes rupture (become damaged) due to the pressure (impact, friction), and the insect-repellent fragrance composition therein is discharged. The insect repelling effect is exhibited when the insect-repellent fragrance composition is discharged. In other words, the insect repellent microcapsules 50 are impact-rupturing microcapsules that contain an insect-repellent fragrance composition.

[0069]

The membrane of the present embodiment is made of urethane resin, but there is not limited thereto, and the membrane need only have a predetermined strength so as to rupture when subjected to the above-described pressure (impact, friction). Other examples of materials include gelatin, gelatin/arabic gum, melamine resin, urea/formalin resin. These resins may be used on their own, or two or more types of resin may be used together.

[0070]

Also, the insect repellent microcapsules 50 of the present embodiment are prepared (microcapsulized) by a so-called interfacial polymerization, but the present invention is not limited thereto, and various methods can be used. Examples include a phase separation method (a coacervation method), an liquid hardening coating method (an orifice method), a pan coating method, a spray drying method, a liquid drying method (interface precipitation method), an interface inorganic reaction method (an inorganic wall microcapsule), an in-situ polymerization method, an ultrasonic method.

[0071]

It should be noted that the insect-repellent fragrance composition will be described in detail later.

[0072]

In the present embodiment, the insect repellent microcapsules 50

are provided on the non-skin side of the band-like sheets 33 (corresponding to hydrophobic nonwoven fabric sheet) of the fastening tape portion 30.

[0073]

5 FIG. 3 is an enlarged view of the non-skin-side surface of one band-like sheet 33. FIG. 4 is a schematic diagram that schematically shows the insect repellent microcapsules 50 provided on the non-skin side of the band-like sheet 33.

[0074]

10 It should be noted that, FIG. 3 shows nonwoven fabric fibers 34 of the band-like sheet 33 (nonwoven fabric fibers 34 in the outermost layer (the layer located the farthest on the non-skin side) and nonwoven fabric fibers 34 in the second layer) and a large number of insect repellent microcapsules 50. Also, FIG. 4  
15 schematically shows the nonwoven fabric fibers 34 in the aforementioned layers and the insect repellent microcapsules 50. The nonwoven fabric fibers 34 are not actually aligned as regularly as shown in FIG. 4, and are shown schematically in order to make the figure easier to understand.

20 [0075]

As shown in FIG. 4, the insect repellent microcapsules 50 according to the present embodiment are embedded inside the band-like sheet 33 so as to not reach a skin-side surface 33a of the band-like sheet 33. In other words, the insect repellent  
25 microcapsules 50 are contained inside the band-like sheet 33, while also not reaching the skin-side surface 33a of the band-like sheet 33.

[0076]

For this reason, it is possible to reduce the possibility that  
30 the insect repellent microcapsules 50 come into contact with the wearer's skin.

[0077]

In addition, as shown in FIG. 4, the insect repellent microcapsules 50 embedded inside the band-like sheet 33 are

located in a range from a non-skin-side surface 33b of the band-like sheet 33 to a middle position C in the thickness direction of the band-like sheet 33 (diaper 1), the middle position C being a position which is between the skin-side surface 33a and the non-skin-side surface 33b. In other words, the insect repellent microcapsules 50 are contained inside the band-like sheet 33, while also remaining in a range less than or equal to a depth  $T/2$ , which is half of a thickness  $T$  of the band-like sheet 33 (i.e., while also not being located deeper than the depth  $T/2$ , which is half the thickness  $T$ ).

[0078]

For this reason, it is possible to further reduce the possibility that the insect repellent microcapsules 50 come into contact with the wearer's skin. Also, if the insect repellent microcapsules 50 are embedded too deeply, such insect repellent microcapsules 50 are not subjected to an appropriate amount of pressure (impact, friction), and therefore the insect-repellent fragrance composition is not discharged, and the insect repelling effect is not exhibited. In the present embodiment, the insect repellent microcapsules 50 remain at or above the middle position C (less than or equal to the depth  $T/2$ , which is half the thickness  $T$  of the band-like sheet 33), and therefore the insect-repellent fragrance composition can be appropriately discharged, and the insect repelling effect can be exhibited effectively.

[0079]

Also, in the present embodiment, the volume of the insect repellent microcapsules 50 embedded inside the band-like sheet 33 (i.e., the total volume of the insect repellent microcapsules 50 remaining at or above the middle position C) is greater than the volume (total volume) of the insect repellent microcapsules 50 located on and above the non-skin-side surface 33b of the band-like sheet 33 (in other words, located above the nonwoven fabric fibers 34 in the outermost layer). Here, letting the upper surface be the surface formed by the tips of the most

protruding fibers in the nonwoven fabric fiber layer, "inside" of the band-like sheet 33 refers to the portion inside the upper surface.

