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[57]	Abstract:	The present invention provides a pant-type disposable absorbent article being capable of preventing body exudates from leaking out from a waist-opening. A diaper (10) is of pent-type and includes a front waist region (14), a rear waist region (15), a crotch region (16) located between the front and rear waist regions, an absorbent core (58) located at least in the crotch region (16), and a waist-opening (22) and a pair of leg-openings (23) defined by joining both side edge portions (18c, 18d) of the front waist region to both side edge portions (19c, 19d) of the rear waist region. A spacing dimension (L1) in a vertical direction from an outer end edge (28b) of a leakage-barrier sheet in the front waist region to the waist-opening's front end edge is larger than a spacing dimension (L2) in the vertical direction from an outer end edge (29b) of the leakage-barrier sheet in the rear waist region to the waist-opening's rear end edge. A spacing dimension (L3) in the vertical direction from a front end edge of the absorbent core to the waist-opening's rear end edge is smaller than a spacing dimension (L5) in the vertical direction from the rear end edge of the absorbent core to the waist-opening's rear end edge.		

acrylic. Though it is possible to use inelastic fibrous nonwoven fabrics as the waist interior layers 24, 25, the waist interior layer 25 in the rear waist region 15 is in direct contact with the wearer's body as described later and, in view of this, at least the waist interior layer 25 is preferably made of elastic fibrous nonwoven fabrics to improve softness and texture.

<leakage-barrier sheet>

Referring to Fig. 2 and Fig. 3, between the respective waist interior layers 24, 25 and the respective waist exterior layers 26, 27, more specifically, between the respective waist exterior layers 26, 27 and respective reinforcing layers 30, front and rear leakage-barrier sheets 28, 29 are arranged in central regions in the lateral direction X of the front and rear waist regions 14, 15. Referring to Fig. 4 and Fig. 5, respective outer end edges 28b, 29b of the front and rear leakage-barrier sheets 28, 29 extend toward front and rear end edges 22a, 22b of the waist-opening beyond front and rear end flaps 54a, 55a. Respective inner end edges 28a, 29a of the front and rear leakage-barrier sheets 28, 29 extend toward the crotch region 16 beyond front and rear end edges 58a, 58b of an absorbent core 58. The non-skin-facing surface of the front and rear leakage-barrier sheets 28, 29 is printed with graphics (not shown) which are recognizable externally.

The front and rear leakage-barrier sheets 28, 29 may be formed of a liquid-impermeable but vapor-permeable sheet which is, in turn, formed of plastic materials such as polyethylene films or polypropylene films or fibrous non-woven fabrics, for example, treated with water repellent agent in order to improve a liquid-permeability.

Referring to Fig. 6 (a) and Fig. 6 (b), a spacing dimension L1 in the vertical direction Y from the outer end edge 28b of the front leakage-barrier sheet 28 in the front waist region 14 to the front end edge 22a of the waist-opening is larger than a spacing dimension L2 in the vertical direction Y from the outer end edge 29b of the rear leakage-barrier sheet 29 in the rear waist region 15. The spacing dimension L1 is, for example, ranging 10 to 50 mm and the spacing dimension L2 is, for example, ranging 1 to 30 mm.

<respective waist-elastic members>

Referring to Fig. 4 and Fig. 5, in the front and rear waist panels 18, 19, respective regions of the waist exterior layers 26, 27 extending outward in the vertical direction Y beyond the respective outer end edges 24a, 25a of the waist interior layers 24, 25 are folded back onto the skin-facing surface. Within respective folded back portions 26a, 27a, a plurality of front and rear waist elastic members 31, 32 are contractibly secured under tension with suitable adhesives, for example, hot melt adhesives. In addition, between the respective waist exterior layers 26, 27 and the liquid-absorbent structure, the elongate reinforcing layers 30 formed of fibrous nonwoven fabrics and the front and rear leakage-barrier sheets 28, 29 are arranged. Between the reinforcing layers 30 and the front and rear leakage-barrier sheets 28, 29, a plurality of the front and rear waist elastic members 35, 36 are contractibly secured under tension with suitable adhesives, for example, hot melt adhesives.

