

[DESCRIPTION]

[Title of Invention]

Disposable diaper

[Technical Field]

[0001]

The present invention relates to a disposable diaper.

[Background Art]

[0002]

Conventionally, there is known a disposable diaper a front waistline region, a back waistline region, and a crotch region, a pair of leg-hole opening units being formed therein, the disposable diaper being provided with an absorber running across the crotch region and extending to the front waistline region and the back waistline region.

[0003]

In such a disposable diaper, a variety of contrivances are made in order to achieve a good comfort of wearing while a leakage of bodily wastes is prevented. For example, there is known a structure in which, in a product longitudinal direction, the absorber is divided into three sections, and outside of the absorber in a product widthwise direction, an elastic member in a stretched state (for example, a leg gather or a solid gather) is disposed along the product longitudinal direction (for example, Patent Literature 1).

[0004]

According to such a disposable diaper, the absorber divided into three sections comes into intimate contact with each other while intervals with the adjacent absorbers narrow, whereby the disposable diaper fits to a wearer and thus a gap between the disposable diaper and the wearer at the time of wearing the disposable diaper is restrained.

[0005]

Incidentally, in a case where the disposable diaper is sealed in a package, the disposable diaper is folded so that a skin contact surface is oriented to the inside (for example, Patent Literature 2).

[Citation List]

[Patent Literature]

[0006]

[Patent Literature 1] Japanese Unexamined Patent Application Publication No. 2004-141270

[Patent Literature 2] Japanese Unexamined Patent Application Publication No. 2005-329106

[Summary of Invention]

[0007]

In the disposable diaper as mentioned above, the entire disposable diaper in the product widthwise direction is shrunk due to a shrink force of an elastic member such as a leg gather or a solid gather, and the disposable diaper comes into intimate contact with a wearer. As a result, a front waistline region and a back waistline region of the disposable diaper are easily pulled down in a crotch direction. In particular, after the disposable diaper has absorbed bodily wastes, displacement of the front waistline region and the back waistline region of the disposable diaper in the crotch direction arises, and an unnecessary gap is easily provided between the wearer's leg hole and the disposable diaper.

[0008]

Also, the disposable diaper is sealed in a package in its folded and compressed state, and a predetermined pressure is applied to the disposable diaper. In addition, the disposable diaper is folded so that the skin contact surface is oriented to the inside. Therefore, in the disposable diaper, a folded wrinkle having a convex

shape is formed to be oriented in a direction which the diaper is spaced from the wearer. Due to such a fold, a gap is formed between the disposable diaper and the wearer, and a gap which is produced between the disposable diaper and the wearer at the time of wearing the disposable diaper further increases. Although it is also considered to increase a shrink force of an elastic member in order to restrain the gap between the disposable diaper and the wearer due to the fold, the displacement of the back waistline region and the front waistline region of the disposable diaper in the crotch direction increases as well.

[0009]

Accordingly, the present invention has been made in order to solve the problem described above, and it is an object of the present invention to provide a disposable diaper which is capable of restraining displacement of a front waistline region and a back waistline region of a disposable diaper in a crotch direction while restraining a gap which is produced between the disposable diaper and a wearer at the time of wearing the disposable diaper even in a case where the disposable diaper in its folded state is sealed in a package.

[0010]

A disposable diaper according to first aspect has: a front waistline region; a back waistline region; a crotch region which is positioned between the front waistline region and the back waistline region; a product longitudinal direction which is oriented from the front waistline region to the back waistline region; and a product widthwise direction which is orthogonal to the product longitudinal direction. The disposable diaper includes: an absorber running across the crotch region and extending at least either one of the front waistline region and the back waistline region; and a crotch stretching unit which is formed at a position which overlaps with the absorber in the crotch region and having elasticity. The crotch stretching unit is formed so as to run across a virtual product centerline passing through a center of the disposable diaper in the product longitudinal direction and extending along the product widthwise direction, in a stretched state of the disposable diaper, and overlaps in the crotch region with two fold lines extending along the product widthwise direction in order to overlap the front waistline region and the back waistline region with each other in a natural state of the disposable diaper. In a case where the disposable diaper is in a stretched state, a virtual crotch centerline passing through a center of the crotch stretching unit in the product longitudinal direction and extending along the product widthwise direction is provided at a front side than the virtual product centerline, and wherein the two fold lines are provided at a rear side than the virtual product centerline, in the product longitudinal direction.

[Brief Description of Drawings]

[0011]

[Fig. 1] Fig. 1 is an exploded plan view of a disposable diaper 10 according to a first embodiment.

[Fig. 2] Fig. 2 is a sectional view of the disposable diaper 10, taken along the line F1-F1 shown in Fig. 1.

[Fig. 3] Fig. 3 is a sectional view of the disposable diaper 10, taken along the line F2-F2 shown in Fig. 1.

[Fig. 4] Fig. 4 is a sectional view of a disposable diaper 10 according to Modification Example 1.

[Fig. 5] Fig. 5 is an exploded plan view of a disposable diaper 10 according to Modification Example 2.

[Description of Embodiments]

[0012]

Hereinafter, a disposable diaper according to an embodiment according to the present invention will be described with reference to the drawings. It is to be noted that, in the following description of the drawings, same or similar constituent elements are designated by same or similar reference numerals.

[0013]

However, it is to be kept in mind that the drawings are schematic, and rates or the like of the respective dimensions are different from actual ones. Therefore, specific dimensions or the like should be determined in

view of the following description. Also, it is a matter of course that portions of which dimensional relationships or rates are different from each other are included in the respective drawings.

[0014]

[Overview of Embodiment]

A disposable diaper according to the embodiment having: a front waistline region; a back waistline region; and a crotch region which is positioned between the front waistline region and the back waistline region, the disposable diaper having: a product longitudinal direction which is oriented from the front waistline region to the back waistline region; and a product widthwise direction which is orthogonal to the product longitudinal direction, the disposable diaper comprising: an absorber running across the crotch region and extending at least either one of the front waistline region and the back waistline region; and a crotch stretching unit which is formed at a position which overlaps with the absorber in the crotch region and having elasticity, wherein the crotch stretching unit is formed so as to run across a virtual product centerline passing through a center of the disposable diaper in the product longitudinal direction and extending along the product widthwise direction, in a stretched state of the disposable diaper, and overlaps in the crotch region with two fold lines extending along the product widthwise direction so that a height of front side end of the front waistline region and a height of rear side end of the back waistline region are made equal to each other, in a natural state of the disposable diaper. In a case where the disposable diaper is in a stretched state, a virtual crotch centerline passing through a center of the crotch stretching unit in the product longitudinal direction and extending along the product widthwise direction is provided at a front side than the virtual product centerline, and wherein the two fold lines are provided at a rear side than the virtual product centerline, in the product longitudinal direction.

[0015]

In an embodiment, a crotch stretching unit is formed at a position which overlaps with an absorber in a crotch region. Also, the crotch stretching region is formed so as to run across a virtual product centerline, and overlaps with two fold lines. Therefore, even in a case where a gap between a disposable diaper and a wearer, which is produced at the time of wearing the disposable diaper, has been restrained due to a shrink force of a leg gather or a solid gather or the like, no lateral wrinkles are formed at the absorber (that is, a site of which rigidity is higher than that of any other site). Also, the crotch stretching unit has elasticity, and is formed at the position which overlaps with the absorber. In this manner, in a state in which a front waistline region and a back waistline region are retained at the wearer's body, the crotch region including the two fold lines is lifted up due to shrinkage of the crotch stretching unit so as to approach the wearer's body together with the absorber. Hence, in the two fold lines, a gap between the disposable diaper 10 and the wearer is restrained.

[0016]

Thus, even in the case where the disposable diaper in its folded state is sealed in the package, it is possible to restrain the displacement of the front waistline region and the back waistline region of the disposable diaper in the crotch direction while restraining the gap that is produced between the disposable diaper and the wearer at the time of wearing the disposable diaper.

[0017]

In an embodiment, a virtual crotch centerline is provided at a front side than the virtual product centerline, and the two fold lines are provided at a rear side than the virtual product centerline. That is, the crotch stretching unit is provided so as to be biased to the front side of the disposable diaper in a product longitudinal direction. Therefore, in a state in which the disposable diaper is worn by the wearer, a height of a front end of the front waistline region and a height of a back end of the back waistline region are easily made to be equal to each other, and the crotch stretching unit is disposed at a position which corresponds to the wearer's crotch region.

[0018]

[First Embodiment]

1. Schematic structure of disposable diaper

Hereinafter, a schematic structure of a disposable diaper will be described. Fig. 1 is an exploded plan view of a disposable diaper 10 according to a first embodiment. Fig. 2 is a sectional view of the disposable diaper 10, taken along the line F1-F1 shown in Fig. 1. Fig. 3 is a sectional view of the disposable diaper 10, taken along the line F2-F2 shown in Fig. 1. The exploded plan view shown in Fig. 1 is a view of a state in which an elastic member 71 such as a leg stretching unit 75 and a leg side gather 80 has been stretched up to a state in which no wrinkles in a topsheet 50 or side flaps 70 constituting the disposable diaper 10 are formed.