[0080]

5 If the volume (amount) of the insect repellent microcapsules 50 located on and above the non-skin-side surface 33b is too excessively large, the insect repellent microcapsules 50 rupture easily (rather easily) and the insect-repellent fragrance composition is discharged immediately, which is not suitable in  
10 terms of the sustainability of the insect repelling effect (the property of sustaining the insect repelling effect of the insect repellent microcapsule 50). In the present embodiment, the volume (total volume) of the insect repellent microcapsules 50 embedded inside the band-like sheet 33 is set larger than the  
15 volume (total volume) of the insect repellent microcapsules 50 located on and above the non-skin-side surface 33b of the band-like sheet 33, and therefore it is possible to prevent the case where the insect repellent microcapsules 50 rupture easily (rather easily) and the insect-repellent fragrance composition  
20 is discharged immediately, and the insect repelling effect can be appropriately sustained. It should be noted that, in the present embodiment, as shown in FIGS. 3 and 4, the insect repellent microcapsules 50 are not located on and above the non-skin-side surface 33b of the band-like sheet 33 (above the  
25 nonwoven fabric fibers 34 of the outermost layer). For this reason, the insect repelling effect can be sustained even more appropriately.

[0081]

As described above, in the present embodiment, the insect  
30 repellent microcapsules 50 are arranged at appropriate locations in the thickness direction of the band-like sheet 33, thus making it possible to effectively exhibit the insect repelling effect while also reducing the possibility that the insect repellent microcapsules 50 come into contact with the wearer's skin.

[0082]

The following describes how the insect repellent microcapsules 50 are arranged at appropriate positions as described above in the present embodiment.

5 [0083]

FIG. 5 is a diagram showing a particle size distribution of the insect repellent microcapsules 50 according to the present embodiment. As shown in FIG. 5 (see FIG. 3 as well), first, the average particle size of the insect repellent microcapsules 50 (in the present embodiment, 5 to 15  $\mu\text{m}$ ) is smaller than the average fiber diameter of the band-like sheet 33 (in the present embodiment, 20  $\mu\text{m}$ , as shown by A in FIG. 5). If the average particle size of the insect repellent microcapsules 50 is larger than the average fiber diameter of the band-like sheet 33, it is difficult for the insect repellent microcapsules 50 to become physically embedded inside the band-like sheet 33, and the insect repellent microcapsules 50 remain on the non-skin-side surface 33b of the band-like sheet 33 (on the nonwoven fabric fibers 34 of the outermost layer). This situation is not suitable in terms of the sustainability of the insect repelling effect as described above, but in the present embodiment, the average particle size of the insect repellent microcapsules 50 is set smaller than the average fiber diameter of the band-like sheet 33, and therefore the insect repellent microcapsules 50 easily become embedded inside the band-like sheet 33, and the insect repelling effect can be appropriately sustained.

[0084]

Also, in a similar manner, the volume (total volume) of the insect repellent microcapsules 50 whose particle size is smaller than the average fiber diameter (20  $\mu\text{m}$ ) of the band-like sheet 33 is greater than the volume (total volume) of the insect repellent microcapsules 50 whose particle size is larger than the average fiber diameter (see FIGS. 3 and 5). Accordingly,

similarly, the insect repellent microcapsules 50 easily become embedded inside the band-like sheet 33, and the insect repelling effect can be appropriately sustained.

[0085]

5 It should be noted that it is also difficult for the insect repellent microcapsules 50 to become embedded inside the band-like sheet 33 if the particle size of the insect repellent microcapsules 50 is excessively small. Specifically, static electricity is generated easily if the particle size is  
10 excessively small, and, due to the generated static electricity, the insect repellent microcapsules 50 fail to move from the top of the non-skin-side surface 33b of the band-like sheet 33 (the top of the nonwoven fabric fibers 34 in the outermost layer), and continue to remain above the non-skin-side surface 33b (above  
15 the nonwoven fabric fibers 34 in the outermost layer). For this reason, in the present embodiment, in order to avoid such phenomenon, the particle size of the insect repellent microcapsules 50 is set greater than or equal to 0.1  $\mu\text{m}$  (preferably, greater than or equal to 0.5  $\mu\text{m}$ ) (see FIG. 5, and  
20 note that the upper limit value is less than or equal to 50  $\mu\text{m}$  (preferably less than or equal to 30  $\mu\text{m}$ )).

[0086]

Also, in the present embodiment, an aqueous dispersion, which contains PVA (polyvinyl alcohol) having an adhesive function and  
25 contains the insect repellent microcapsules 50 dispersed in water, is prepared, and the insect repellent microcapsules 50 are provided in (applied on) to the band-like sheet 33 to the non-skin side of the band-like sheet 33, which is made of hydrophobic nonwoven fabric. Further, the band-like sheet 33 is a nonwoven  
30 fabric sheet that has a relatively high basis weight. For this reason, the aqueous dispersion (insect repellent microcapsules 50) does not move very far into the band-like sheet 33, and the insect repellent microcapsules 50 can remain within the depth  $T/2$ , which is half the thickness  $T$  of the band-like sheet 33.