<front waist region>

The front waist region 14 has front waist exterior elastic region 37 located on the side of the front end edge 22a of the waist-opening, a front waist interior elastic region 38 located on the side of the crotch region 16 and a front waist intermediate elastic region 39 located between the front waist exterior elastic region 37 and the front waist interior elastic region 38. The absorbent core 58 is not included in the front waist exterior elastic region 37 but partially included in the front waist intermediate elastic region 39 and the front waist interior elastic region 38.

The front waist region 14 has, in addition, a front waist elastic region 49a defined between a front end edge 58a of the absorbent core 58 and the front end edge 22a of the waist opening.

The front waist exterior elastic region 37 has a plurality of thread-, string- or strand-like front waist elastic members 31 arranged at given intervals in the vertical direction Y and extending in the lateral direction X.

The front waist intermediate elastic region 39 has a plurality of thread-, string- or strand-like front waist elastic members 33 arranged at given intervals in the vertical direction Y and extending in the lateral direction X.

The front waist interior elastic region 38 has a plurality of thread-, string- or strand-like front waist elastic members 35 arranged at given intervals in the vertical direction Y and extending in the lateral direction X. In this regard, it is also possible to locate elastic sheets in the front waist exterior elastic region 37, the front waist interior elastic region 38 and the front waist intermediate elastic region 39 instead of arranging the thread-, string- or strand-like front waist elastic members 31.

<rear waist region>

The rear waist region 15 has a rear waist exterior elastic region 40 located on the side of the rear end edge 22b of the waist opening, a rear waist interior elastic region 41 located on the side of the crotch region 16 and a rear waist intermediate elastic region 42 located between the rear waist exterior elastic region 40 and the rear waist interior elastic region 41. The absorbent core 58 is not included in the rear waist intermediate elastic region 42 and in the rear waist exterior elastic region 40 but the rear absorbent core 58 lies adjacent to the rear end edge 58b of the absorbent core 58 partially included in the rear waist interior elastic region 41.

The rear waist exterior elastic region 40 has a plurality of, for example, thread-, string- or strand-like rear waist elastic members (rear waist elastic members) 32 arranged at given intervals in the vertical direction Y and extending in the lateral direction X.

The rear waist intermediate elastic region 42 has a plurality of, for example, thread-, string- or strand-like rear waist elastic members (rear waist elastic members) 34 arranged at given intervals in the vertical direction Y and extending in the lateral direction X. The rear waist elastic members 34 are arranged on the side of the non-skin-facing surface of the liquid-absorbent structure.

The rear waist interior elastic region 41 has a plurality of, for example, thread-, string- or strand-like rear waist elastic members (rear waist elastic members) 34 arranged at given intervals in the vertical direction Y and extending in the lateral direction X. In this regard, it is also possible to locate elastic sheets in the rear waist exterior elastic region 40, the rear waist interior elastic region 41 and the rear waist intermediate elastic region 42 instead of arranging the thread-, string- or strand-like rear waist elastic members 32, 34, 36 in these regions 40, 41, 42.

<waist-elastic members>

Tensile stress in the lateral direction X of the front and rear waist exterior elastic regions 37, 40 are set to be higher than tensile stress in the lateral direction X of the front and rear waist intermediate elastic regions 39, 42. In the present embodiment, as the front and rear waist elastic members 31, 32, thread-, string- or strand-like elastic members having a fineness ranging 470 to 940 dtex are contractibly secured under tension at a stretch ratio ranging about 1.6 to about 3.5. As the front and rear waist elastic members 33, 34, thread-, string- or strand-like elastic members having a fineness ranging 310 to 780 dtex are contractibly secured under tension at a stretch ratio ranging about 1.8 to about 2.8. By setting the fineness and the stretch ratio of the front and rear waist elastic members 31, 32 to be higher than the fineness and the stretch ratio of the front and rear waist elastic members 33, 34, it is possible to ensure the tensile stress of the front and rear waist exterior elastic regions 37, 40 higher than that of the front and rear waist intermediate elastic regions 39, 42.