[0019]

The disposable diaper 10 has a front waistline region 20, a crotch region 25, and a back waistline region 30. The front waistline region 20 is a portion which comes into contact with a front waistline part (a dorsal portion) of a wearer. Also, the back waistline region 30 is a portion which comes into contact with a back waistline part (a ventral portion) of the wearer. The crotch region 25 is positioned between the front waistline region 20 and the back waistline region 30.

[0020]

In addition, in the disposable diaper 10, a pair of leg-hole opening units 35 are formed. The leg-hole opening units 35 are portions which are respectively provided at side ends of the disposable diaper 10 in a product widthwise direction W and which is respectively disposed along the holes of a wearer in a state in which the disposable diaper 10 is worn by the wearer.

[0021]

In the first embodiment, the direction from the front waistline region 20 towards the back waistline region 30 is called the product longitudinal direction L, and the direction perpendicular to the product longitudinal direction L is called the product widthwise direction W.

[0022]

The disposable diaper 10 includes an absorber 40 running across the crotch region 25 and extending at least one of the front waistline region 20 and the back waistline region 30. The absorber 40 is configured by an absorbent core 40a and a core wrap 40b.

[0023]

The absorbent core 40a is composed of an absorbent polymer (SAP; Super Absorbent Polymer) and a predetermined fiber, like a conventional disposable diaper. The predetermined fiber is a pulp fiber or a thermoplastic fiber, for example. The absorbent core 40a is enveloped by the core wrap 40b shaped like a sheet.

[0024]

The core wrap 40b is a sheet for wrapping the absorbent core 40a. A part of at least the skin surface contact side of the core wrap 40b is configured by various fibrous nonwoven fabrics or a tissue sheet having liquid permeability. For example, an air-through fibrous nonwoven fabric, a spunbond nonwoven fabric, or an SMS (spunbond · meltblown · spunbond) nonwoven fabric having a mass of approximately 10 g/m² to 30 g/m², or a tissue sheet having a mass of approximately 10 g/m² to 30 g/m² can be used as the component configuring the core wrap 40b.

[0025]

At the top side (skin contact surface side) of the absorber 40 is provided the liquid-permeable topsheet 50. Further, at the back side (non-skin contact surface side) of the absorber 40 is provided a liquid-impermeable backsheet 60a.

[0026]

A side flap 70 is provided at each side edge in the product widthwise direction W of the absorber 40. The side flaps 70 are made of one or two or more pieces of nonwoven fabrics overlapping one another. Furthermore, a fastening tape 90 is provided in each of the pair of side flaps 70.

[0027]

The fastening tape 90 extends along the product widthwise direction W in the back waistline region 30, and is securely attached to a non-skin contact surface of the front waistline region 20, whereby the disposable diaper 10 is retained at the wearer's body.

[0028]

Target units 95 are respectively disposed on non-skin contact surfaces in the front waistline region, and are structured so that a pair of fastening tapes 90 are respectively securely attached thereto.

[0029]

In the first embodiment, a waistline retaining unit is composed of the front waistline region 20, the back waistline region 30, and the fastening tape 90. The waistline retaining unit of the back waistline region 30 is a site which extends along the product widthwise direction W from a region in which an engagement member of the fastening tape 90 has been provided. The waistline retaining unit of the front waistline region 20 is a site which extends along the product widthwise direction from regions in which the target units 95 have been provided.

[0030]

Also, the disposable diaper 10 is formed at a position which overlaps with the absorber 40 in the crotch region 25, and is provided with a crotch stretching unit 200 having elasticity. It is to be noted that a structure of the crotch stretching unit 200 will be described later in detail.

[0031]

A surface side of the absorber 40 (the topsheet 50 side) is formed at the periphery of a leg-hole opening unit 35, and is provided with a pair of leg stretching units 75 which is stretchable in the product longitudinal direction L.

[0032]

The leg stretching units 75 are configured to be longer than the crotch stretching unit 200 in the product longitudinal direction L, and are provided at the outer side from the crotch stretching unit 200 in the product widthwise direction W.

[0033]

It is sufficient if the leg stretching unit 75 be configured so as to be able to stretch a leg-hole opening unit 35 in the product longitudinal direction L, it is also sufficient if this stretching unit be disposed along the leg-hole opening unit 35, or alternatively, it is sufficient if a part of the leg stretching unit be disposed in a state in which the part thereof is inclined with respect to the leg-hole opening unit 35.

[0034]

Also, the leg stretching unit 75 is a portion which is substantially stretched in the product longitudinal direction L by stretchable sheet or the like, and is also based on a conceptual idea of eliminating a portion at which the stretchable sheet is disposed in a state in which a stretching force is not attained. It is to be noted that a configuration of the leg stretching unit 75 will be described later in detail.

[0035]

<Leg Side Gathers>

A pair of leg side gathers 80 extending along the product longitudinal direction L are provided at the inner side of the pair of leg stretching units 75 (towards the center of the product widthwise direction W). The leg side

gathers 80 are provided at inside ends in the product widthwise direction W of the side flap 70, and are rising-type stretching gathers disposed to be inner in the product widthwise direction W than the leg stretching unit 75.

The leg side gathers 80 are provided at inside ends in the product widthwise direction W than the leg stretching unit 75. As the leg side gathers 80, a known structure in the prior art can be employed, and specifically, these gathers may be composed of a sheet material other than that for the side flap 70.

[0036]

The side flap 70 is folded back to the side of topsheet 50 at an inside end in the product widthwise direction W, and is laminated in two layers.

An elastic member 71 (See Fig. 2) in a state of being stretched out in the product longitudinal direction L is provided between the two layers of the side flap 70. The leg side gathers 80 are made up of the side flaps 70 and the elastic members 71.

[0037]

The leg side gathers 80 include a joint portion 81 joined to the topsheet 50 or the backsheet 60a, and a free end portion 82 provided with an elastic member 71. Of a free end portion 82, a central portion in the product longitudinal direction L including a crotch region 25 is shrunk in the product longitudinal direction L by an elastic member 71, and makes up a shrinking unit 84. The leg side gathers 80 rise, with a joint portion 81 being a proximal end, at the time of wearing, and come into contact with a wearer's skin with the shrinking unit 84 of the free end portion 82 being an apex part. That is, the joint portion as mentioned above is obtained as a proximal portion of the rise of the leg side stretching unit.

[0038]

It is to be noted that the shrinking unit 84 is a portion which is substantially shrunk in the product longitudinal direction L by the elastic member 71, and is also based on a conceptual idea of eliminating a portion at which the elastic member 71 is disposed in a state in which a shrinking force is not attained. Also, the leg side gathers 80 are indicated by applying the shaded line to a joint portion 81 at which a side flap 70 and a topsheet 50 (or backsheet 60a and the like) are joined with each other (See Fig. 1).

[0039]

A plurality of joint portions 81 are provided, wherein a first joint portion 81A is disposed to be outer in the product longitudinal direction L than the shrinking unit 84, and a second joint portion 81B is disposed to be outer in the product widthwise direction W than the shrinking unit 84. Therefore, the leg side gathers 80 are configured so that the central portion in the product longitudinal direction L including the crotch region 25 rises towards the wearer's side.

[0040]

Among the joint portions 81 of the leg side gathers 80, the first joint portion 81A disposed to be outer in the product longitudinal direction L than the shrinking unit 84 is joined with the topsheet 50.

[0041]

Among the joint portions 81 of the leg side gathers 80, the second joint portion 81B disposed to be outer in the product widthwise direction W than the shrinking unit 84 is disposed between a crotch stretching unit 200 and a leg stretching unit 75 in the product widthwise direction W. The second joint portion 81B is joined with a backsheet 60a (an exterior sheet 60 at part) at a full length in the product longitudinal direction L. It should be noted, the backsheet 60a which is disposed between the absorber 40 and the exterior sheet 60, and functions as a leakage preventing sheet.

[0042]

It is to be noted that, as the joint portions 81 of the leg side gathers 80, a variety of configurations can be employed. Such joint portions 81 may be portions extending from the crotch region 25 to the front waistline region 20 and the back waistline region 30 in the product longitudinal direction L, the portions being joined with the topsheet 50, for example, or alternatively, such joint portions may be portions joined with the backsheet 60a or the exterior sheet 60 so as to be outer in the product widthwise direction W than an absorbent core 40a, and is configured so as to be a proximal end of a rise.

[0043]

Also, it is sufficient if the leg side gathers 80 be rising-type gathers disposed to be inner in the product widthwise direction W than the leg stretching unit 75, and it is a matter of course that a structure of the leg side gathers known in the prior art can be employed without being limitative to the structure as mentioned above.

[0044]

< Waistline stretching unit >

A waistline stretching unit 85 which is stretchable in the product widthwise direction W is provided between a pair of fastening tapes in the product widthwise direction W. The waistline stretching unit 85 shrinks between the fastening tapes in the product widthwise direction W.

[0045]

In the first embodiment, the waistline stretching unit 85 is composed of an stretchable sheet. Although a member constituting the waistline stretching unit 85 is not limited in particular, it is preferable to employ the one which is as thin as possible, which is low in bending rigidity, and which is small in widthwise inclusion rate. The waistline stretching unit 85 is composed of a material having a low bending rigidity, whereby the waistline stretching unit 85 easily bends along the body, and the waistline stretching unit 85 can be fitted along the body without applying a load on the wearer's body. Also, the waistline stretching unit 85 is composed of a material having a small widthwise inclusion rate to thereby able to restrain a shrink of the disposable diaper 10 in the product longitudinal direction L in a case where the disposable diaper has stretched in the product widthwise direction W and to restrain pulling down of the disposable diaper 10 to the crotch side in the wearer's waistline.