[0087]

It should be noted that, in the step of applying the aqueous dispersion to the band-like sheet 33, a hydrophilic agent (0.3%, polyoxyethylene sorbitan monooleate) is added to the aqueous dispersion in order to achieve uniform application.

Also, in this case, a defoaming agent (0.2%, polyoxyethylene polyoxypropylene glycol (block copolymer)) is also added in accordance with the addition of the hydrophilic agent.

[0088]

Insect-repellent fragrance composition

The insect-repellent fragrance composition includes at least one type of fragrance having a boiling point of 200°C to 220°C (higher than or equal to 200°C and lower than 220°C) selected from the group (A) (hereinafter referred to as a high boiling point fragrance for convenience), and one type of fragrance having a boiling point of 150°C to 200°C (higher than or equal to 150°C and lower than 200°C) selected from the group (B) (hereinafter referred to as a low boiling point fragrance for convenience). The weight ratio of fragrance from the group (A) is higher than the weight ratio of fragrance from the group (B) in the insect-repellent fragrance composition. The fragrances of the group (A) include: citronellal, menthol,  $\alpha$ -terpineol, linalyl acetate, lavandulol, isopulegol, benzyl acetate, and ethyl linalool. The fragrances of the group (B) include: menthane, camphene, tetrahydrolinalool, dihydrolinalool, dihydromyrcenol, and ocimenol. It should be noted that the insect-repellent fragrance composition includes solvent (for example, isopropyl myristate) in addition to the fragrance.

[0089]

The following are reasons for this. If the insect-repellent fragrance composition includes only a low boiling point fragrance (only the fragrance in the group B), the fragrance volatilizes (diffuses) immediately, which is not suitable in view of the sustainability of the insect repelling effect. On the other

hand, if the insect-repellent fragrance composition includes only a high boiling point fragrance (only a fragrance in the group A), the sustainability of the insect repelling effect improves due to the fragrance the time being required for volatilization (diffusion). However, the initial fragrance volatilization (diffusion) is very low, and therefore it is not possible to demonstrate the insect repelling effect to the user.

[0090]

In contrast, according to the present embodiment, the fragrance having a higher weight ratio (the main component of the insect-repellent fragrance composition) is a high boiling point fragrance (the fragrance in the group A), thus suitably ensuring the sustainability of the insect repelling effect. Moreover, the low boiling point fragrance (the fragrance in the group B) is added as a supplementary fragrance in order to promote the initial fragrance volatilization (diffusion), thus making it possible for the insect repelling effect to be recognized by (demonstrated to) the user through the scent, and making it possible to give the user an expectation of the insect repelling effect. As described above, according to the diaper 1 of the present embodiment, it is possible to ensure the sustainability of the insect repelling effect while also giving the user an expectation of the insect repelling effect.

[0091]

Further, citronellal, menthol,  $\alpha$ -terpineol, linalyl acetate, lavandulol, isopulegol, benzyl acetate, ethyl linalool, menthane, camphene, tetrahydrolinalool, dihydrolinalool, dihydromyrcenol, and ocimenol are all allergen-free substances. For this reason, in terms of allergic reaction, it is possible to give the user a sense of ease.

[0092]

It should be noted that the insect-repellent fragrance composition according to the present embodiment does not contain any of the following 26 types of fragrances. These 26 types of

fragrances are  $\alpha$ -isomethylionone, amyl cinnamic aldehyde, amylcinnamyl alcohol, anise alcohol, benzyl alcohol, benzyl benzoate, benzyl cinnamate, benzyl salicylate, butylphenyl methylpropional, cinnamaldehyde, cinnamyl alcohol, citral, citronellol, coumarin, eugenol, farnesol, geraniol, hexyl cinnamal, hydroxycitronellal, hydroxyisohexyl 3-cyclohexene carboxaldehyde, isoeugenol, limonene, linalool, methyl 2-octinate, Evernia prunastri extract, and Evernia furfuracea extract. Here, "not containing" means that the fragrance is substantially not contained, and does not mean that the fragrance is not contained at all (not at all present).

[0093]

Under the European Union (EU) Cosmetics Directive (76/768/EEC), there is an obligation to display these fragrances as allergens on the label. Accordingly, due to the insect-repellent fragrance composition not containing these fragrances, it is possible to give the user a sense of ease in terms of allergic reaction.

[0094]

In addition, in the present embodiment, the following effects are achieved due to the insect-repellent fragrance composition being applied to an absorbent article (diaper 1) that includes a hot-melt adhesive. Specifically, some fragrances inhibit the adhesive function of the hot-melt adhesive, and if such fragrances are used in the absorbent article (diaper 1), it is possible for the fragrance, which has volatilized in the package (packaging material) before the diaper 1 is used, to have an effect on the hot-melt adhesive and cause peeling of the diaper 1 or the like.

