{Description}

{Title of Invention}

DISPOSABLE WEARING ARTICLE

{Technical Field}

{0001}

The present invention relates to disposable wearing articles and more particularly to disposable wearing articles such as a disposable adult diaper of which front and rear waist regions are connected to each other with the use of fastening tapes when the diaper is put on a wearer's body.

{Background}

{0002}

Conventionally, wearing articles of which front and rear waist regions are connected to each other with the use of fastening tapes to put the wearing articles on the wearer's body has been known. For example, {PTL 1} discloses a disposable diaper including tape tabs attached to respective side flaps on the back side and provided with hook tape strips, and a front target tape strip provided on an exterior surface of the front side and adapted to be fastened, in engagement, to the respective hook tape strips to connect the front and rear waist regions to each other.

{Citation List}

{Patent Literature}

{0003}

{PTL 1}

JP 2010-22550 A

{Summary}

{Technical Problem}

{0004}

According to the disclosure of the above-exemplified {PTL 1}, the tape tabs are attached directly to the back side. When the respective hook tape strips are engaged with the target tape strip, the tape tabs must be pulled in a transverse direction, and consequently, there is a possibility that one or both of the tape tabs might tear between the tape tab(s) and the back side. If respective values in mass per unit area of a base sheet and a bracing sheet constituting the tape tab are sufficiently increased to resist such possibility of tearing, stiffness of the sheets will be proportionally increased and a desired flexibility of the tape tab(s) will be impaired as another problem.

{0005}

An object of the present invention is to provide a disposable wearing article including a chassis of the wearing article and side panels joined to the chassis particularly

wherein the side panels can maintain desired flexibility.

{Solution to Problem}

{0006}

The present invention relates to an improvement in a disposable wearing article having a longitudinal direction, a transverse direction and including a chassis having a skin-contact surface, a non-skin-contact surface opposite thereto, front and rear waist regions, a first waist region defining one of the front and rear waist regions, a second waist region defined by another of the front and rear waist regions and a crotch region extending between the first and second waist regions, and a fastening system to fasten the first and second waist regions to each other.

{0007}

The disposable wearing article according to the present invention further includes a pair of side panels extending outward in the transverse direction from the second waist region and being elastically stretchable/contractible at least in the transverse direction and a pair of coupling sheets to couple each of the side panels and the chassis to each other; each of the coupling sheets includes an inner side region overlapping the chassis, an outer side region overlapping each side panel and an intermediate region extending between the inner and outer

side regions wherein the inner side region and the chassis are joined to each other; and the fastening system includes a first fastening element lying on the non-skin-contact surface of the first waist region and a second fastening elements each attached to each side panel and adapted to be releasably fastened to the first fastening system.

{Advantageous Effects of Invention}

{0008}

According to one or more embodiments of the present invention, the chassis and each side panel are coupled to each other through each coupling sheet and consequently a possibility that the side panels might be broken in comparison to when the side panels are directly coupled to the chassis. So it is possible to avoid a situation that a stuffiness of the side panels might be increased as a result of increasing a mass per unit area of the side panels. In this way, it is possible to provide the disposable wearing article including the side panels having an appropriate flexibility.

{Brief Description of Drawings}

{0009}

{Fig. 1}

Fig. 1 is a perspective view illustrating a disposable diaper according to one embodiment (first embodiment) of the disposable

wearing article in a state that front and rear waist regions are coupled to each other.

{Fig. 2}

Fig. 2 is a plan view of the opened diaper as viewed from a skin-contact surface.

{Fig. 3}

Fig. 3 is an exploded perspective view of the diaper.

{Fig. 4}

Fig. 4 is a scale-enlarged sectional view taken along line IV-IV in Fig. 2.

{Fig. 5}

Fig. 5 is a plan view similar to Fig. 2, illustrating a second embodiment.

{Fig. 6}

Fig. 6 is a scale-enlarged sectional view taken along line VI-VI in Fig. 5.

{Fig. 7}

Fig. 7 (a) is a diagram illustrating a side flap according to a third embodiment in its contracted state and Fig. 7 (b) is a diagram illustrating the side flap in a state stretched from the state illustrated in Fig. 7 (a).

{Fig. 8}

Fig. 8 is a scaled-enlarged sectional view taken along line

VIII-VIII in Fig. 7 (a).

{Description of Embodiments}

{0010}

<First Embodiment>

Figs. 1 through 4 illustrate a first embodiment of the present invention. Referring to Figs. 1 through 3, a diaper 1 has a longitudinal direction Y and a transverse direction X, and including a chassis 10 having a front waist region 11, a rear waist region 12, a crotch region 13 extending between the front and rear waist regions 11, 12, front and rear end edges 14, 15 extending in the transverse direction X, both side edges 16 extending in the longitudinal direction, and a pair of side panels 70 coupled to the chassis 10 with a pair of couplings sheets 80, respectively.

{0011}

The diaper 1 has an imaginary longitudinal center line 2-2 bisecting a dimension in the transverse direction X and is symmetrical about this imaginary longitudinal center line 2-2. As for the similar constituents symmetrically allocated about the imaginary longitudinal center line 2-2, reference marks are sometimes omitted partially in the accompanying drawings.

{0012}

The chassis 10 includes a liquid-impermeable interior

sheet 20 located on a skin-contact surface, an exterior sheet 30 located on a non-skin-contact surface located on a side opposite to the skin-contact surface, an absorbent body 40 interposed between the interior and exterior sheets 20, 30 and a hardly liquid-permeable or liquid-impermeable but breathable leakage-barrier sheet 50 interposed between the absorbent body 40 and the exterior sheet 30. The interior sheet 20 is disposed on the skin-contact surface thereof with a pair of containment flaps 60 spaced apart from each other in the transverse direction X and extending in the longitudinal direction Y.