[0046]

In the first embodiment, as the waistline stretching unit 85, an elastic film of which a total weight is 20 g/m² to 45 g/m² was employed.

[0047]

After the waistline stretching unit 85 has been stretched to 1.5 times to 2.5 times of a length in a non-stretched state (a natural state), the stretched unit is adhesively bonded with the exterior sheet 60 by a hot melt adhesive agent or heating treatment or the like.

[0048]

In the first embodiment, the waistline stretching unit 85 is disposed between the exterior sheet 60 and the backsheet 60a. However, in a structure in which the core wrap 40b extends to the outside than the absorbent core 40a in the product longitudinal direction L, the waistline stretching unit 85 may be disposed between the core wrap 40b and the backsheet 60a (or the exterior sheet 60). A position of the waistline stretching unit 85 is not limited in particular. Also, in a region in which the absorber 40 is not disposed, the leg-hole stretching unit may be disposed between a side flap 70 and the backsheet 60a (or the exterior sheet 60).

[0049]

It is to be noted that, although the waistline stretching unit according to the first embodiment is structured so as to stretch in the product widthwise direction W, the waistline stretching unit 85 may be structured so as to stretch in the product widthwise direction W and the product longitudinal direction L.

[0050]

<Cutout of absorber>

Of the absorber 40, a total weight of a site which is provided in the back waistline region 30 is lower than a total weight of a site which is provided in a region other than the back waistline region 30. Alternatively, the absorber 40 has a cutout 110 for forming a low rigidity region in which the absorbent core 40a does not exist. The cutout 110 is formed at a center at a rear side end of the absorber 40 in the product widthwise direction W. A width of the cutout 110 in the product widthwise direction W has a wedge shape which is gradually smaller in size as it goes to the front side. Also, a boundary with respect to the cutout 110 of the absorbent core 40a is formed in the shape of an arc which is convex toward the center of the product widthwise direction W. The absorber 40 that is more outside than the cutout 110 in the product widthwise direction W is formed in a trapezoidal shape which is protrusive toward an end at the back waistline region's side.

[0051]

A part of the cutout 110 is disposed so as to overlap with the waistline stretching unit 85 in a planar view of the disposable diaper. It is to be noted that, although, in the first embodiment, the waistline stretching unit 85 is disposed so as to overlap with the part of the cutout 110, all of the waistline stretching unit 85 and the cutout 110 may be disposed so as to overlap with each other.

[0052]

Such a cutout 110 is formed, whereby the shrink of the waistline stretching unit 85 is not blocked, and even if the waistline stretching unit 85 shrinks, the cutout 110 narrows, and in the product widthwise direction W, a gap between the absorbers that is more outside than the cutout 110 narrows in the product widthwise direction W and thus the absorber 40 hardly rises up in an unintended shape. Incidentally, it is preferable that the cutout 110 be narrower than the waistline stretching unit 85 in consideration of prevention of a leakage of bodily wastes.

[0053]

Also, if the absorber 40 is shrunk in the product widthwise direction W by the waistline stretching unit 85 and then the gap between the absorbers that are more outside than the cutout 110 in the product widthwise direction W narrows, a site close to an end at the back waistline region 30 side of the cutout 110 is made close to the center in the product widthwise direction W than a site close to the crotch region 25 and thus there arises a difference in shrink quantity in the product widthwise direction between the site at the back waistline region 30 side and the site close to the crotch region 25, and the back waistline region 30 rises up.

[0054]

That is, the disposable diaper has the waistline stretching unit 85 that is stretchable in the product widthwise direction W and the cutout 110 shaped like a wedge and thus a cut shape in which the disposable diaper 10 swells is easily formed at a non-skin contact side at the time of wearing the disposable diaper 10.

[0055]

Also, in the first embodiment, the absorbent core 40a does not exist in the cutout 110 and the waistline stretching unit 85 exists so as to overlap with the cutout 110 and thus the site close to the end at the back waistline region 30 side in the product longitudinal direction L is made closer to the center in the product widthwise direction W than the position of the end of the absorbent core 40a, and a rise of the back waistline region 30 is more significant and then the cut shape can be formed more stably.

[0056]

In the first embodiment, since the waistline stretching unit 85 exists beyond a side edge in the product widthwise direction W of the absorbent core 40a, the absorbent core 40a at a position close to the end at the back waistline region 30 side in the product longitudinal direction L can be actively taken along the wearer's body while the disposable diaper 10 is formed in a cut shape. Further, at least a part of the waistline stretching unit 85 and the cutout 110 exists in a region which extends along the product widthwise direction W from a pair of fastening tapes 90. Therefore, even when the disposable diaper 10 is worn in a state in which a wearer is caused to lay down while the disposable diaper 10 is laid down, the waistline stretching unit 85 that exists beyond the side edge in the product widthwise direction W of the absorbent core 40a is not laid down under the wearer's body. Accordingly, the side edge of the waistline stretching unit 85 is stretched by pulling the fastening tapes 90, and it is easy to more reliably take the position close to the waistline side of the cup shape along the body.

[0057]

In the first embodiment, the absorbent core 40a that is more outside than the cutout 110 in the product widthwise direction W is in a convex shape as it goes to the back waistline region's side. Thus, as described above, the cut shape in which the disposable diaper 10 swells is easily formed at the non-skin surface's side, and in addition, a surface area of the absorbent core 40a is maintained; and therefore, it is possible to prevent a leakage of bodily wastes from the end of the absorbent core 40a.

[0058]

In the first embodiment, the cutout 110 is shaped like a wedge, and the boundary between the absorbent core 40a and the cutout 110 is shaped like an arc which is convex as it goes to the crotch region 25. It is to be noted that a radius of the arc is 50 mm to 200 mm. Thus, a width of the cutout 110 in the product widthwise direction W is larger in a nonlinear manner as it goes to the rear side in the product longitudinal direction L, and a rise of the back waistline region 30 is more significant and thus the cut shape is easily formed more stably. Further, the boundary between the absorbent core 40a and the cutout 110 is shaped like an arc which is convex as it goes to the crotch region 25 and thus the back waistline region 30 is formed in a rounded cup shape due to the shrink of the cutout 110, and is formed in the shape that is easily taken along a rounded buttocks part of the wearer.

[0059]

Also, the cutout 110 is formed, whereby a rear side end of the absorber 40 has a convex shape at the rear side outside of the cutout 110 in the product widthwise direction W. Such a shape of the absorber 40 assumes that the wearer's hip is placed and thus there is attained an advantageous effect that a user easily adjusts the diaper to a correct position for the wearer.

[0060]

<Bending Rigidity of Absorber>

The bending rigidity in the first embodiment is based on the rigidity value conforming to the Taber method (JISP8125), and is measured by the following method. First, in a state in which the disposable diaper is expanded, a sample of a portion targeted to be measured for bending rigidity (for example, absorber) is taken. The sample is defined as dimensions of 70 mm (a length in the product widthwise direction) x 38 mm (a length in the product longitudinal direction) as to the portion targeted to be measured for bending rigidity. In a case where a stretchable elastic member is included in the samples, such an elastic member is removed. It is to be noted that as a testing instrument for measuring rigidity values, a Taber stiffness tester manufactured by Yasuda Seiki Manufacturing Co., Ltd is used. Also, the number of samples is 10, measurement is carried out as to each of the samples, and the average value thereof is defined as a rigidity value.

[0061]

Procedures for measurement are as described in the following items (a) to (e).

- (a) A thickness (A) of a sample taken is measured.
- (b) Next, the sample is pinched to an extent such that it comes into contact with a center of a chuck (a lower side) of the testing instrument.
- (c) A total of left and right gaps between a supporting roller and the sample is adjusted to $(A) \times 0.80$ (mm).
- (d) Auxiliary weights are appropriately selected so that an indicated load scale is within the range of 15% to 85% of the maximum scale.
- (e) The sample is rotated in both of the leftward and rightward directions, the rotation is stopped at a point at which a 15-degree supporting marked line and a center mark of a pendulum are coincident with each other, and the scale of the testing instrument is read. The numeric value at the left side of the scale is defined as (B), and the numeric value at the right side of the scale is defined as (C).

[0062]

The rigidity value is obtained by the following formula.

Formula: Rigidity value (mN X m) = $((B) + (C))/2$ (Auxiliary weight coefficient) X $9.8 \times 1 \times 10^{-2}$

It is to be noted that in a case where the width of a piece to be tested cannot be taken as 38 mm, conversion to a bending moment of 38 mm in width is carried out.

[0063]

The higher the thus measured rigidity value is, the higher the bending rigidity is, and the lower the rigidity value is, the lower the bending rigidity is.

[0064]

<Configuration of Fastening tape and Target unit>

The fastening tape 90 is installed in the region of the side flaps 70 corresponding to the back waistline region 30. The fastening tape 90 is provided with: a base sheet 91 coupled with the side flap 70; and a hook sheet 92 in which engagement hooks (not shown) as a plurality of engagement members are provided, and which is fixed to the base sheet 91. The hook sheet 92 is a portion in which the engagement members are provided, and the waistline retaining unit as mentioned above is a portion extending in the product widthwise direction W from the hook sheet 92.