[0095]

The following do not inhibit the adhesive function of a hotmelt adhesive: citronellal, menthol,  $\alpha$ -terpineol, linalyl acetate, lavandulol, isopulegol, benzyl acetate, ethyl linalool, menthane, camphene, tetrahydrolinalool, dihydrolinalool, dihydromyrcenol, and ocimenol. For this reason, it is possible to prevent the

occurrence of peeling the diaper 1 and the like, and it is possible to appropriately maintain the functionality of the diaper 1.

[0096]

5 Note that insect repellent fragrances that inhibit the adhesive performance of a hot-melt adhesive include: terpinene, limonene, phenylacetaldehyde, methyl salicylate, thymol, methyl isoeugenol, coumarin,  $\beta$ -phenylethyl alcohol, cymene, eugenol, and carvacrol, but the insect-repellent fragrance composition according to the  
10 present embodiment does not contain any of these (as defined above for these fragrances being "not contained"). For this reason, it is possible to prevent the occurrence of peeling the diaper 1 and the like, and it is possible to appropriately maintain the functionality of the diaper 1.

15 [0097]

Further, in the present embodiment, in addition to the high boiling point fragrance (the fragrance of the group (A)) and the low boiling point fragrance (the fragrance of the group (B)), the insect-repellent fragrance composition includes at least one  
20 type of fragrance having a boiling point of 220°C to 270°C (higher than or equal to 220°C and lower than 270°C) selected from the group (C) (hereinafter referred to as a super high boiling point fragrance, for convenience). The fragrances of the group (C) include: terpinyl acetate, isobornyl acetate, geranyl formate,  
25 p-menthane-3,8-diol, 2-(tert-butyl)cyclohexyl acetate, dihydroterpinyl acetate, mugol, myrcenol, nerol, phenylethyl acetate, 4-tert-butylcyclohexyl acetate, citronellyl acetate, neryl acetate, anisyl acetate, geranyl acetate, ethyllinalyl acetate, tricyclodecenyl acetate, and cinnamyl acetate. In such  
30 a case, since the super high boiling point fragrance is added to the low boiling point fragrance and the high boiling point fragrance, thus making it possible to reinforce the sustainability of the insect repelling effect.

[0098]

FIG. 6 shows the table of the above-described fragrances that can be applied to the diaper 1 and the above-described fragrances that cannot be applied to the diaper.

It should be noted that the insect-repellent fragrance composition according to the present embodiment has the following characteristic. Citronellal 30% to 40%, terpinyl acetate 1% to 5%, isobornyl acetate 1% to 5%, and other fragrances less than 1% (including the fragrance of the group (B)) have been added as fragrances to isopropyl myristate 50% (weight ratio; this similarly applies hereinafter), which is the solvent.

[0099]

Also, in the present embodiment, the insect-repellent fragrance composition includes of only synthetic fragrances. Here, fragrances can be roughly divided into natural fragrances and synthetic fragrances. The natural fragrances are essential oils, for example, and are fragrances directly extracted from natural plants or the like. Accordingly, the composition varies depending on the production location and harvest timing, and natural fragrances contain various fragrance components in addition to the target fragrance component.

[0100]

However, synthetic fragrances are chemically synthesized fragrances, and therefore do not contain such various fragrance components. Synthetic fragrances include isolated fragrances, fully synthetic fragrances, semi-synthetic fragrances, and biosynthetic fragrances. In the present embodiment, only synthetic fragrances are included, thus making it possible to appropriately avoid the inclusion of substances that are not to be included in the insect-repellent fragrance composition (e.g., the above-described allergens or substances that inhibit the hot-melt adhesive).

[0101]

It should be noted that isolated fragrances (e.g., citronellal), which are produced by isolating one component from a natural

fragrance (e.g., citronella oil), fall under the category of synthetic fragrances, not natural fragrances, and therefore even in the case of such isolated fragrances as well, it is possible to avoid the inclusion of the above-described substances.

5 [0102]

Dischargability of insect-repellent fragrance composition from insect repellent microcapsule 50

In the present embodiment, as shown in FIG. 5, there is a mixture of insect repellent microcapsules 50 that have difference  
10 particle sizes. The larger (smaller) particle size of an insect repellent microcapsule 50 is, the easier (harder) it is for the insect repellent microcapsule 50 to rupture, and therefore, in the present embodiment, the insect repellent microcapsules 50 that have difference rupturing pressures (i.e., the insect-  
15 repellent fragrance composition discharge pressures) are provided.

[0103]

Specifically, the insect repellent microcapsules 50 include low-pressure rupturing capsules, which are insect repellent  
20 microcapsules 50 that discharge the insect-repellent fragrance composition from the membrane when subjected to a pressure  $P$  (23.6 MPa in the present embodiment), and high-pressure rupturing capsules, which are insect repellent microcapsules that do not discharge the insect-repellent fragrance composition from the  
25 membrane even when subjected to a pressure  $2P$  (47.2 MPa in the present embodiment), which is twice the pressure  $P$ .