{0013}

As material for the interior sheet 20, for example, a hydrophobic but previously hydrophilized spunbond fibrous nonwoven fabric or pointbond fibrous nonwoven fabric having a mass per unit area in a range of about 15 to about 35 g/m2, preferably in a range of about 18 to about 23 g/m2 may be used. As material for the exterior sheet 30, for example, a hydrophobic spunbond/meltblown/spunbond (hereafter refers to as SMS) fibrous nonwoven fabric or spunbond fibrous nonwoven fabrics having a mass per unit area in a range of about 10 to 30 g may be used. The interior sheet 20 has front and rear end edges 21, 22 substantially aligning with front and rear end edges 31, 32 of the exterior sheet 30 but has a dimension in the transverse

direction X smaller than that of the exterior sheet 30 so that both inner side edges 23 of the interior sheet 20 lie inboard of both side edges 33 of the exterior sheet 30.

{0014}

As preferable material for the containment flaps 60, for example, a hydrophobic or hardly liquid-permeable SMS fibrous nonwoven fabric or spunbond fibrous nonwoven fabric having a mass per unit area in a range of about 10 to 30 g/m2 may be used. Front and rear end edges 61, 62 of the respective containment flaps 60 are substantially aligned with the front and rear end edges 21, 22 of the interior sheet 20 and also with the front and rear end edges 31, 32 of the exterior sheet 30. The front and rear end edges 61, 62 are joined to the front and rear end edges 21, 22, respectively, with the use of well known joining means such as hot melt adhesive (not shown). Proximal edge portions 63 of the respective containment flaps 60 are joined to the side edge portions 33 of the exterior sheet 30 with the use of well known joining means such as not hot melt adhesive not shown). Distal edge portions 64 of the respective containment flaps 60 merely overlap the interior sheet 20 when the distal edge portions 64 are in a state stretched in the longitudinal direction Y as illustrated in Fig. 2. Within sleeves or loops (not shown) formed along the respective distal edge portions

64, elastic elements 65 extending in the longitudinal direction Y are contractibly secured in their stretched state. Upon contraction of the respective elastic elements 65, the distal edge portions 64 are elastically spaced away from the interior sheet 20 toward the thighs of a wearer and kept in close contact with the thighs so that body exudates such as feces may be contained within a space defined by the containment flaps 60.

{0015}

Although the absorbent body 40 will perform its function so long as the absorbent body 40 is arranged so as to extend over at least the crotch region 13, the absorbent body 40 according to this embodiment is arranged to extend from the crotch region 13 into the front and rear waist regions 11, 12 so that body exudates such as urine may be absorbed over a range as wide as possible. The absorbent body 40 includes a liquid-absorbent core material and a liquid-diffusive wrapping sheet such as tissue paper adapted to wrap the core material. The core material may be formed from wood fluff pulp or superabsorbent polymer particles or a mixture thereof. The core material and the wrapping sheet may be joined to each other with the use of well known joining means such as hot melt adhesive (not shown) in the well known manner free from inhibiting the desired absorptive function of the core material for body

exudates such as urine.

{0016}

The leakage-barrier sheet 50 is interposed between the bottom surface of the absorbent body 40 and the exterior sheet 30 and joined thereto with the use of well known joining means such as hot melt adhesive (not shown). As material for the leakage-barrier sheet 50, a hardly-liquid-permeable, preferably liquid-impermeable but breathable plastic film may be used. The leakage-barrier sheet 50 is dimensioned so as to be larger than the absorbent body 40 and capable of preventing body exudates such as urine once absorbed by the absorbent body 40 from leaking out of the diaper 1.

{0017}

The leakage-barrier sheet 50 on which the absorbent body 40 is placed is disposed adjacent to both side edges with leg-elastic elements 51 contractibly secured in their stretched state. Specifically, the leg-elastic elements 51 are secured between the leakage-barrier sheet 50 and the containment flaps 60 with the use of well known joining means such as hot melt adhesive (not shown). The respective leg-elastic elements 51 are contractibly secured in their stretched state in the longitudinal direction Y so as to extend across the crotch region 13 along the both side edges 16 in the longitudinal direction

Y wherein respective first end edges 51a are positioned at portions of the front waist region 11 adjacent to the crotch region 13 and respective second end edges 51b are positioned at portions of the rear waist region 12 adjacent to the crotch region 13. As material for the leg-elastic elements 51, a plurality of thread-, string- or strand-like elastomeric material may be used. The leg-elastic elements 51 makes it possible to form elastic side flaps each having a gasketing function extending in each lateral portion of the absorbent body 40 over a length dimension corresponding to the length dimension of the leg-elastic elements 51 in its stretched state.

{0018}

The side panels 70 are coupled to the side edge portions 16 of the chassis 10, respectively, placed in the rear waist region 12 through the coupling sheets 80. As material for the coupling sheets 80, for example, a hydrophobic spunbond fibrous nonwoven fabric, or an SMS fibrous nonwoven fabric having a mass per unit area in a range of about 40 to about 60 g/m and a desired tensile strength may be used. Referring to Fig. 4, each of the coupling sheets 80 has an outer side region 81 joined to each of side panels 70, an inner side region 82 joined to the chassis 10 and an intermediate region 83 situated between the both side regions 81, 82. The inner side region 82 is secured between the

proximal edge portion of the containment flap 60 and the exterior sheet 30 through the joining regions 86, 87 by well known joining means such as hot melt adhesive. The chassis 10 and each of the side panels 70 leave a space therebetween but coupled to each other the intermediate region 83. There is nothing but the coupling sheet 80 in the intermediate region 83 and, in consequence, stiffness in the intermediate region 83 is lower than that in the other regions, causing a stiffness differential. Such stiffness differential facilitates the coupling sheet 80 to be bent through the intermediate region 83 and makes it possible to keep the side panels 70 in close contact with the wearer's skin during wearing the article. In this regard, it is possible to join the chassis 10 and the side panels 70 to each other in any other manners as long as the above-mentioned effect can be ensured. The outer side region 81 is secured to the associated side panel 70 through a joining region 84 by well known joining means such as hot melt adhesive.