[0065]

The hook sheet 92 is fixed to specifically, joined with, the base sheet 91. The hook sheet 92 and the base sheet 91 are desired to be joined such that the rigidity of the fastening tape 90 does not become more than necessary. Specifically, the hook sheet 92 and the base sheet 91 are desired to be joined by a hot-melt adhesive applied intermittently in dot shape, line shape, or spiral shape. The hook sheet 92 and the base sheet 91 may also be joined with a heat seal.

[0066]

The base sheet 91 is configured by one layer of nonwoven fabric or two or more plurality of layers of nonwoven fabric layered on each other. A nonwoven fabric manufactured by a manufacturing method such as spun bond (SB) or spun bond-melt blown-spun bond (SMS) can be used as the base sheet 91. The basis weight of the nonwoven fabric (or a total weight in the case of a plurality of layers) configuring the base sheet 91 is between 30 and 120 g/m², and desired to be between 40 and 90 g/m².

[0067]

The target unit 95 is provided on a non-skin contact surface of the exterior sheet 60 of the front waistline region 20. The target unit 95 is configured so as to be hooked by an engagement hook of a fastening tape, and functions as a loop of an engagingly locking system of hook and loop. As the target unit, for example, air-through nonwoven fabric can be employed.

[0068]

As the target unit 95, for example, there can be employed a textile nonwoven fabric or a polyolefin-based thermoplastic synthetic resin film made of polyolefin-based thermoplastic synthetic resin fibers. Also, a loop mounted to the target unit can be formed of a polyolefin-based thermoplastic synthetic resin.

[0069]

Further, as the target unit 95, there may be employed a bulky nonwoven fabric, a part of which is embossed to thereby prevent scuffing of a surface of the nonwoven fabric.

[0070]

Also, the exterior sheet 60 of the disposable diaper is formed of nonwoven fabric, and a pattern indicating a mounting position of the fastening tape 90 is printed on a non-skin contact surface of the backsheet 60a or the exterior sheet 60. Alternatively, a sheet of such a pattern is disposed at a non-skin contact surface side S2 of the backsheet 60a or the exterior sheet 60, whereby the target unit can be obtained as well.

[0071]

2. Leg Stretching Unit

Hereinafter, the leg stretching unit 75 will be explained.

[0072]

The leg stretching unit 75 is disposed along the leg-hole opening unit 35 provided to be outer in the product widthwise direction W than the absorber 40, and is configured to be stretchable in the product longitudinal direction L. The leg stretching unit 75 has a widthwise direction inner end portion 75I in which a position in the product widthwise direction W in the crotch region 25 is positioned at the innermost side.

The leg-hole opening unit 35 and the leg stretching unit 75, in particular, extends toward the outside in the product widthwise direction W, as it faces from the crotch region 25 to the outside in the product longitudinal direction L. It is to be noted that the widthwise direction inner end portion 75I of the leg stretching unit 75 may be continuously disposed in the product longitudinal direction L, or alternatively, does not need be continuous in the product longitudinal direction L. In the first embodiment, although a region in which the position in the product widthwise direction W of the leg-hole opening unit 35 is positioned at the innermost side in the crotch region 25 is coincident with the widthwise direction inner end portion 75I of the leg stretching unit 75, these regions do not always need to be coincident with each other.

[0073]

The leg stretching unit 75 in the first embodiment is configured with a stretchable sheet. For example, a stretch film formed by melting a thermoplastic elastomer resin, such as urethane and styrene, and then, converting into the shape of a film, a stretchable nonwoven fabric formed from such stretchable fibers, or a composite sheet formed by pasting together non-stretchable sheets that have been partially cut into a stretchable film and stretchable nonwoven fabric or have been made fragile can be used as the stretchable sheet.

[0074]

Furthermore, rather than the stretchable sheet, the leg stretching unit 75 may also be configured through an alternate, parallel arrangement of thread-like or stripe-like stretchable elastic members made from polyurethane elastic fibers and natural rubber.

[0075]

The leg stretching unit 75 is disposed between the side flap 70 and the exterior sheet 60. Alternatively, in a portion in which the backsheet 60a disposed between the absorber 40 and the exterior sheet 60 is provided, the leg stretching unit 75 is disposed between the backsheet 60a and the side flap 70.

[0076]

The stretchable sheet that constitute the leg stretching unit 75, is preferably width 5 mm (the width in the product widthwise direction W in the natural state of the disposable diaper 10) to 45 mm, preferably 12.5 mm to 35 mm, in at least the crotch region 25. If the width of such an stretchable sheet is less than 5 mm, the sheet member is taken along the wearer's crotch unit at a substantially facial side, whereby a partially tightening force does not concentrate, and an advantageous effect of lowering a burden on the wearer's skin by an elastic element is not attained; or if the width of the stretchable sheet exceeds 45 mm, a region along the leg hole becomes too wide in comparison with a length in the product widthwise direction W of the entire disposable diaper, the stretchable sheet rolls up to the wearer's body side or easily turns up.

[0077]

The stretch rate of the leg stretching units 75 is preferably 1.5 to 2.2 times. For example, in the first embodiment, the stretch rate of the leg stretching units 75 may be set to 1.8 to 2.0 times. It is to be noted that a ratio of expansion and contraction means degree of expansion and contraction of the leg stretching unit 75 and is determined as follows.

[0078]

Ratio of expansion and contraction = (length in the expansion and contraction direction of the leg stretching unit in the stretched state) / (length in the expansion and contraction direction of the leg stretching unit in a natural state)

It is to be noted that the stretch rate as used herein is to be measured as described below, for example.

[0079]

Firstly, in a case where the disposable diaper 10 is inserted into a package, for example, the disposable diaper 10 is then taken out of the package. Next, a disposition region of the leg stretching unit is cut out. At this time, an area including the exterior sheet joined with the leg stretching unit is also cut out. An extension rate of a sample of the leg stretching unit after cutout is measured, and the extension rate of the leg stretching unit is measured.

[0080]

Each of the samples is left as is for 60 minutes in an atmospheric environment of 20 degrees Centigrade $\pm$ 2 degree Centigrade and a relative humidity of 60% $\pm$ 5%RH, and a length of the leg stretching unit is measured along a stretching direction. This length is defined as "a length of the leg stretching unit in a natural state".

[0081]

Secondly, the length in the stretching direction of the desired region of the open-type disposable diaper in this state (that is, in the natural state), and the length in the stretching direction of the desired region, when the open-type disposable diaper is stretched from its natural state until wrinkles caused by the elastic members cannot be visually checked on the non-stretchable sheet, are measured. This length is defined as "a length of the leg stretching unit in the stretched state".

[0082]

By employing these results of measurement and then carrying out computation by the formula as mentioned above, the stretch rate is measured.

[0083]

Furthermore, the interval between the inner ends of the pair of the left-right leg stretching units 75 in the product widthwise direction W widens from the crotch region 25 towards the front waistline region 20, and also widens from the crotch region 25 towards the back waistline region 30. In a case where the disposable diaper 10 is worn on the wearer's body, the leg stretching unit is disposed in a shape in which the diaper shrinks at the crotch and stretches toward the front and back waistlines, whereby the leg stretching unit can be taken along the wear's bodyline more significantly, and is disposed in a state in which the leg stretching unit is

preferably stretched along the wearer's leg line.

[0084]

Further, the interval (D1 in the figure) at the ends of the front waistline region 20 of the pair of left-right leg stretching unit 75 is narrower than the interval (D2 in the figure) at the ends of the back waistline region 30 of the pair of left-right leg stretching unit 75. The interval is obtained by measuring the distance between the inner ends of the pair of the left-right leg stretching units 75 in the product widthwise direction W, after the open-type disposable diaper 10 has been stretched in the product longitudinal direction L and the product widthwise direction W from the natural state until the state where wrinkles cannot be visually recognized, and retained in that state.

[0085]

The extension of the skin surface of the body of the wearer is particularly large in the hip, and is remarkable at a position towards the outer side of a product widthwise direction W. Furthermore, the leg stretching unit 75 is in contact with the body of the wearer. Because $D2 > D1$, even when the movement of the wearer is added to the disposable diaper 10, the leg stretching unit 75 in the hip can extend while being in contact with the body, and even when the amount of change of the stretching is large, the leg stretching unit 75 do not become stiff. Therefore, the shifting of the disposable diaper 10 can be controlled by the leg stretching unit 75.

[0086]

Furthermore, an interval between the both legs of a wearer is shaped so as to become the narrowest in the crotch region and stretch as approaching from the crotch region to the ventral side and the dorsal side. The leg hole opening unit and the leg stretching unit 75 are shaped so as to extend from the crotch region to the outer side in the product longitudinal direction L and the product widthwise direction W, which allows the leg hole opening and the leg stretching unit 75 to be arranged along the leg hole of a wearer, thereby preventing local concentration of stress, achieving close contact with the wearer at a relatively low stretch rate, and making it possible to reduce burden on the skin.

[0087]

The leg stretching unit 75 is configured so as to curve and shrink the disposable diaper 10 along the wearer's leg hole. An end in the product longitudinal direction L of the leg stretching unit 75 is disposed so as to stretch in the product widthwise direction W, and is also disposed in the vicinity of a waistline retaining unit. Therefore, the end in the product longitudinal direction of the leg stretching unit 75 acts to shrink in the product widthwise direction W together with the waistline retaining unit.