[0104]

In other words, in the case of the low-pressure rupturing capsules, the lowest value of the pressure required for rupturing  
30 (discharging fragrance composition), which is the pressure value at which the insect repellent microcapsule 50 first rupture when the pressure is gradually increased, is less than or equal to the pressure  $P$  (23.6 MPa), whereas in the case of the high-pressure rupturing capsules, the aforementioned lowest value is

greater than the pressure 2P (47.2 MPa), and both of such capsules are included.

[0105]

Effects such as the following can be obtained according to such matter.

[0106]

The user can adjust the amount of insect-repellent fragrance composition that is discharged. For example, in a situation where the risk of insect bites is not very high (e.g., indoors or daytime), the user can use less pressure when touching (grasping) the diaper 1 so as to only break (rub against and break) the low-pressure rupturing capsules, thus reducing the amount of insect-repellent fragrance composition that is discharged. On the other hand, in a situation where the risk of insect bites is high (e.g., outdoors or after dark), the user can use more pressure when touching (grasping) the diaper 1 so as to break (rub against and break) both the low-pressure rupturing capsules and the high-pressure rupturing capsules, thus increasing the amount of insect-repellent fragrance composition that is discharged. If only the low-pressure rupturing capsules or the high-pressure rupturing capsules are provided, the discharge amount cannot be adjusted. As described above, according to the present embodiment, the user can adjust the amount of the insect-repellent fragrance composition that is discharged, in accordance with the risk of insect bites.

[0107]

#### Other Embodiments

The above embodiment has been described in order to facilitate the understanding of the present invention, not to interpret the present invention in a limited manner. The present invention may variously be changed or altered without departing from its gist and encompass equivalents thereof.

[0108]

In the above embodiment, a tape-type (open-type) diaper 1 is

described as an example of the absorbent article to be put on a body. However, the present invention is not limited thereto, and the diaper may be a pull-on diaper. Also, there is no limitation to being a diaper, and the absorbent article may be a napkin, a urine absorbing pad, or a pantyliner, for example. Further, the absorbent article to be put on a body is not limited to being an absorbent article that is put on a human body, and may be a diaper for pets, for example.

[0109]

Further, in the above embodiment, an integrated band-like sheet 33 is described as an example of the "nonwoven fabric sheet" on which the insect repellent microcapsules are provided, but the present invention is not limited thereto. And the nonwoven fabric sheet on which the insect repellent microcapsules are provided may be constituted by multiple nonwoven fabric sheets.

[0110]

As shown in FIG. 7, in this variation, the nonwoven fabric sheet on which the insect repellent microcapsules are provided is constituted by two nonwoven fabric sheets (the overall nonwoven fabric sheet constituted by two nonwoven fabric sheets will be called a nonwoven fabric sheet 60). The one of the two nonwoven fabric sheets is the same as the above-described band-like sheet 33 (corresponding to a second nonwoven fabric sheet, which will be referred to as a band-like sheet 62). The other one of the two nonwoven fabric sheets is a cover material 64 (corresponding to the first nonwoven fabric sheet) that is thinner than the band-like sheet 62, and the cover material 64 covers the non-skin side of the band-like sheet 62. In other words, the band-like sheet 62 is located on the skin side with respect to the cover material 64, and the band-like sheet 62 is covered by the cover material 64 on the non-skin side.

[0111]

For this reason, a non-skin-side surface 60a of the nonwoven fabric sheet 60 is constituted by the cover material 64, not the

band-like sheet 62, and the insect repellent microcapsules 50 are provided on the band-like sheet 62, and not provided on the cover material 64. This makes it possible to reliably realize a state where the insect repellent microcapsules 50 are not located  
5 above the non-skin-side surface 60a of the band-like sheet 62. Accordingly, it is possible to reliably realize the above-described effect that the insect repelling effect is sustained even more appropriately. Moreover, the cover material 64 also plays a role of suppressing the case where ruptured insect  
10 repellent microcapsules 50 fall out.

[0112]

It should be noted that FIG. 7 is a schematic diagram that schematically show the insect repellent microcapsules 50 provided on the non-skin side of the nonwoven fabric sheet 60 according  
15 to the variation.

[0113]

The following are examples of other aspects of the absorbent article.

[0114]

A configuration is possible in which the absorbent article includes a coated portion that is coated with a plurality of the insect repellent microcapsules, and when the absorbent article is taken out of the packaging material, the insect repellent microcapsules include damaged capsules, which are insect  
20 repellent microcapsules that are damaged, and undamaged capsules, which are insect repellent microcapsules that are not damaged.

[0115]

The coated portion is provided at any location on a diaper 101. In this aspect, a coated portion R (hatched portion in FIG. 8) is provided on the non-skin-side surface of the fastening tape  
30 portion 140 on one side in the product width direction W. The coated portion R is applied flatly over substantially the entirety of a band-like sheet 141. It should be noted that FIG. 8 is a diagram showing the one-side fastening tape portion 140

according to this aspect, when viewed from the non-skin side.