{0019}

Each of the side panels 70 includes a first sheet 71 lying on the skin-contact surface, a second sheet 72 lying on the non-skin-contact surface and a plurality of elastic elements 73 contractibly secured between the sheets. As material for the elastic elements 73, for example, thread-, string- or strand

elastomeric material may be used and the elastic elements 73 are arranged at a stretch ratio in a range of about 2 to about 3 times in the transverse direction at a pitch in a range of about 5 to about 15 mm in the longitudinal direction Y. According to this embodiment, the elastic elements 73 made of such material having a fineness of about 620 dtex are arranged at the pitch of about 10 mm in the longitudinal direction Y at a stretch ratio of about 2.6 times in the transverse direction X. In this regard, as used herein, the term "pitch" means a center-to-center distance between each pair of the adjacent elastic elements in the longitudinal direction Y.

{0020}

The first and second sheets 71, 72 are nearly the same in shape as well as in size and may be formed of, for example, a hydrophobic SMS fibrous nonwoven fabric having a mass per unit area in a range of about 10 to about 30 g/m2. The first and second sheets 71, 72 are joined to each other with the use of well known joining means such as hot melt adhesive. The first and second sheets 71, 72 and the coupling sheet 80 are made from a substantially nonstretchable fibrous nonwoven fabric. As used herein, "substantially nonstretchable" means that the sheets have no elastic contraction/ expansion properties and, at least when the sheets are pulled in the transverse direction X by a

normal force to put the diaper 1 on the wearer's body, there does not occur such a change in the dimension as to affect on the circumferential dimension of the waist-opening assumed for the diaper 1 put on the wearer's body.

{0021}

With the elastic elements 73 secured to the first and second sheets 71, 72, an elastic region 74 adapted to be elastically contractible in the transverse direction X and inner and outer side inelastic regions 75, 76 lying on both outer sides in the transverse direction X of the elastic region 74 so as to be spaced from each other in the transverse direction X are defined in each of the side panels 70. The elastic elements 73 extend from the elastic region 74 to the inner and outer side inelastic regions 75, 76 and ends 73A, 73B thereof respectively lie in the inner and outer side inelastic regions 75, 76. The inner side inelastic region 75 is secured to the outer side region 81 of the coupling sheet 80 and the outer side inelastic region 76 is secured between the first and second tab sheets 91, 92. Hook elements 95 are attached to the first tab sheet 91.

{0022}

The inner and outer side inelastic regions 75, 76 are defined in a manner as follows: The elastic member 73 is secured in their stretched state to the elastic region 74 and the inner

and outer side inelastic regions 75, 76. In the inner side inelastic region 75, the second sheet 72 is secured to the outer side region 81 of the coupling sheet 80 through the joining region 84 by well known joining means such as hot melt adhesive. The joining region 84 coated with the adhesive necessarily has a stiffness higher than when this region 84 is not coated with the adhesive. In the joining region 84, the first and second sheets 71, 72 and the elastic member 73 are joined together in an overlapped state. Also in the inner side inelastic region 75 of the side panel 70, the elastic elements 73 are contractibly secured in their stretched state. However, the second sheet 72 is joined to the coupling sheet 80 through the joining region 84 and, in consequence, a stiffness in this layered region becomes sufficiently high to make the elastic elements 73 substantially non-contractible. In this way, the inner side inelastic region 75 is defined. Similarly, in the outer side inelastic region 76 of the side panel 70, the second sheet 72 is joined to the second tab sheet 92 through a joining region 93. In the joining region 93, end portions 73B of the elastic elements 73 for each side panel 70 overlap the joining region 93. The portions of the elastic elements 76 overlapping the joining region 93 have their contraction restricted so as to become substantially non-contractible and, in this way, the

outer side inelastic region 76 in the joining region 93. The joining region 93 may be formed with the use of well known joining means such as hot melt adhesive.

{0023}

For defining the inner and outer side inelastic regions 75, 76, it is unnecessary to follow the conventional process of cutting the elastic elements 73 to inelastic the inner and outer side end portions of the elastic elements 73 once having been secured under tension. The inner and outer side inelastic regions 75, 76 according to this embodiment are defined in the manner easier than following the above-mentioned conventional process. In addition, the inner and outer side inelastic regions 75, 76 are joined to the coupling sheet 80 and the second tab sheet 92 to enhance a joining strength. The inner and outer side inelastic regions 75, 76 are more crease-resistant than the elastic region 74.

{0024}

In each of the side panels 70, the first and second sheets 71, 72 are joined to each other through a joining region defined by, for example, hot melt adhesive (not shown) and the elastic elements 73 also is secured to at least one of the first and second sheets 71, 72 through this joining region. At the both end portions 73A, 73B of the elastic elements 73, a quantity

of the adhesive to be distributed thereon may be increased to prevent the elastic elements from falling off. The first and second sheets 71, 72 and the joining region 84 lying therebetween overlap together wherein a dimension in the transverse direction X of such overlapping region may be set to 10 mm or more. Similarly, the first and second sheets 71, 72 and the joining region 93 lying therebetween overlap together wherein a dimension in the transverse direction X of such overlapping region may be set to 10 mm or more. The sheets and the joining region overlap together to increase the stiffness and also to strengthen the joining effect. In the regions of the side panel 70 which overlap the joining region 84, 93, the elastic elements 73 may be arranged so that the both end portions 73A, 73B thereof extend into the respective overlapping regions.

{0025}

Outside the joining region 84 of the coupling sheet 80 as viewed in the transverse direction X, a non-joining region 85 is provided so that the second sheet 72 and the outer edge portion of the coupling sheet 80 may be spaced apart from each other. Similarly, outside the joining region 93 of the second tab sheet 92 as viewed in the transverse direction X, a non-joining region 94 is provided so that the second sheet 72 and the inner edge portion of the second tab sheet 92 may be

spaced apart from each other.

{0026}

Referring again to Figs. 2 and 3, the first and second tab sheets 91, 92 extending in the longitudinal direction Y are formed with a plurality of tabs 96 projecting outward in the transverse direction X and spaced from each other in the longitudinal direction Y. The hook element 95 is attached to each of the tabs 96. In other words, the hook elements 95 are arranged so as to be spaced from each other in the longitudinal direction Y. As material for the first and second tab sheets 91, 92, for example, a spunbond fibrous nonwoven fabric or an SMS fibrous nonwoven fabric having a mass per unit area in a range of about 40 to about 60 g/m2 may be used.