[0088]

3. Shape of Crotch Stretching unit

Hereinafter, a shape of the crotch stretching unit 200 will be explained. The crotch stretching unit 200 is configured to maintain a flat shape in a part of the crotch region 25 of wearer at the time of putting the disposable diaper 10 on a wearer, as compared to the other part of the absorber 40. The crotch stretching unit 200 is stretchable configured at least in the product longitudinal direction L or in the product widthwise direction W.

[0089]

In the first embodiment, in the product longitudinal direction L, a length of the crotch stretching unit 200 is the same as a length of the crotch region 25. Therefore, in the product longitudinal direction L, a length of the front waistline region 20 is from a front side end of the crotch stretching unit 200 to a front side end of the front waistline region 20. Similarly, in the product longitudinal direction L, a length of the back waistline region 30 is from a rear side end of the crotch stretching unit 200 to a rear side end of the back waistline region 30.

[0090]

In the first embodiment, the crotch stretching unit 200 is formed so as to run across a virtual product centerline VL_T . The virtual product centerline VL_T is a virtual line which passes through a center C_T of the disposable diaper 10 in the product longitudinal direction L and which extends along the product widthwise direction W.

[0091]

The disposable diaper 10 has two fold lines FL which extend along the product widthwise direction W. For example, the disposable diaper 10 is sealed in a package in a state in which the diaper is folded into two sections while the two fold lines FL are employed as base points. The two fold lines FL are respectively formed at positions which overlap with the crotch stretching unit 200 in the crotch region 25.

[0092]

Incidentally, it is to be kept in mind that the virtual product centerline VL_T is a virtual line which passes through the center C_T of the disposable diaper 10 in the product longitudinal direction L in a case where the disposable diaper 10 (an elastic member 71) is in a stretched state. It is preferable that the two fold lines FL pass through the center of the disposable diaper 10 in the product longitudinal direction L in the case where the disposable diaper 10 (the elastic member 71) is in a shrunk state. Therefore, in the stretched state of the disposable diaper 10, it is preferable that the two fold lines FL be provided at a rear side than the virtual product centerline VL_T in the product longitudinal direction L. In this manner, in a state in which the disposable diaper 10 is folded into two sections, a height of the rear side end of the back waistline region 30 and a height of the front end of the front waistline region 20 are easily made equal to each other.

[0093]

In detail, in the case where the disposable diaper 10 is in the stretched state, in the product longitudinal direction L, let us consider a case in which: a length from the virtual product centerline VL_T to the rear side end of the back waistline region 30 and a length from the virtual product centerline VL_T to the front end of the front waistline region 20 are represented by " L_H "; a length from the virtual product centerline VL_T to the front side end of the crotch stretching unit 200 is represented by " A_f "; a length from the virtual product centerline VL_T to the rear side end of the crotch stretching unit 200 is represented by " A_b "; and a length from the virtual product centerline VL_T to a respective one of the two fold lines is represented by " X ". Also, let us consider a case in which a stretching rate of the crotch stretching unit 200 is represented by " t " and a range defined by a product thickness of a site which overlaps with the two fold lines FL is represented by P.

[0094]

In such cases, it is preferable that the two fold lines FL be formed in a range of $\pm P$ from a position which meets a relationship of $X = \{[L_H - A_f(t - 1) / t] - [L_H - A_b(t - 1) / t]\} \times 1/2 \times t$. The two fold lines FL are formed at the position which meets the relationship as mentioned above, whereby, in a state in which the disposable diaper 10 has been folded into two sections, the height of the rear side end of the back waistline region 30 and the height of the front side end of the front waistline region 20 are made equal to each other.

[0095]

Thus, in the first embodiment, the crotch stretching unit 200 is formed at the position that overlaps with the absorber 40 in the crotch region 25. Also, the crotch stretching unit 200 is formed so as to run across the virtual product centerline VL_T , and overlaps with the two fold lines FL.

[0096]

Therefore, the crotch stretching unit 200 is stretchable in the product longitudinal direction L, and is formed at a position which overlaps with the absorbent core 40a in a planar view. In this manner, in a state in which the front waistline region 20 and the back waistline region 30 are retained at the wearer's body, the crotch

region 25 including the two fold lines FL is lifted up so as to approach the wearer's body together with the absorbent core 40a, due to the shrink of the crotch stretching unit 200. Hence, at the two fold lines FL, a gap between the disposable diaper 10 and the wearer is restrained. Also, generation of the gap is restrained by a shrink force of the crotch stretching unit 200, whereby lateral wrinkles (causes of generation of gap) which randomly arise at the absorbent core 40a of the conventional disposable diaper 10 can be concentrated on the crotch stretching unit 200 due to the shrink force of the elastic member 71 such as the leg stretching unit 75 or the leg side gather 80, and the lateral wrinkles that arise due to the shrink force of the elastic member 71 such as the leg stretching unit 75 or the leg side gather 80 is lifted up so as to approach the wearer's body by the crotch stretching unit 200. In this manner, the gap between the disposable diaper 10 and the wearer is restrained.

[0097]

Thus, even in the case where the disposable diaper 10 in its folded state is sealed in the package, it is possible to restrain displacement of the front waistline region 20 and the back waistline region 30 in the crotch direction while restraining the gap that is generated between the disposable diaper 10 and the wearer at the time of wearing the disposable diaper 10.

[0098]

In the first embodiment, the virtual crotch centerline VL_C is provided at a front side than the virtual product centerline VL_T . The virtual crotch centerline VL_C is a virtual line which passes through a center C_C of the crotch stretching unit 200 in the product longitudinal direction L and which extends along the product widthwise direction W.

[0099]

Thus, in the first embodiment, the virtual crotch centerline VL_C is provided at the front side than the virtual product centerline VL_T , and the two fold lines FL each are provided at a rear side than the virtual product centerline VL_T . That is, the crotch stretching unit 200 is provided so as to be biased to the front side of the disposable diaper 10 in the product longitudinal direction L. Therefore, the crotch stretching unit 200 is lifted up so as to approach the wearer, and the crotch stretching unit 200 is disposed at a position which corresponds to the wearer's crotch region. In such a state, the crotch stretching unit 200 is biased to the front side, whereby the height of the front side end of the front waistline region 20 and the height of the rear end of the back waistline region 30 are easily made equal to each other in a state in which the disposable diaper 10 is worn by the wearer, and it is possible to wear the disposable diaper 10 in a state which is suitable for a feature of the wearer's body in which the wearer's body is not longitudinally symmetrical, and which is longer at the buttocks part positioned at the ventral side than at the dorsal side.

[0100]

Also, in the case where the disposable diaper 10 is sealed in the package as well, the height of the front side end of the front waistline region 20 and the height of the rear side end of the back waistline region 30 are easily made equal to each other. Therefore, folding of the disposable diaper 10 in the package is restrained, and formation of a fold line at a position which does not overlap with the crotch stretching unit 200 is also restrained. Hence, the gap between the disposable diaper 10 and the wearer can be restrained.

[0101]

In the first embodiment, the absorbent core 40a has: an overlap site which overlaps with the crotch stretching unit 200; a front side site which is provided at a front side than the overlap site; and a rear side site which is provided at a rear side than the overlap site. In the product widthwise direction W, a width of the overlap site is smaller than a respective one of a width of the front side site and a width of the rear side site. Thus, at the site that overlaps with the crotch stretching unit 200, a width of the absorbent core 40a is reduced, whereby a

folded wrinkle of the absorbent core 40a, which is generated due to a shrink force of the crotch stretching unit 200, is hardly hooked at the wearer's leg feed, and the gap between the disposable diaper 10 and the wearer can be further reliably reduced.

[0102]

Here, at a position which overlaps with the two fold lines FL, a width of the crotch stretching unit 200 in the product widthwise direction W is 1/2 or more of a width of the absorbent core 40a in the product widthwise direction W.

[0103]

Preferably, at the position that overlaps with the two fold lines FL, the width of the crotch stretching unit 200 in the product widthwise direction W is 80% or more of the width of the absorbent core 40a in the product widthwise direction W. In this manner, at the position that overlaps with the two fold lines FL, the absorbent core 40a is lifted up due to the shrink force of the crotch stretching unit 200, and the gap between the disposable diaper 10 and the wearer can be further reliably reduced. Incidentally, it is preferable that the intervals as mentioned above be uniformly provided outside of the crotch stretching unit 200 in the product widthwise direction W.

[0104]

It is preferable that, at a site at which the crotch stretching unit 200 and the absorbent core 40a overlap with each other, the width of the crotch stretching unit 200 in the product widthwise direction W is smaller than the width of the absorbent core 40a in the product widthwise direction W. In this manner, an end of the absorbent core 40a in the product widthwise direction W hardly shrinks due to the shrink force of the crotch stretching unit 200. Therefore, flexibility of the end of the absorbent core 40a in the product widthwise direction W is comparatively kept, and even if the end of the absorbent core 40a in the product widthwise direction hits the wearer's leg, the wearer hardly feels a sense of discomfort exerted by the shrink at the end of the absorbent core 40a.