Specifically, the tensile stress of the front and rear waist exterior elastic regions 37, 40 at the moment of the maximum elongation of 171% ranges from about 0.7 to about 1.7 N/mm and the tensile stress of the front and rear intermediate elastic regions 39, 42 at the moment of the maximum elongation of 171% ranges from about 0.4 to about 1.4 N/mm. In this manner, the front and rear waist exterior elastic regions 37, 40 have relatively high tensile stress enough to fit the wearer's body stably and, in consequence, it is possible to prevent the diaper 10 from being unintentionally displaced downward even if the tensile stress of the leg elastic regions 62 is set to a relatively low value. In this regard, the tensile stress of the front and rear waist exterior elastic regions 37, 40 may be set to be the same for the front and rear waist intermediate elastic regions 39, 42.

Means to differentiate the tensile stresses are not limited to selective use of the elastic members being different in the fineness and the tensile stress depending on the respective elastic regions but may be achieved, for example, by forming the elastic members of materials being different depending on the respective elastic regions or by using the elastic members formed of the same material but arranged at given intervals being different depending on the respective elastic regions. Obviously, it is possible to set the tensile stress required for the respective elastic regions by appropriate combination of the materials used, the fineness, the stretch ratio and the intervals of the elastic members.

<measurement of tensile stress>

Tensile stresses of the front and rear waist exterior, interior, and intermediate elastic regions 37 through 40 were measured by a method as described below with use of a tensile tester manufactured by INSTRON JAPAN Co. Ltd (INSTRON Model: 5564). First, a spacing dimension R between a pair of upper and lower chucks (gripper devices) was set to a dimension in the lateral direction X (a spacing between a pair of side seam columns of the waist region) of the diaper in an unworn state and the measurement was conducted in a cyclic mode at a pulling rate of 100 mm/min.

Then, test pieces for measurement each having a length dimension in the lateral direction X ranging 3 to 5 cm were cut out from the diaper 10 so carefully that the test pieces may not include the liquid-absorbent structure 11. The test piece was elongated in the lateral direction X until gathers formed under contractile force of the respective elastic members disappear and a spacing dimension between the seam-columns 20 arranged along both side edge portions of the diaper 10 in this state was measured as a dimension R1 (not shown) at a state of the maximum elongation. In this regard, the test piece used to measure the dimension R1 at the state of the maximum elongation was not used to measure a tensile stress. Then, both the side edge portions of the test piece cut out from the diaper 10 were held by upper and lower chucks, respectively. With the respective side edge portions held, the upper and lower chucks were moved apart from each other to pull the test piece in the vertical direction until the test piece was elongated to a desired length.

The previously measured dimension R1 at the state of the maximum elongation was represented by 100%. The measurement was started from the state of the chucks being apart from each other by the spacing dimension R and the test piece was elongated until the spacing dimension between the chucks was enlarged to about 87% of the maximum dimension R1. Then, the test piece was elongated to about 87% of the maximum dimension R1 was gradually contracted until the spacing dimension R between the upper and lower chucks was reduced to about 71% of the maximum dimension R1 and the tensile stress of the test piece at this moment was measured. On the basis of a width of the test piece, a measured value of tensile stress was converted to a value per unit width (about 30 mm) as a measurement value (N/30 mm).

The front and rear waist elastic members 35, 36 included by the front and rear waist interior elastic regions 38, 41 are, for example, formed of thread-, string- or strand-like elastic material each having a fineness ranging about 310 to about 620 dtex attached under tension at a stretch ratio ranging about 1.1 to about 3.5 but in contractible manner. Tensile stress of the front and rear waist intermediate elastic regions 38, 41 was measured on test pieces having a width of about 30 mm cut out from the front and rear waist panels 18, 19, respectively, in the same manner for the measurement of the tensile stress of the front and rear waist exterior elastic regions 37, 40 and the front and rear waist intermediate elastic regions 39, 42.

By setting the fineness and the tensile stress of the front and rear waist elastic members 31, 32 to be higher than those of the front and rear waist elastic members 35, 36, it is possible to set the tensile stress (tension strength) of the front and rear waist interior elastic regions 38, 41 lower than that of the front and rear waist external elastic regions 37, 40.