[0116]

The coated portion R of the diaper 101, which has been taken out of the packaging material, includes the damaged capsules DC in which insect repellent microcapsules MC are damaged and undamaged capsules NC in which insect repellent microcapsules MC are not damaged. In other words, in the state of being contained in the packaging material, the diaper 101 has the damaged capsules DC and the undamaged capsules NC.

[0117]

The damaged capsules DC are insect repellent microcapsules MC whose membrane is at least partially damaged. The term "damaged" refers to the state where the membrane has at least a scratch, an indentation, a deformation, or a crack. The damaged capsules DC are in a state where the contained insect-repellent fragrance composition has leaked from the ruptured portion to the outside of the insect repellent microcapsules MC, or the insect-repellent fragrance composition is exposed.

[0118]

FIG. 9 is an electron micrograph of a region that includes both damaged capsules DC and undamaged capsules NC in the coated portion. In the photograph shown in FIG. 9, microcapsules MC are provided around nonwoven fabric fibers 145. The undamaged capsules NC are spherical, and include the insect-repellent fragrance composition. On the other hand, the damaged capsules DC have various shapes, and have collapsed or are in a state where the inside is visible.

[0119]

The insect-repellent fragrance composition of the this aspect is a highly volatile fragrance, and therefore due to the diaper 101 including the damaged capsules DC, the insect-repellent fragrance composition easily fills the air-tight packaging material. When the packaging material is opened, firstly, the wearer or the user can recognize the scent of the insect-repellent fragrance

composition that was contained in the damaged capsules DC. Accordingly, the wearer or the user can recognize that the diaper 101 includes the insect-repellent fragrance composition before putting on the diaper 101.

5 [0120]

Also, due to the diaper 101 including the damaged capsules DC when taken out of the packaging material, the wearer or the user can recognize the scent of the insect-repellent fragrance composition discharged from the damaged capsules DC when taking  
10 the diaper 101 out of the packaging material or performing an operation such as unfolding the diaper 101, for example. Accordingly, the wearer or the user can recognize that the diaper 101 includes the insect-repellent fragrance composition before putting on the diaper 101.

15 [0121]

Further, due to the diaper 101 including not only the damaged capsules DC but also the undamaged capsules NC, the undamaged capsules NC can also become damaged when subjected to some sort of impact or contact in the put-on state. When the undamaged  
20 capsules NC are subjected to physical stimulus, they become the damaged capsules DC, and new insect-repellent fragrance composition can leak to the outside or become expose. Accordingly, the existence of the insect-repellent fragrance composition can be recognized not only before the diaper is put  
25 on, but also while the diaper is in the put-on state. Also, the insect control effect is likely to be exhibited by the insect-repellent fragrance composition not only before the diaper 101 is put on, but also while the diaper 101 is put on.

[0122]

30 Also, normally, the fastening tape portions are portions that are grabbed by a hand of the wearer or the user when the diaper is put on. For this reason, due to providing the coated portion R in the fastening tape portions 140, the fastening tape portions 140 are physically stimulated (e.g., rubbed) when pinched by the

wearer or the user, and therefore the undamaged capsules NC among the insect repellent microcapsules MC of the coated portion R can more reliably become the damaged capsules DC, thus making it more likely for the effect of the insect-repellent fragrance composition to exhibited when the diaper is put on.

[0123]

The coated portion R has a processing mark portion, where the number of the damaged capsules DC per unit area is greater than the number of the undamaged capsules NC per unit area. The processing mark portion is a marked portion that has been subjected to pressure or impact in compression processing, folding processing, cutting processing, laser processing, or the like after the formation of the coated portion R. The processing mark portion is a portion where undamaged capsules NC have become damaged capsules DC due to pressure or impact during processing. It is preferable that the processing that forms the processing mark portion is performed in the manufacturing process. Due to this processing being performed in the manufacturing process, the damaged capsules DC are included in the processing mark portion of the diaper 101 in the packaged state. Accordingly, the wearer or user can recognize that the diaper 101 includes the insect-repellent fragrance composition before putting on the diaper 101. It should be noted that in FIG. 8, processing mark portions (M1 to M3) are shown by dotted hatching.

[0124]

The number of damaged capsules DC per unit area and the number of undamaged capsules NC per unit area in the diaper 101 can be compared by preparing sample pieces of unit area by cutting out the target regions, and using an electron microscope to visually compare the number of damaged capsules DC and the number of undamaged capsules NC in the sample pieces.