[0105]

For example, at the position which overlaps with the two fold lines FL, in a case where the width of the absorbent core 40a is 120 mm, it is preferable that the width of the crotch stretching unit 200 be 60 mm to 110 mm. Further preferably, it is preferable that the width of the crotch stretching unit 200 be 90 mm to 110 mm.

[0106]

Thus, in the first embodiment, at the position that overlaps with the two fold lines FL, the width of the crotch stretching unit 200 in the product widthwise direction W is 1/2 or more of the width of the absorbent core 40a in the product widthwise direction W. Therefore, a predetermined width or more of a site at which the absorbent core 40a has been disposed is shrunk by the crotch stretching unit 200, whereby the absorbent core 40a shrinks, and the absorbent core 40a is lifted up so as to approach the wearer's body. Such lifting up of the absorbent core 40a is achieved at the position that overlaps with the two fold lines FL, whereby the gap between the disposable diaper 10 and the wearer can be reduced. At the position that overlaps with the two fold lines FL, in a case where the width of the crotch stretching unit 200 in the product widthwise direction W is 80% or more of the width of the absorber 40 (the absorbent core 40a) in the product widthwise direction W, the gap between the disposable diaper 10 and the wearer can be further reduced.

[0107]

Further, if the width of the crotch stretching unit 200 is too small in comparison with the width of the absorbent core 40a, the advantageous effect of lifting up the absorbent core 40a, as mentioned above, is hardly attained. On the other hand, if the width of the crotch stretching unit 200 is too large in comparison with the width of the absorbent core 40a, a site at which the absorbent core 40a is not disposed shrinks, and

the rigidity of a site outside of the crotch stretching unit 200 in the product widthwise direction W increases. Therefore, the crotch stretching unit 200 is hardly hooked at the wearer's femoral part. Also, in a case where the crotch stretching unit 200 is provided at the site at which the absorbent core 40a is not disposed, the disposable diaper 10 is worn in a state in which the site at which the absorbent core 40a is not disposed shrinks than the site at which the absorbent core 40a is disposed. In this manner, members constituting the site at which the absorbent core 40a is not disposed overlap with each other, the crotch stretching unit 200 hardens, and wearing comfort of the disposable diaper 10 is degraded.

[0108]

It is preferable that intervals in the product widthwise direction W between the end of the product widthwise direction W of the absorbent core 40a in a layout region of the crotch stretching unit 200 and an inside end of the product widthwise direction W of the leg stretching unit 75 be 30 mm to 60 mm. In this manner, the crotch stretching unit 200 approaches the wearer's body, whereby the leg stretching unit 75 also easily fits to the leg-hole (the body), and even if movement of the wearer arises, the gap between the crotch stretching unit 200 and the wearer is hardly generated.

[0109]

It is preferable that a site at which the width of the absorbent core 40a is the smallest in the product widthwise direction W be provided at the front side by 10 mm to 60 mm with respect to the virtual product centerline VL_T. Preferably, the site at which the width of the absorbent core 40a is the smallest in the product widthwise direction W is provided at the front side by 20 mm to 40 mm with respect to the virtual product centerline VL_T. It is preferable that the crotch stretching unit 200 be formed so as to run across the site at which the width of the absorbent core 40a is the smallest in the product widthwise direction W.

[0110]

Here, the positions at which the left and right femoral parts of the wearer are the most proximal to each other are at the front side than a center in the longitudinal direction of the wearer's body. Therefore, by the shrink force of the crotch stretching unit 200, the site at which the width of the absorbent core 40a is the smallest in the product widthwise direction W can be actively disposed at the position at which the left and right femoral parts of the wearer are the most proximal to each other. In other words, even if an attendant such as the mother does not carry out alignment of the absorbent core 40a, the alignment of the absorbent core 40a is naturally carried out.

[0111]

The absorbent core 40a that is positioned in the front waistline region 20 or the back waistline region 30 positioned to be more outside than the crotch stretching unit 200 in the product longitudinal direction L is not shrunk by the crotch stretching unit 200. Therefore, in a state in which the diaper is retained at the wearer's waist or around the waist, the crotch stretching unit 200 that is maintained in a flat shape in the crotch region 25 of the disposable diaper does not excessively come into intimate contact with the body, and as a result, the crotch stretching unit 200 is appropriately disposed along the body.

[0112]

Also, in a case where the crotch stretching unit 200 is stretchable along the product longitudinal direction L, the front waistline region 20 and the back waistline region 30 easily rise up due to the shrink of the crotch stretching unit 200, and at the time of wearing, a flat crotch region 25 can be formed along the body at the wearer's crotch part.

[0113]

As a result, the front waistline region 20 and the back waistline region 30 rise up from the crotch stretching unit 200 and thus the fitting property of the disposable diaper 10 to the wearer is improved.

[0114]

That is, due to the shrink of the crotch stretching unit 200, the disposable diaper 10 can be stably worn so that the crotch region 25 of the disposable diaper 10 is disposed in the wearer's crotch region 25.

[0115]

It is preferable that the crotch stretching unit 200 be composed of a stretchable sheet. The crotch stretching unit 200 be composed of the stretchable sheet, whereby the absorbent core 40a in which the stretchable sheet has been disposed is uniformly shrunk; the crotch region 25 of the disposable diaper 10 can be lifted up together with the absorbent core 40a so as to approach the wearer's body; and the gap between the disposable diaper 10 and the wearer can be restrained. It is to be noted that the stretchable sheet can be composed of a stretchable sheet which is similar to that for the leg stretching unit 75, for example.

[0116]

Also, in place of the stretchable sheet as mentioned above, a plurality of elastic members shaped like a yarn or a belt, which are made of a polyurethane elastic fiber or a natural rubber, are disposed, whereby the crotch stretching unit 200 may be structured. In this case, in order to uniformly shrink the absorbent core 40a by way of the crotch stretching unit 200, it is preferable that intervals between the elastic members be 7 mm or less, and it is more preferably that the intervals therebetween be 5 mm or less. In addition, in order to uniformly shrink the absorbent core 40a, it is desirable that a difference in intervals between the adjacent elastic members be 2 mm or less.

[0117]

The stretch rate of the crotch stretching unit 200 is specifically, preferably 1.2 to 1.8 times. For example, in the first embodiment, the stretch rate of the crotch stretching unit 200 set to 1.4 times. A ratio of expansion and contraction means degree of expansion and contraction (in first embodiment, product longitudinal direction L) of the crotch stretching unit 200 and is determined as follows.

[0118]

Ratio of expansion and contraction = (length in the expansion and contraction direction of the crotch stretching unit 200 in the maximum stretched state) / (length in the expansion and contraction direction of the crotch stretching unit 200 in a natural state)

It is to be noted that the stretch rate as used herein is to be measured as described below, for example.

[0119]

Firstly, in a case where the disposable diaper 10 is inserted into a package, for example, the disposable diaper 10 is then taken out of the package, and then at this state, left as is for 60 minutes in an atmospheric environment of 20 degrees Centigrade $\pm$ 2 degree Centigrade and a relative humidity of 60% $\pm$ 5%RH, and a length of the crotch stretching unit is measured along a stretching direction. This length is defined as "a length of the crotch stretching unit 200 in a natural state".

[0120]

Secondly, the length in the stretching direction of the desired region of the open-type disposable diaper in this state (that is, in the natural state), and the length in the stretching direction of the desired region, when the open-type disposable diaper is stretched from its natural state until wrinkles caused by the elastic members cannot be visually checked are measured. This length is defined as "a length of the crotch stretching unit 200 in the maximum stretched state".

[0121]

By employing these results of measurement and then carrying out computation by the formula as mentioned above, the stretch rate is measured.

[0122]

By thus setting the stretch rate of the crotch stretching unit 200 to 1.2 to 1.8 times, it is possible to favorably follow the stretching of the skin of the wearer.

[0123]

For example, when the wearer is slouchy such that the front side of the body is cringing, the skin at the side of the hip portion of the wearer stretches by approximately 30% as compared to the state when the body has been stretched out.

[0124]

Namely, if a stretch rate of the crotch stretching unit 200 is less than 1.2 times, a shrinkage of the crotch stretching unit 200 in a natural state is not sufficient in degree; a shrinkage in an absorber disposition region in the crotch part of the disposable diaper 10 is small in degree in comparison with a case in which the crotch stretching unit 200 is not provided; it becomes insufficient to form a flat shape so as to be taken along the body at the wearer's crotch part of the disposable diaper 10.

[0125]

On the other hand, when the stretch rate of the crotch stretching unit 200 is more than 1.8 times, the contraction size in the contraction direction of the crotch stretching unit 200 becomes too large, because of which the region where the crotch stretching unit 200 exists easily comes in close contact with the body of the wearer rather than running along it, and the disposable diaper 10 easily shifts to the lower side of the wearer.

[0126]

Also, the amount of shrinkage in the product longitudinal direction L of the crotch stretching unit 200 may be configured so as to be 2% to 8% of a length in the product longitudinal direction L of the disposable diaper 10.

[0127]

It is to be noted that the amount of shrinkage is a difference between a length "b (mm)" in a stretched state to an extent such that wrinkles become sufficiently small and a surface of a sample is close to be smooth and a length "a (mm)" in a natural state in an orientation along the stretching direction of the sample, and this amount can be computed by $(b - a)$.