{0027}

As illustrated in Figs. 1 and 2, the hook elements 95 constituting a fastening system may be temporarily engaged with a predetermined region of the exterior sheet 30 formed of a fibrous nonwoven fabric which serves as a cooperating fastening system in the front waist region 11 to couple the front and rear waist regions 11, 12 to each other and to fix the diaper in a state put on the wearer's body. The hook elements 95 according to this embodiment define second fastening elements according to the present invention and the predetermined region of the

exterior sheet 30 in the front waist region 11 defines a first fastening element according to the present invention. By utilizing the exterior sheet 30 as the first fastening element, it is possible to define the first fastening element over the entire area in the transverse direction X extending from the one side edge 16 to the other side edge 16 so that the hook elements 95 may be fastened to the non-skin-contact surface of the chassis 10 over an optional area. In this manner, it is possible to fasten the hook elements 95 to the front waist region 11 over a wide range so that the front and rear waist regions 11, 12 may be coupled to each other in consideration of the wearer's body shape and other physical conditions so as to keep the diaper in close contact with the wearer's body. By utilizing the exterior sheet 30 as the first fastening element, it becomes unnecessary to prepare any element prepared separately as the first fastening element and, in consequence, it is possible to reduce the manufacturing cost. The fibrous nonwoven fabric forming the first fastening element may be locally positioned in the front waist region 11 or over a nearly entire area of the front waist region 11.

{0028}

In the diaper 1 as has been described above, each of the side panels 70 is secured to the chassis 10 through the coupling

sheet 80. Assuming that the side panel 70 is directly secured to the chassis 10, when the side panel 70 is pulled in the transverse direction X, the tensile force will directly act on the lateral portion of the side panel 70 secured to the chassis 10 so that the side panel 70 might be torn or separated from the chassis 10. However, the arrangement of the coupling sheet 80 makes it possible to prevent the side panel 70 from being torn or separated from the chassis 10 since the tensile force acts on the chassis 10 through the coupling sheet 80. To prevent the side panel 70 from being torn in the arrangement without the coupling sheet 80, it will be required to use suitable material for the side panel 70 having a relatively heavy mass per unit area and a relatively high density. In contrast, according to this embodiment, the arrangement of the coupling sheet eliminates such requirement and makes it possible to form the side panel 70 from materials such as a fibrous nonwoven fabric having a low stiffness and a high flexibility.

{0029}

The side panel 70 each extend along a nearly entire area of the rear waist region 12 in the longitudinal direction Y and the hook elements 95 are attached to the outer side edge portion as viewed in the transverse direction X of the side panel 70. With such an arrangement, after the hook elements 95 have been

fastened to the exterior sheet 30 of the front waist region 11, there is a possibility that the hook elements 95 and a vicinity thereof overlap the front waist region 11 but the side panel 70 does not snugly overlap the front waist region 11 and protrudes from the front waist region 11. In such case, the side panel 70 may come in direct contact with the wearer's skin. However, the side panel 70 according to this embodiment is formed of suitable material having a relatively low stiffness and a relatively high flexibility. Consequently, even if the side panel 70 comes in direct contact with the wearer's skin, it is possible for the diaper 1 to alleviate irritation to the wearer's skin and to ensure a comfortable texture.

{0030}

According to this embodiment, the exterior sheet 30 and the containment flap 60 constituting the chassis 10 are adjacent to and joined to each other along the inner side edge of the coupling sheet 80 and the elastic region 74 of the side panel 70 is adjacent to the outer side edge of the coupling sheet 80. The coupling sheet 80 has a stiffness in a range of about 45 to about 100 N/50 mm, the chassis 10 formed of the exterior sheet 30 and the containment flap 60 laminated together has a stiffness in a range of about 30 to about 50 N/50 mm, the elastic region 74 has a stiffness in a range of about 40 to about 70 N/50 mm

and the coupling sheet 80 has the maximum tensile strength. The coupling sheet 80 has the outer side region 81 joined to the side panel 70, the inner side region 82 joined to the chassis 10 and the intermediate region 83 extending between the outer and inner side regions constituted by the coupling sheet 80 alone. When the side panel 70 is pulled outward in the transverse direction X to fasten the hook elements 95 to the exterior sheet 30 of the front waist region 11, the intermediate region 83 is most prone to breakage from a commonsense viewpoint since the intermediate region 83 of the coupling sheet 80 composes of the least layers and has a stiffness lower than those of the inner and outer side regions 81, 82. However, the tensile strength of the coupling sheet 80 is set to be higher than those of the chassis 10 and the side panel 70 and, in consequence, it is possible to prevent the side panel 70 from being broken in the intermediate region 83 before all other constituents. Measurement of the tensile strength was conducted with use of the method as described below.

{0031}

<Measuring method for tensile strength>

Tensile strength was measured with use of Tensile Strength Tester manufactured by Instron Japan Co., Ltd. For measurement, test pieces of the elastic region 74 and of the inner side

inelastic region 75, respectively, each cut in a size of 50 mm × 50 mm in the longitudinal direction Y and the transverse direction X, were used. For the elastic region 74, an assembly of the first sheet 71, the second sheet 72 and the elastic element 73 in a contracted state was cut out in 50 mm × 50 mm to prepare the test piece. For the inner side inelastic region 75, an assembly of the first sheet 71, the second sheet 72, the elastic element 73, the coupling sheet 80 and the joining region 84 was cut out in 50 mm × 50 mm to prepare the test piece. The respective test pieces were pinched by a pair of chucks and pulled in the direction in which the respective chucks are distanced from each other at a pulling rate of 100 mm/min and the maximum tensile strength at break was measured.