[0125]

When the diaper 101 has been taken out of the packaging material, the fastening tape portions 140 each have been folded at a tape

fold line (fold line portion) TL, and the portion that overlaps with the tape fold line TL is the processing mark portion M1. In the step for folding the fastening tape portion 140, a folding guide is pressed against the tape fold line TL from the skin-side surface, for example. For this reason, the damaged capsules DC are provided in at least in the processing mark portion M1 due to pressure in the folding processing. In this way, due to a fold line such as the tape fold line TL serving as the processing mark portion M1, there is not need to provide a separate step for forming the damaged capsules DC, thus making it possible to more easily obtain the diaper 101 that reliably includes the damaged capsules DC in the packaged state. As a result, the wearer or the user can recognize that the diaper 101 includes the insect-repellent fragrance composition before putting on the diaper 101.

[0126]

Also, in the diaper 101, damaged capsules DC are provided in a leading end portion M2 of the fastening tape portion 140. The leading end portion M2 of the fastening tape portion 140 is a portion that is adjacent to a cut made when forming the shape of the band-like sheet 141. For this reason, the leading end portion M2 is also the processing mark portion M2. In the processing mark portion M2, damaged capsules DC are easily formed due to impact in the cutting step. As a result, the packaged diaper 101 includes the damaged capsules DC, and the wearer or the user can recognize that the diaper 101 includes the insect-repellent fragrance composition before putting on the diaper 101.

[0127]

Furthermore, in the packaged state, the diaper 101 includes compressed portions F for maintaining the folded state of the fastening tape portion 140, and the compressed portions F are the processing mark portions M3. The compressed portions F are formed after coating of the coated portion R, and therefore the processing mark portions M3 are portions where the damaged

capsules DC are likely to be formed due to the pressure during formation of the compressed portions F. As a result, the packaged diaper 101 includes the damaged capsules DC, and the wearer or the user can recognize that the diaper 101 includes the insect-repellent fragrance composition before putting on the diaper 101. [0128]

It should be noted that, the coated portion R has a non-processing mark portion N in which the number of undamaged capsules NC per unit area is greater than the number of damaged capsules DC per unit area when the diaper 101 is taken out of the packaging material. At this time, in the coated portion R, it is preferable that the area of the non-processing mark portion N is greater than the area of the processing mark portions. Specifically, the processing mark portions of the coated portion R of the diaper 101 include the processing mark portions M1 and M2 and the compressed portions M3 (F), and the non-processing mark portion N is a region of the fastening tape portion 140 excluding the processing mark portions M1 and M2 and the compressed portions M3 (F). As can be seen from FIG. 8, the area of the non-processing mark portion N is greater than the area of the processing mark portions of the coated portion of the diaper 101. In this way, due to setting a larger region for the undamaged capsules NC, the wearer or the user can adjust the number of damaged capsules according to the desired effect of the insect-repellent fragrance composition, thus making it possible to obtain an effect of the insect-repellent fragrance composition that corresponds to the put-on state.

[0129]

It should be noted that, although the processing mark portions M1 and M2 and the compressed portion M3 (F) in the fastening tape portion 140 are described above, the processing mark portions are not limited thereto. In the case where the coated portion is provided on a portion overlapped with a processing mark portion P1 shown in FIG. 8, the damaged capsules DC are formed

in the processing mark portion P1. The processing mark portion P1 is the outer end portion of the diaper 101, and is a portion that is adjacent to the cut portion when the back sheet and the side sheet are cut into a shape shown in FIG. 8, for example.

5 In the processing mark portion P1, the damaged capsules are easily formed due to impact in the cutting step.

#### REFERENCE SIGNS LIST

[0130]

1: Diaper,

10 3: Front portion, 5: Crotch portion, 7: Back portion,

14: Flap portion,

15: leg gather, 16: leg side gather,

17: End joining portion, 18: Main body portion, 18a: main-body joining portion, 19: Elastic string,

15 21: Absorbent body, 22: Top sheet, 23: leak-proof sheet,

24: back sheet, 25: Core wrap, 26: skin-side sheet,

28: Waist gather film,

29: Target tape, 30: Fastening tape portion,

31: Engaging portion, 31a: no-hook-and-loop-fastener portion,

20 31b: Wavy portion, 32: Fixed portion,

33: Band-like sheet, 33a: skin-side surface, 33b: non-skin-side surface, 34: Nonwoven fabric fiber,

35: Hook-and-loop fastener,

50: Insect repellent microcapsule,

25 60: Nonwoven fabric sheet, 60a: non-skin-side surface, 62: Band-like sheet, 64: Cover material,

101: Diaper,

140: Fastening tape portion, 141: Band-like sheet, 145: Nonwoven fabric fiber,

30 F: Compressed portion,

MC: Insect repellent microcapsule,

M1: Processing mark portion, M2: Processing mark portion (leading end portion), M3: Processing mark portion, N: non-processing mark portion,

DC: Damaged capsule, NC: Undamaged capsule,

P1: Processing mark portion, R: Coated portion,

## CLAIMS

[Claim 1]

An absorbent article that is configured to be put on a body,

the absorbent article comprising:

5 a hydrophobic nonwoven fabric sheet; and

an insect repellent microcapsule,

the insect repellent microcapsule being disposed on a non-skin side of the nonwoven fabric sheet,

the insect repellent microcapsule including

10 an insect repellent fragrance and

an containing member that contains the insect repellent fragrance,

the insect repellent microcapsule is embedded inside of the nonwoven fabric sheet in a state of not reaching a skin-side surface of the nonwoven fabric sheet.