[0128]

The Inventor successfully verified that, when the amount of shrinkage in the product longitudinal direction L of the crotch stretching unit 200 is 2% to 8% of the length in the product longitudinal direction L of the disposable diaper 10, in the course of attaching the disposable diaper 10 to the wearer, the crotch stretching unit 200 is easily preferably taken along the wearer's body.

[0129]

Here, if the amount of shrinkage in the product longitudinal direction L of the crotch stretching unit 200 is larger than 8%, the crotch stretching unit 200 shrinks too much; the length in the product longitudinal direction L of the disposable diaper 10 is insufficient; it becomes difficult to wear the disposable diaper 10 on the wearer's body; or alternatively, the disposable diaper 10 and the wearer's body excessively come into intimate contact with each other at the crotch region 25, and are easily displaced from each other.

[0130]

On the other hand, if the amount of shrinkage in the product longitudinal direction L of the crotch stretching unit 200 is less than 2%, it becomes difficult to attain an advantageous effect of the crotch stretching unit 200 itself that the disposable diaper 10 is brought into close contact with the wearer's body.

[0131]

Furthermore, the center of the crotch stretching unit 200 in the product longitudinal direction L is arranged at the side of the front waistline region 20 from the center of the open-type disposable diaper 10 in the product longitudinal direction L. However, the crotch stretching unit 200 is arranged to span the center of the

open-type disposable diaper 10 in the product longitudinal direction L.

[0132]

In such a case, in view of the rigidity of the absorbent core 40a and the rigidity of other members configuring the open-type disposable diaper 10, the thickness of the elastic members and the arrangement pitch can be selected appropriately, however, when the main body of the open-type disposable diaper 10 is in the natural state (non-stretched state), the entire side edge in the product widthwise direction W of the absorbent core 40a is preferable to be in a contracted state.

[0133]

In the first embodiment, a first inflected unit 41 and a second inflected unit 42 are formed in the absorber 40. The first inflected unit 41 and the second inflected unit 42 extend along the product widthwise direction W. The second inflected unit 42 is positioned towards the rear side from the first inflected unit 41. The first inflected unit 41 and the second inflected unit 42 form the curved base points of the disposable diaper 10.

[0134]

The crotch stretching unit 200 is formed so as to more easily maintain the flat shape as compared to the other portions of the absorber 40, at a portion that sandwiched between the first inflected unit 41 and the second inflected unit 42. The first inflected unit 41 and the second inflected unit 42 are formed by the rigidity difference between the area shrunk by the constriction of the crotch stretching unit 200 and the area other than the shrunk area. Therefore, as described later, a flat "bottom unit" is formed in the disposable diaper 10.

[0135]

In the first embodiment, a notch 115 (notch 125) is formed in the vicinity of the first inflected unit 41 (second inflected unit 42). The notch 115 is formed in a region corresponding to the first inflected unit 41. Similarly, the notch 125 is formed in a region corresponding to the second inflected unit 42. The notch 115 and the notch 125 is a region in which the absorbent core 40a configuring the absorber 40 does not exist. In the first embodiment, the notch 115 and the notch 125 correspond to a low rigidity unit in which the basis weight of the absorbent core 40a are lower than that of the other portion of the absorbent core 40a. It should be noted that instead of forming the notch 115 and the notch 125, the region of the notch 115 and the notch 125 may be such that the basis weight of the absorbent core 40a is lower than that of the other portion of the absorbent core 40a.

[0136]

The notch 115 and the notch 125 are formed in order to improve the condition of the first inflected unit 41 and the second inflected unit 42. In the first embodiment, the notch 115 and the notch 125 exist along the edges in the product longitudinal direction L of the crotch stretching unit 200. It should be noted that even though the notch 115 and the notch 125 are formed, the absorbent core 40a positioned in the front waistline region 20 and the back waistline region 30, and the absorbent core 40a positioned in the crotch region 25 are preferred to be in continuation rather than being completely separate.

[0137]

As the notch 115 and the notch 125 run towards the outer side of the product widthwise direction W, the length in the product longitudinal direction L keeps on widening. As a result of such a shape, the outer side of the back waistline region 30 of the absorbent core 40a can constrict easily, and thus, a flat "bottom unit" is formed in the disposable diaper 10. Furthermore, the absorbent core 40a positioned towards the front waistline region 20 from the notch 115, and the absorbent core 40a positioned towards the back waistline region 30 from the notch 125 rise up from the "bottom unit", and can easily curve along the roundness of the body of the wearer (the abdomen and the hip).

[0138]

The edge towards the front waistline region 20 (back waistline region 30) of the notch 115 (notch 125) is arc

shaped. The shape of the edge of the notch 115 (notch 125) is such that the center of the arc is positioned in the back waistline region 30 (front waistline region 20) from the edge. As a result of such a shape, the deformation along the roundness of the body of the wearer arises more easily and remarkably.

[0139]

The crotch stretching unit 200 is provided independently from the front waistline region 20, the back waistline region 30, and the fastening tape 90 that configure the waistline retaining unit.

[0140]

4. Shape of disposable diaper in product longitudinal direction

Hereinafter, a shape of the disposable diaper 10 in the product longitudinal direction L will be described. In the following description, it is to be kept in mind that a length in a natural state, that is, in a shrunk state, will be explained.

[0141]

In the product longitudinal direction L, a length L_R of the back waistline region 30 is larger than a length L_F of the front waistline region 20. Specifically, it is preferable that the length L_R of the back waistline region 30 be 1.1 times or more and 1.6 times or less of the length L_F of the front waistline region 20. Preferably, the length L_R of the back waistline region 30 is 1.2 times or more and 1.5 times or less of the length L_F of the front waistline region 20.

[0142]

Here, if the length L_R of the back waistline region 30 exceeds 1.6 times of the length L_F of the front waistline region 20, a balance between a ventral side and a dorsal side in the disposable diaper 10 is lost, and in a case where the crotch stretching unit 200 is taken along the wearer's crotch region, the front waistline region 20 excessively comes into intimate contact with the wearer or the back waistline region 30 flies out from the wearer. In this manner, the gap between the disposable diaper 10 and the wearer is generated.

[0143]

In detail, as the shape of the wearer's body, in general, the buttocks part is more protrusive than a lower dorsal part. In a case where the crotch stretching unit 200 is taken along the wearer's crotch region, a rate between the length L_R of the back waistline region 30 and the length L_F of the front waistline region 20 is set in the range as mentioned above, whereby the shape of the disposable diaper 10 that is suitable for the shape of the wearer's body is achieved.

[0144]

That is, protrusion of the disposable diaper 10, which is exerted by a dimensional shortage, or generation of an unnecessary gap between the disposable diaper 10 and the wearer's body, which is exerted by a dimensional redundancy, is restrained.

[0145]

In particular, in so far as an infant before starting walking or immediately after starting walking is concerned, it is deemed to be preferable to take a posture in which the body is rounded toward the dorsal side. In such a posture, the skin at the buttocks part's side is prone to be stretched, and the ratio between the length L_R of the back waistline region 30 and the length L_F of the front waistline region 20 is set in the range as mentioned above, whereby the shape of the disposable diaper 10 that is suitable for the body of the infant is achieved.

[0146]

For example, in the stretched state, a total length L_T (that is, $2 L_H$) of the disposable diaper 10 in the product longitudinal direction L is 400 mm, it is preferable that the length L_F of the front waistline region 20 be 130 mm, the length L_C of the crotch stretching unit 200 be 80 mm, and the length L_R of the back waistline region 30 be 190 mm.

[0147]

According to such dimensions, the length L_R of the back waistline region 30 is about 1.46 times of the length L_F of the front waistline region 20. In this manner, it is possible to wear the disposable diaper along the wearer's body as a whole of the disposable diaper 10 in the product longitudinal direction L as well as the crotch stretching unit 200.

[0148]

5. Method of manufacturing disposable diaper

Next, an example of a method of manufacturing the absorbent article according to the first embodiment is explained. As far as the method that is not described in the first embodiment is concerned, the existing method can be used. Furthermore, the manufacturing method explained below is only an example, and the absorbent article can also be manufactured by other manufacturing methods. The method of manufacturing the absorbent article includes at least a component-forming step, a component-loading step, a leg-hole-forming step, and a cutting step and a fold-line-forming step.

[0149]

In the component-forming step, components configuring the absorbent article are formed. Specifically, for example, an absorbent material configuring the absorber is deposited to form the absorber 40.

[0150]

In the component-placing step, stretchable sheets constituting the crotch stretching unit 200, stretchable sheets constituting the leg stretching unit 75, other webs such as webs constituting the topsheet, components constituting the disposable diaper 10 such as the leakage preventing sheet or the absorber are placed on webs constituting the backsheet.

[0151]

For example, the stretchable sheets constituting the crotch stretching unit 200 are conveyed in a non-stretched state, and the stretchable sheets are stretched due to a difference in rotation velocity between two rotational rolls. Preferably, the stretchable sheets are stretched to two times or more. Subsequently, the stretchable sheets are stretched to a desired magnification due to a difference in velocity between a belt conveyor to convey the stretchable sheets and an intermittent drum. On the intermittent drum, the stretchable sheets are cut at the individual product lengths. Intervals between the stretchable sheets are provided due to rotation of the intermittent drum and then the stretchable sheets are transferred on a continuous web. In this manner, the crotch stretching unit 200 can be disposed.