{0032}

In the side panel 70, the elastic element 73 is secured between the first and second sheets 71, 72 with use of well known means such as hot melt adhesive. In this case, a mass per unit area of the adhesive distributed to the middle portion of the elastic element may be adjusted to be less than a mass per unit area of the adhesive distributed to the outer portions as viewed in the transverse direction X. In this way, it is possible to prevent, in the elastic region 74, the stiffness from increasing due to the presence of the adhesive and, in the both end portions

of the elastic element 73, it is assured that the elastic element 73 is fixed to the first and second sheets 71, 72 without an anxiety that the elastic element 73 might fall off. While a elastically nonstretchable fibrous nonwoven fabric is used as material for the first and second sheets 71, 72 and the elastic element 73 is fixed between the sheets according to this embodiment so that the side panel 70 may be elastically contractible, it is also possible to use an elastically stretchable fibrous nonwoven fabric as material for the side panel 70. The elastic element 73 is not indispensable in this case but it is also possible to attach the elastic element to such elastically stretchable fibrous nonwoven fabric.

{0033}

The coupling sheet 80 is provided with the non-joining region 85 so that the outer side edge portion of the coupling sheet 80 may be spaced apart from the side panel 70 and overlap the elastic region 74 of the side panel 70. Similarly, the second tab sheet 92 also is provided with the non-joining region 94 so that the inner side edge portion of the second tab sheet 92 may be spaced apart from the side panel 70 and overlap the elastic region 74. The portions of the coupling sheet 80 and the second tab sheet 92 lying in the non-joining regions 85, 94 at least partially cover the elastic region 74 and do not contract even

when the elastic region 74 contracts. In consequence, even when the elastic region 74 b gets wrinkled due to contraction of the elastic element 73, the portions of the sheet overlapping lying in the non-joining regions 85, 94 respectively cover the wrinkles. The coupling sheet 80 and the second tab sheet 92 lie on the non-skin-contact surface and prevent the wrinkles of the elastic region 74 from being caught by the clothes of the wearer and, in addition, prevent a friction between the wrinkles and the clothes from increasing.

{0034}

While the coupling sheet 80 and the second tab sheet 92 are attached to the non-skin-contact surface of the side panel 70 according to this embodiment, it is possible to attach the sheets to the skin-contact surface. In this case, it is possible to cover the elastic region 74 of the side panel 70 with the sheets lying in the non-joining regions 85, 94 to prevent the wrinkles of the elastic region 74 from coming in contact with the wearer's skin and irritating the wearer's skin. In the coupling sheet 80, a length dimension in the transverse direction X of the joining region 84 is in a range of about 10 to about 25 mm and a length dimension in the transverse direction X of the non-joining region 85 is in a range of about 1 to about 15 mm.

{0035}

Such diaper 1 is suitable, for example, to be put on a bedridden adult. A length dimension in the transverse direction X of the diaper 1 with the side panel stretched from its non-stretched state to the maximum elongation state is sufficiently large, i.e., in a range of about 550 to 1250 mm to use put this diaper 1 on the wearer having relatively large body width as the adult diaper. To put the diaper 1 on the wearer's body, for example, the wearer is put on a thick bedquilt so as to lie down on their side and the diaper 1 flatly opened as illustrated in Fig. 2 is placed on the thick bedquilt so that the diaper 1 may be positioned just under the wearer's buttocks when the wearer turns on his or her back. Then, the wearer's body is turned over so as to lie on his or her opposite side in order to position-adjust the diaper 1 and then the wearer's body is turned again on their back. Preferably, the diaper 1 is properly position-adjusted so as to extend in the transverse direction X without folds or wrinkles during operation of turning over the wearer's body. Structurally, the side panels 70 extend outward from the both side edges 16 of the diaper 1 and, in consequence, the side panels 70 smoothly extend outward from lateral portions of the wearer's body, facilitating the diaper 1 to be position-adjusted merely by pulling the side panels 70.

After the diaper 1 has been placed under the wearer's buttocks, the front waist region 11 of the diaper 1 is allocated on the wearer's belly and the hook elements 95 arranged on the side panels 70 are fastened, in engagement, to the exterior sheet 30 in the front waist region 11.

{0036}

The elastic side panels 70 of the above described diaper 1 make it possible to use the diaper 1 for the wearers having various waist sizes. For adults in comparison to infants, the waist sizes as well as the body types vary in a wide range depending on the individuals and the genders. Use of the elastic side panels 70 make it possible to set an applicable range in conformity to the waist size of an individual wearer within a wide range.

{0037}

Each of the side panels 70 continuously extends in the rear waist region 12 from the rear end edge 15 to the crotch region 13 and has a length dimension in the longitudinal direction Y is in a range of about 180 to about 300 mm and, in this embodiment, about 240 mm. A length dimension in the longitudinal direction Y of the rear waist region 12 is in a range of about 260 to about 320 mm and, in this embodiment, about 193.5 mm. Length dimensions in the longitudinal direction Y of

the front and rear waist region 11, 12 are defined by length dimensions from the front and rear end edges 14, 15 to the boundary to the crotch region 13 in which a length dimension in the transverse direction X decreases. The side panel 70 extends in the longitudinal direction Y along most area of the rear waist region 12 and consequently it is possible to keep the diaper 1 in close contact with the wearer's body not only along the waist-opening defined by the front and rear end edges 14, 15 but also in the vicinity of the leg-openings defined by the side edges 16 of the crotch region 13. In addition, the side panel 70 is dimensioned to be larger than the length dimension in the longitudinal direction Y of the front waist region 11 and consequently it is possible to couple the side panel 70 to the front waist region 11 over an nearly entire region in the longitudinal direction Y of the front waist region 11 and thereby it is possible to put the entire front waist region 11 in close contact with the wearer's body. In this regard, as used herein, the expression "the side panel 70 extends in the longitudinal direction Y substantially entire region of the rear waist region 12" includes embodiments in which the side panel 70 is smaller or larger than the length dimension in the longitudinal direction Y of the rear waist region 12 as long the effect of keeping the front waist region 11 as a whole in close contact with the

wearer's body is assured.