15

[Claim 2]

The absorbent article according to claim 1, wherein

the insect repellent microcapsule embedded inside the nonwoven fabric sheet is located in a range from a non-skin-side surface of the nonwoven fabric sheet to an middle position in a thickness direction of the nonwoven fabric sheet,

20

the middle position being a position between the skin-side surface and the non-skin-side surface.

[Claim 3]

25 The absorbent article according to claim 1 or 2, wherein

a volume of the insect repellent microcapsules embedded inside the nonwoven fabric sheet

is larger than

a volume of the insect repellent microcapsules located on and above a non-skin-side surface of the nonwoven fabric sheet.

30

[Claim 4]

The absorbent article according to claim 3, wherein

the insect repellent microcapsules are not located on and above the non-skin-side surface of the nonwoven fabric sheet.

[Claim 5]

The absorbent article according to claim 4, wherein

the nonwoven fabric sheet includes a first nonwoven fabric sheet and a second nonwoven fabric sheet,

5 the first nonwoven fabric sheet being a nonwoven fabric sheet

that constitutes the non-skin-side surface and

that is not provided with the insect repellent microcapsules, and

10 the second nonwoven fabric sheet being a nonwoven fabric sheet

that is located on a skin side with respect to the first nonwoven fabric sheet and

15 that is provided with the insect repellent microcapsules.

[Claim 6]

The absorbent article according to any one of claims 1 to 5, wherein

20 an average particle size of the insect repellent microcapsules is smaller than an average fiber diameter of the nonwoven fabric sheet.

[Claim 7]

The absorbent article according to any one of claims 1 to 6, wherein

25 a volume of the insect repellent microcapsules whose particle size is smaller than an average fiber diameter of the nonwoven fabric sheet

is greater than

30 a volume of the insect repellent microcapsules whose particle size is larger than the average fiber diameter.

[Claim 8]

The absorbent article according to any one of claims 1 to 7, wherein

the insect repellent microcapsule includes

an insect repellent microcapsule that discharges the insect repellent fragrance from the containing member when subjected to a pressure  $P$ , and

an insect repellent microcapsule that does not discharge  
5 the insect repellent fragrance from the containing member even when subjected to a pressure  $2P$  that is twice the pressure  $P$ .

[Claim 9]

The absorbent article according to any one of claims 1 to 8, wherein

10 the absorbent article further comprises a coated portion that is coated with a plurality of the insect repellent microcapsules, when the absorbent article has been taken out of a packaging material, the plurality of insect repellent microcapsules include a damaged capsule and an undamaged capsule,

15 the damaged capsule being an insect repellent microcapsule that is damaged,

the undamaged capsule being an insect repellent microcapsule that is not damaged.

[Claim 10]

20 The absorbent article according to claim 9, wherein

the coated portion has a processing mark portion in which a number of damaged capsules per unit area is greater than a number of undamaged capsules per unit area.

[Claim 11]

25 The absorbent article according to claim 10, wherein

the coated portion includes a non-processing mark portion,

the non-processing mark portion being a portion in which the number of undamaged capsules per unit area is greater than the number of damaged capsules per unit area when the absorbent  
30 article has been taken out of the packaging material, and

the non-processing mark portion has a larger area than the processing mark portion.

[Claim 12]

The absorbent article according to claim 10 or 11, wherein

when the absorbent article has been taken out of the packaging material, at least a portion of the absorbent article has been folded at a fold line portion,

the processing mark portion is the fold line portion, and

5 at least a part of the damaged capsules is provided in the fold line portion.

[Claim 13]

The absorbent article according to any one of claims 9 to 12, wherein

10 when the absorbent article is in an unfolded state,

at least a part of the damaged capsules is provided in an outer end portion of the absorbent article.

[Claim 14]

The absorbent article according to any one of claims 9 to 13, wherein

15

the absorbent article further comprises a fastening tape portion, and

the coated portion is provided in the fastening tape portion.

[Claim 15]

20 The absorbent article according to claim 14, wherein

at least a part of the damaged capsules is provided in a leading end portion of the fastening tape portion.

[Claim 16]

The absorbent article according to claim 14 or 15, wherein

25 when the absorbent article has been taken out of the packaging material,

the fastening tape portion has been folded at a tape fold line with a skin-side surface of the fastening tape portion being on an inward side,

30 the tape fold line extending along a vertical direction,

the fastening tape portion has a compressed portion for maintaining a folded state, and

at least a part of the damaged capsule is provided in the compressed portion.

35