[0152]

Also, the stretchable sheets constituting the leg stretching unit 75 is stretched and further, the stretched stretchable sheets are transferred onto the intermittent drum while they are displaced in the product widthwise direction W and then the stretchable sheets are cut at the individual product lengths. Intervals between the stretchable sheets are provided concurrently with rotation of the intermittent drum, and the stretchable sheets are transferred onto the continuous web. In this manner, the leg stretching unit 75 can be disposed in a curved manner.

[0153]

In the leg-hole forming step, the topsheet 50, the exterior sheet 60, and the backsheet 60a are cut along an end of the leg stretching unit 75 in the product widthwise direction W . In this manner, the leg-hole opening unit 35 that is disposed at the wearer's leg hole is formed.

[0154]

In the cutting step, a continuous body in which the topsheet 50, the backsheet 60a, the absorber 40 are arranged is cut into a size of a single product in the widthwise direction W . In this manner, the disposable

diaper 10 is manufactured.

[0155]

In the fold-line forming step, a linear pressure along the product widthwise direction W is applied to the disposable diaper 10 from the skin surface side to the non-skin surface side, whereby two fold lines FL are formed. In detail, it is preferable that the two fold lines FL be formed in the range of $\pm P$ from the position meeting a relationship of $X = \{[L_H - A_f(t-1)/t] - [L_H - A_b(t-1)/t]\} \times 1/2 \times t$.

[0156]

[Modification Example 1]

Hereinafter, Modification Example 1 of the first embodiment will be described. Hereinafter, matters which are different from those of the first embodiment will be mainly described.

[0157]

Specifically, in Modification Example 1, thicknesses of the back waistline region 30 are different depending on sites. Fig. 4 is a view showing a state in which the disposable diaper 10 is folded into two sections with the two fold lines FL being employed as base points. In detail, Fig. 4 shows a cross section of the disposable diaper 10, taken along the line F3-F3 shown in Fig. 1.

[0158]

As shown in Fig. 4, the back waistline region 30 has: an opposite site 30X which opposes to the crotch stretching unit 200; and another site 30Y. Such another site 30Y is a site which is continuous to the opposite site 30X and which has a substantially predetermined thickness.

[0159]

The thickness of the opposite site 30X is smaller than the thickness of such another site 30Y. In this manner, the thickness that is increased by the crotch stretching unit 200 is mitigated by the opposite site 30X and thus even if a plurality of disposable diapers 10 overlap, an increase in thickness exerted by formation of the crotch stretching unit 200 can be mitigated as a whole.

[0160]

Incidentally, it is to be kept in mind that the height of the rear side end of the back waistline region 30 and the height of the front side end of the front waistline region 20 are equal to each other, as shown in Fig. 4.

[0161]

<Measurement of Thickness>

A thickness of a target site (for example, the back waistline region 30) can be measured as follows. Specifically, the thickness of the target site was measured by employing the PEACOCK dial thickness gauge available from Ozaki MFG Co., Ltd, in a state in which a load of 2.5 gf/cm² was applied to the target site in a circular shape of 10 mm in diameter. Also, such measurement of thickness was carried out in a state in which the disposable diaper was stretched up to a state in which a wrinkle exerted by an elastic member from a natural state cannot be visually observed on a non-stretchable sheet.

[0162]

<Measurement of Length>

In so far as measurement of "length" in the specification is concerned, a length was measured so as to be taken along a site targeted to be measured, by employing a spring measurement tape (tape: glass fiber-containing, vinyl chloride-coated) available from Shinwa Rules Co., Ltd. The measurement as mentioned above was carried out as to 10 samples in their states, and an average value thereof was computed as a length.

[0163]

[Modification Example 2]

Hereinafter, Modification Example 2 of the first embodiment will be described. Hereinafter, matters which

are different from those of the first embodiment will be mainly described.

[0164]

Specifically, in the first embodiment, the leg stretching unit 75 is composed of a stretchable sheet. In other words, in the first embodiment, the leg stretching unit 75 is composed of an elastic member shaped like a belt. In contrast to this, in Modification Example 2, the leg stretching unit 75, as shown in Fig. 5, is composed of an elastic member shaped like a yarn.

[0165]

It is to be noted that all the contents of Japanese Patent Application No. 2012-247871 (which was filed on November 9, 2012) are incorporated in the present specification by reference.

[Industrial Applicability]

[0166]

It is possible to provide a disposable diaper which is capable of restraining displacement of a front waistline region and a back waistline region of the disposable diaper in a crotch direction while restraining a gap which is generated between the disposable diaper and a wearer at the time of wearing the disposable diaper even in a case where the disposable diaper, in its folded state, is sealed in a package.

[Explanation of Numerals]

[0167]

L... Product longitudinal direction

W... Product widthwise direction

10... Disposable diaper

20... Front waistline region

25... Crotch region

30... Back waistline region

35... leg-hole opening unit

40... Absorber

40a... Absorbent core

40b... Core wrap

41... First inflected unit

42... Second inflected unit

50... Topsheet

60... Exterior sheet

60a... Backsheet

70... Side flap

71... Elastic member

75... Leg stretching unit

75L... Widthwise direction inner end portion

80... Leg side gather

81... Joint portion

81A... First joint portion

81B... Second joint portion

82... Free end portion

84... Shrinking unit

85... Waistline stretching unit

90... Fastening tape

91... Base sheet
92... Hook sheet
95... Target unit
110... Cutout
115... Notch
125... Notch
200... Crotch stretching unit

[CLAIMS]

[Claim 1]

A disposable diaper comprising:

a front waistline region;

a back waistline region;

a crotch region which is positioned between the front waistline region and the back waistline region;

a product longitudinal direction which is oriented from the front waistline region to the back waistline region;

a product widthwise direction which is orthogonal to the product longitudinal direction, the disposable diaper comprising:

an absorber running across the crotch region and extending at least either one of the front waistline region and the back waistline region; and

a crotch stretching unit which is formed at a position which overlaps with the absorber in the crotch region and having elasticity, wherein

the crotch stretching unit is formed so as to run across a virtual product centerline passing through a center of the disposable diaper in the product longitudinal direction and extending along the product widthwise direction, in a stretched state of the disposable diaper, and overlaps in the crotch region with two fold lines extending along the product widthwise direction in order to align a height of a front end of the front waistline region and a height of a rear side end of the back waistline region with each other in a natural state of the disposable diaper;

in a case where the disposable diaper is in a stretched state, a virtual crotch centerline passing through a center of the crotch stretching unit in the product longitudinal direction and extending along the product widthwise direction is provided at a front side than the virtual product centerline; and

the two fold lines are provided at a rear side than the virtual product centerline, in the product longitudinal direction.

[Claim 2]

The disposable diaper according to claim 1, wherein

the absorber has an absorbent core which is configured by an absorbent polymer and a predetermined fiber;

the absorbent core has: an overlap site which overlaps with the crotch stretching unit; a front side site which is provided at a front side than the overlap site; and a rear side site which is provided at a rear side than the overlap site;

in the product widthwise direction, a width of the overlap site of the absorbent core is smaller than a respective one of a width of the front side site and a width of the rear side site; and

at a position which overlaps with the two fold lines, a width of the crotch stretching unit in the product widthwise direction is 1/2 or more of a width of the absorbent core in the product widthwise direction.

[Claim 3]

The disposable diaper according to claim 1, wherein a shrink quantity of the crotch stretching unit in the product longitudinal direction is 2% or more and 8% or less with respect to a whole length of the disposable diaper in the product longitudinal direction.

[Claim 4]

The disposable diaper according to claim 1, wherein

the back waistline region has: an opposite site which opposes to the crotch stretching unit; and another site in a state in which the disposable diaper is folded into two sections with the two fold lines being employed as base points; and

a thickness of the opposite site is smaller than a thickness of said another site.

[Claim 5]

The disposable diaper according to claim 1, wherein a length of the back waistline region in the product longitudinal direction is 1.1 times or more and 1.6 times or less of a length of the front waistline region in the product longitudinal direction.

[Claim 6]

The disposable diaper according to claim 1, wherein a length of the back waistline region in the product longitudinal direction is 1.2 times or more and 1.5 times or less of a length of the front waistline region in the product longitudinal direction.

[Claim 7]

The disposable diaper according to claim 1, wherein the disposable diaper is sealed in a package in a state in which the disposable diaper is folded into two sections with the two fold lines being employed as base points.

[Claim 8]

The disposable diaper according to claim 1, wherein

in a case where the disposable diaper is in a stretched state, in the product longitudinal direction, a length from the virtual product centerline to the rear side end of the back waistline region are represented by " L_H "; a length from the virtual product centerline to the front side end of the crotch stretching unit is represented by " A_f "; a length from the virtual product centerline to the rear side end of the crotch stretching unit is represented by " A_b "; and a length from the virtual product centerline to a respective one of the two fold lines is represented by " X ";

a stretching rate of the crotch stretching unit is represented by " t ";

a range defined by a product thickness of a site which overlaps with the two fold lines is represented by " P "; and

the two fold lines are formed in a range of $\pm P$ from the position meeting a relationship of $X = \{[L_H - A_f(t - 1) / t] - [L_H - A_b(t - 1) / t]\} \times 1/2 \times t$.