{0038}

For the diaper in which the side panels 70 extend along a nearly entire area in the longitudinal direction Y of the rear waist region 12 as has described above, handling of the diaper may be more bothersome than for the diaper in which the length dimension in the longitudinal direction Y of the side panels 70 is relatively small and operation of fastening the side panels 70 to the front waist region 11 may be also difficult. However, according to the present invention, a plurality of the hook elements 95 are provided so as to be spaced apart each other in the longitudinal direction Y and consequently it is possible to fasten the hook elements 95 to the front waist region 11 one by one. In this way, each side panel 70 can be easily fastened to the front waist region 11 even when a dimension in the longitudinal direction Y of the side panel 70 is relative large. In addition, the hook elements 95 are attached to a common tab sheet 91 and, when the one tab 96 is gripped and pulled, the other tab 96 follow this in some measure, facilitating the other hook elements 95 to be fastened to the front waist region 11 after leading hook elements 95 have been fastened to the front waist region 11.

{0039}

The leg-elastic elements 51 are secured to the crotch region 13 of the diaper 1 and the second end portions 51b thereof are located inboard of the side panels 70 as viewed in the transverse direction X. In other words, the second end portions 51b of the leg-elastic elements 51 are located between the side panels 70. More specifically, an imaginary extended line connecting the lower end edges 70a of the side panels 70 adjacent to the crotch region 13 and extending in the transverse direction X intersects with the leg-elastic elements 51. With such a positional relationship, when the side panels 70 are pulled outward in the transverse direction X and fastened to the front waist region 11, the second end portions 51b of the leg-elastic elements 51 also are pulled outward in the transverse direction X and the both side edge portions 16 of the chassis 10 secured with the leg-elastic elements 51 are put in close contact with the wearer's legs.

{0040}

While the exterior sheet 30 in the front waist region 11 is used as the first fastening element according to this embodiment, it is possible to attach a separately prepared loop elements or the like to the front waist region 11. When the separately prepared loop elements or the like are attached to the exterior sheet 30, it is also possible to use a breathable

plastic sheet or the like as the exterior sheet 30. Although the hook elements are used as the second fastening elements according to this embodiment, it is also possible to use the conventionally used means such as a pressure-sensitive adhesive tape as long as such means can be reliably fastened to the non-skin-contact surface of the front waist region 11. When such pressure-sensitive adhesive tape or the like is used as the second fastening element, it is possible to use, for example, a plastic sheet in which pressure-sensitive adhesive is coated as the first fastening element.

{0041}

<Second Embodiment>

Figs. 5 and 6 illustrate a second embodiment of the present invention. Fig. 5 is a plan view similar to Fig. 2 and Fig 6 is a scale-enlarged sectional view taken along line VI-VI in Fig. 5. This embodiment is in that the coupling sheet 80 is attached to the skin-contact surface of the side panel 70. The features other than this arrangement are similar to those in the first embodiment and will not be described hereunder.

{0042}

Each of the side panels 70 includes the first sheet 71 lying on the skin-contact surface, the second sheet 72 lying on the non-skin-contact surface and the elastic elements 73

contractibly secured in their stretched state between the first and second sheets 71, 72. A plurality of the elastic elements 73 are arranged so as to extend in the transverse direction X and to be spaced apart one from another in the longitudinal direction Y. The second sheet 72 has a length dimension in the transverse direction X larger than that of the first sheet 71 and extends outward in the transverse direction X beyond the first sheet 71. The side panel 70 includes the elastic region 74 defined by contraction of the elastic elements 73 and the inner and outer side inelastic regions 75, 76 defined outside the elastic region 74 as viewed in the transverse direction X.

{0043}

Each of the coupling sheets 80 includes the outer side region 83 overlapping the first sheet 71, the inner side region 82 joined to the chassis 10 and the intermediate region 83 extending between the inner and outer side regions 82, 83.

{0044}

In the inner side inelastic region 75 of the side panel 70, the first sheet 71 is secured to the outer side region 81 of the coupling sheet 80 through the intermediary of the joining region 84. The inner side inelastic region 75 is defined by the first sheet 71 and the second sheet 72 both overlapping the joining region 84 and the end portion 73A of the elastic element

73. In the outer side region 81, the non-joining region 85 is defined outboard of the joining region 84 as viewed in the transverse direction X. In the non-joining region 85, the outer side edge portion of the coupling sheet 80 is spaced apart from the first sheet 71. The inner side region 82 of the coupling sheet 80 is together with the second sheet 72 secured between the containment flaps 60 and the exterior sheet 30 with the use of well known joining means such as hot melt adhesive (not shown).

{0045}

In the outer side inelastic region 76 of the side panel 70, the second tab sheet 92 is joined to the first sheet 71 through the joining region 93. The outer side inelastic region 76 is defined by the first and second sheets 71, 72 and the end portion 73B of the elastic element 73. The first tab sheet 91 is joined to the second tab 92 with the use of well known joining means such as hot melt adhesive (not shown) and the hook elements 95 are attached to the first tab sheet 91. The non-joining region 94 is provided inboard of the joining region 93 as viewed in the transverse direction X so that the inner side edge portion 92 may be spaced apart from the first sheet 71.

{0046}

In the diaper 1 as has been described above, the non-joining regions 85, 94 are formed on the body side of the

side panel 70 wherein the elastic region 74 may be partially covered with the outer side edge portion of the coupling sheet 80 and the inner side edge portion of the second tab sheet 92 located in the non-joining regions 85, 94, respectively. In this way, at least in the zones covered with the sheets, it is possible to prevent the wrinkles of the elastic region 74 from coming in direct contact with the wearer's skin and to prevent wrinkle traces from being traced on the wearer's skin and/or to prevent the wrinkles from irritating the wearer's skin.

{0047}

<Third Embodiment>

Figs. 7 and 8 illustrate a third embodiment of the present invention. Fig. 7 is a plan view of the diaper 1 viewed from the non-skin-contact surface wherein the side panel 70 is illustrated in an enlarged scale and Fig. 8 is a sectional view taken along line VIII-VIII in Fig. 7 (a). This embodiment is in that the coupling sheet 80 continuously extending from the side edge 16 of the chassis 10 to the hook elements 95 is attached to the non-body side of the side panel 70 and this coupling sheet 80 is provided with a cutting guide line 88. The arrangement other than such feature is similar to the arrangement of the first embodiment and will not repetitively described.

{0048}

Referring to Fig. 8, the coupling sheet 80 is joined to the second sheet 72 through the joining region 84 extending in the longitudinal direction Y in the inner side inelastic region 75 of the side panel 70 and joined to the second sheet 72 through the joining region 93 extending in the longitudinal direction Y in the outer side inelastic region 76. Specifically, the inner side edge portion of the second sheet 72 joined to the coupling sheet 80 through the joining region 84 in the inner side inelastic region 75. In the outer side inelastic region 76, the outer side edge portion of the second sheet 72 is joined to the coupling sheet 80 through the joining region 93. Between the joining regions 84, 93 as viewed in the transverse direction X, the non-joining region 89 is defined, in which the second sheet 72 and the coupling sheet 80 are not joined to each other.

{0049}

Each of the coupling sheets 80 includes a cutting guide line 88 extending in the longitudinal direction Y between the joining regions 84, 93. The cutting guide line 88 is defined by a plurality of slit-like through-holes, each extending through the coupling sheet 80 in its thickness direction, arranged at intervals in the longitudinal direction Y.

{0050}

Referring to Fig. 7 (a), the cutting guide line 88 is

defined by a plurality of perforations arranged along a straight line extending inward in the longitudinal direction Y from the front and rear end edges of the coupling sheet 80. So long as the coupling sheet 80 is not cut along the cutting guide line 88, the coupling sheet 80 restricts elongation of the elastic region 74 even if it is tried to stretch the elastic region 74.

{0051}

Referring to Fig. 7 (b), when the coupling sheet 80 is cut along the cutting guide line 88 and separated in the transverse direction X, the elastic region 74 is exposed between two halves of the coupling sheet 80. The elastic region 74 is pulled in opposite directions through the joining regions 84, 93 in the transverse direction X so as to be stretched in the transverse direction X. By arranging the cutting guide line 88 so as to extend in the non-joining region 89, it is possible to cover at least partially the elastic region 74 with the coupling sheet 80 which can be spaced apart from the second sheet 72 of the side panel 70.

{0052}

When the diaper 1 as has been described is put on the wearer having a slender waist, the hook elements 95 may be fastened to the front waist region 11 to stabilize the diaper 1 on the wearer's body without cutting the coupling sheet 80, in other

words, directly from the state illustrated in Fig. 7 (a). When the diaper 1 is put on the wearer having a relatively ample waist, the diaper 1 may be put on the wearer's body in a stabilized state after the coupling sheet has been cut, in other words, from the state illustrated in Fig. 7 (b). In this manner, the state of the side panel 70 may be selected depending on the wearer's body type to keep the diaper 1 in close contact with the wearer's body depending on the various waist sizes of individual wearers. In addition, particularly when the diaper 1 is put on the wearer's body after the coupling sheet 80 has been cut, contraction of the elastic region 74 assures that the diaper 1 is kept in further close contact with the wearer's body. A pair of side panels 70 is attached to the both side edges of the chassis 10, respectively, and any one of the side panels 70 may be cut and the other may be left uncut to put the diaper 1 on the wearer's body.

{0053}

In the diapers according to the first through third embodiments, it is possible to set off the elastic region 74 of the side panel 70 so that this elastic region 74 may be visually distinguished from the other regions. If the elastic region 74 is set off, a degree of stretch when the elastic region 74 is stretched can be understood merely by visually observing the

elastic region 74 as one of reliable indices teaching whether the diaper 1 is kept in close contact with the wearer's body or not. Measures making such visual observation include, for example, coloring any one of the first and second sheets 71, 72 in the color making it possible to distinguish it from the other sheets; coloring the elastic element 73 making it possible to distinguish it from the first and second sheets 71, 72; and coloring the adhesive distributed between the first and second sheets 71, 72 making it possible to distinguish it from the other regions. It is also contemplated to pattern the elastic region 74. The measures for this purpose is not limited to those as have been described above and the other various measures may be adopted.

{0054}

The disclosure of the present invention described above may be arranged at least as follows:

A disposable wearing article 1 has a longitudinal direction Y, a transverse direction X and includes a chassis 10 having a skin-contact surface, a non-skin-contact surface opposite thereto, front and rear waist regions 11, 12, a first waist region defining one of the front and rear waist regions 11, 12, a second waist region defined by another of the front and rear waist regions 11, 12 and a crotch region 13 extending between the first

and second waist regions 11, 12, and a fastening system to fasten the first and second waist regions to each other.

{0055}

In the disposable wearing article 1, the present invention further includes the following features as follow:

Side panels 70 extending outward in the transverse direction X from the second waist region and being elastically stretchable/contractible at least in the transverse direction X and a coupling sheet 80 to couple the side panel 70 and the chassis 10 to each other.

Each of the coupling sheet 80 includes an inner side region 82 overlapping the chassis 10, an outer side region 81 overlapping each side panel 70 and an intermediate region 83 extending between the inner and outer side regions 82, 81 wherein the inner side region 82 and the chassis 10 are joined to each other.

The fastening system includes a first fastening element 30 lying on the non-skin-contact surface of the first waist region and a second fastening elements 95 attached to the side panel 70 and adapted to be releasably fastened to the first fastening system.

{0056}

The present invention may include at least embodiments

as follow, which may be taken in isolation from or in combination with one another:

(1) The side panel 70 has an elastic region 74 being elastically contractible in the transverse direction X and a pair of inelastic regions 75, 76 being adjacent to the elastic region 74 in the transverse direction X, the coupling sheet 80 being joined to one of the inelastic regions 75, 76 and the second fastening system 95 being joined to the other of the inelastic regions.

(2) The outer side region 81 of the coupling sheet 80 is adjacent to the joining region 84 from the outer side as viewed in the transverse direction X and includes also a non-joining region 85 adapted to be spaced apart from the side panel 70.

(3) The non-joining region 85 is positioned so as to overlap the elastic region 74 of the side panel 70.

(4) The side panel 70 includes a first sheet 71 lying on the skin-contact surface, a second sheet 72 lying on the non-skin-contact surface and a plurality of elastic elements 73 contractibly attached in a stretched state between the first and second sheets 71, 72, the elastic region 74 being formed under contraction of the elastic elements 73.

(5) Both end portions 73A, 73B of the elastic element 73 extends from the elastic region 74 into a pair of the inelastic

regions 75, 76, respectively, and are inelasticized by the joining regions 84 defined in the inelastic regions 75, 76.

(6) The chassis 10 includes a pair of sheets 30, 60 lying on the skin-contact surface and the non-skin-contact sheet, respectively, and the coupling sheet 80 lies between a pair of the sheets 30, 60.

(7) The second fastening elements 95 are attached to the tab sheets 91, 92 and the tab sheets 91, 92 are joined to the side panel 70.

(8) The tab sheet includes a first tab sheet 91 to which the second fastening element 95 is attached and a second tab sheet 92 layered on the first tab sheet 91 and the side panel 70 is attached between the first and second tab sheets 91, 92.

(9) The chassis 10 and the side panel 70 are spaced apart from each other in the transverse direction X through the intermediate region 83 of the coupling sheet 80.

(10) Tensile strength of the coupling sheet 80 is higher than respective tensile strength of the chassis 10 and the side panel 70.

(11) The side panel 70 lies on the skin-contact surface of the coupling sheet 80.

(12) The side panel is provided over a substantially entire area in the longitudinal direction of the second waist region.

{0057}

The constituent elements of the disposable diaper 1 are not limited to those described in the specification but the other various types of well known material widely used in the relevant technical field may be used without limitation. As used herein, the terms "first" and "second" in this specification of the present invention are used merely to distinguish the similar elements, similar positions or the other similar means.

{Reference Signs List}

{0058}

1 disposable wearing article (disposable diaper)

10 chassis

11 front waist region

12 rear waist region

13 crotch region

16 both side edges

20 interior sheet

30 exterior sheet

60 containment sheet

70 side panel

71 first sheet

72 second sheet

73 elastic element

73A, 73B both ends

74 elastic region

75 inner side inelastic region

76 outer side inelastic region

80 coupling sheet

81 outer side region

82 inner side region

83 intermediate region

84 joining region

91 first tab sheet

92 second tab sheet

95 hook elements (second fastening elements)

X transverse direction

Y longitudinal direction

{Claims}

{Claim 1}

A disposable wearing article having a longitudinal direction, a transverse direction and including a chassis having a skin-contact surface, a non-skin-contact surface opposite thereto, front and rear waist regions, a first waist region defining one of the front and rear waist regions, a second waist region defined by another of the front and rear waist regions and a crotch region extending between the first and second waist regions, and a fastening system to fasten the first and second waist regions to each other, wherein:

the disposable wearing article further includes side panels extending outward in the transverse direction from the second waist region and being elastically stretchable/contractible at least in the transverse direction and a coupling sheet to couple the side panel and the chassis to each other;

the coupling sheet includes an inner side region overlapping the chassis, an outer side region overlapping the side panels and an intermediate region extending between the inner and outer side regions wherein the inner side region and the chassis are joined to each other extending in the longitudinal direction;

the fastening system includes a first fastening element lying on the non-skin-contact surface of the first waist region and

a second fastening elements attached to the side panel and adapted to be releasably fastened to the first fastening system;

the second fastening elements are fixed to the tab sheets;

the side panel has an elastic region being elastically contractible in the transverse direction and a pair of inelastic regions being adjacent to the elastic region in the transverse direction, the coupling sheet being joined to one of the inelastic regions and the second fastening system being joined to the other of the inelastic regions;

the side panel includes a first sheet lying on the skin-contact surface, a second sheet lying on the non-skin-contact surface and a plurality of elastic elements lying between the first and second sheets;

the elastic elements are secured to at least one of the first and second sheets by hot melt adhesive and at the both end portions of the elastic elements, a quantity of the hot melt adhesive to be distributed thereon is increased while a quantity of the hot melt adhesive distributed to the middle portion of the elastic element is less than a quantity of the adhesive distributed to the both end portions of the elastic elements;

the outer side region of the coupling sheet is fixed to the side panels through a second joining region and includes also a first non-joining region adjacent to the second joining region from the outer side as viewed in the transverse direction;

the first non-joining region of the coupling sheet is positioned so as to overlap a part of the elastic region of the side panel;

the tab sheet includes a first tab sheet fixed to the second joining region and a second tab sheet layered on the first tab sheet;

an outer edge portion of the side panel is fixed to the second tab sheet through the second tab sheet and includes also a second non-joining region adjacent to the second joining region from the inner side as viewed in the transverse direction;

the second non-joining region of the second tab sheet is positioned so as to overlap a part of the elastic region of the side panel; and

the coupling sheet is positioned on the non-skin-contact surface of the first non-joining region and the second tab sheet is positioned on the non-skin-contact surface of the second non-joining region.

{Claim 2}

The disposable wearing article according to claim 1 wherein both ends of the elastic element extends from the elastic region into a pair of the inelastic regions, respectively, and are inelasticized by the second joining regions formed on the inelastic regions.

{Claim 3}

The disposable wearing article according to claim 1 or 2 wherein the chassis includes a pair of sheets each lying on the skin-contact surface and the non-skin-contact surface and the coupling sheet lies between a pair of the sheets.

{Claim 4}

The disposable wearing article according to any of claims 1 through 3 wherein the chassis and the side panel are spaced apart from each other in the transverse direction through the intermediate region of the coupling sheet.

{Claim 5}

The disposable wearing article according to any one of claims 1 through 4 wherein a tensile strength of the coupling sheet is higher than respective tensile strength of the chassis and the side panel.

{Claim 6}

The disposable wearing article according to any one of claims 1 through 5 wherein the side panel lies on the skin-contact surface of the coupling sheet.

{Claim 7}

The disposable wearing article according to any one of claims 1 through 6 wherein the side panel is provided over a substantially entire area except upper end and lower end in the longitudinal direction of the second waist region.