By setting the fineness and the tensile stress of the front and rear waist elastic members 33, 34 higher than those of the front and rear waist elastic members 35, 36, it is possible to set the tensile stress (tension strength) of the front and rear waist interior elastic regions 38, 41 lower than those of the front and rear waist intermediate elastic regions 39, 42.

In the diaper wherein a plurality of the waist elastic members are arranged so as to extend from the vicinity of the absorbent core to the end edge of the waist-opening, contraction of the waist elastic members arranged in the vicinity of the absorbent core are restricted under a relatively high rigidity of the liquid-absorbent structure but the waist elastic members located in the vicinity of the waist-opening's end edge exert a desired contractile force so that a dimension in the transverse direction of a region defined in the vicinity of the waist-opening's end edge may be reduced, whereby the front and rear waist panels may fit the wearer's body. According to the present embodiment, the front and rear waist exterior elastic regions 37, 40 do not include the absorbent core 58 and are defined between the front and rear end edges 58a, 58b of the absorbent core 58 and the front and rear end edges 22a, 22b of the waist-opening so that the front and rear waist elastic members 31 through 34 without being significantly influenced by the rigidity of the absorbent core 58. Consequently, a circumferential dimension around the waist of the front and rear waist exterior elastic regions 37, 40 having the front and rear waist elastic members 31 through 34 arranged therein becomes smaller than a circumferential dimension around the waist at the front and rear end edges 48a, 58b of the absorbent core 58, thereby making it possible to assure that the font/rear waist exterior elastic regions 37, 40 fit the wearer's body. The front and rear waist exterior elastic regions 37, 40 are sufficiently elastic even along convexo-concave of the wearer's dorsal region to restrict a gap left between the dorsal region and the rear waist panel 19 thereby to reduce the leakage of body exudates beyond the waist-opening's rear end edge 22b of the rear waist region 15. The same is true of the front waist region 14.

The front and rear waist elastic members 31 through 34 continuously extend in the lateral direction X in the front and rear waist exterior elastic regions 37, 40 and in the front and rear waist intermediate elastic regions 39, 42 so that these front and rear waist elastic members 31 through 34 may be continuous in the circumferential direction around the waist. For this reason, in the front and rear waist exterior elastic regions 37, 40 and the front and rear waist intermediate elastic regions 39, 42, it is possible to press the diaper 10 against the wearer's body over the whole circumference around the waist so that the diaper 10 may fit the wearer's body.

In the front waist interior elastic region 38 of the front waist region 14, the front waist elastic members 35 are not located in a central portion in the lateral direction X of the liquid-absorbent structure and the contractile force of the elastic members 35 should not act on the liquid-absorbent structure, thereby forming gathers which may cause the leakage of bodily exudates.

In the rear waist interior elastic region 41 of the rear waist region 15, the rear waist elastic members 36 are not located in the central portion in the lateral direction X of the liquid-absorbent structure and the contractile force of the elastic members 36 should not act on the liquid-absorbent structure, thereby forming gathers which may cause the leakage of bodily exudates.

The elastic waist panel 12 has a waist retention region 51a extending in the vertical direction Y over a given length dimension L9 from the end edge 22a of the waist-opening in the front waist panel 18 to the side of the crotch region 16 and a waist central region 51b extending in the vertical direction Y over a given dimension L10 from a lower end edge of the waist retention region 51a to the side of the crotch region 16 and bordering on the waist central region 51a (see Figs. 1, 4 and 5).

In the front waist panel 18, the waist retention region 51a is defined between the front end edge 58a of the absorbent core 58 and the front end edge 22a of the waist-opening over a length dimension L9 in the vertical direction Y. The waist retention region is defined in the rear waist panel 19 also over the length dimension L9 from the rear end edge 22b of the waist-opening to the side of the crotch region 16. The length dimension L9 in the vertical direction Y of the waist retention region 51a and a length dimension L10 of the waist central region 51b may be, for example, equal to each other.

Specifically, the length dimension L9 ranges from 10 to 60 mm and the length dimension L10 ranges from 10 to 60 mm.

The waist retention region 51a is defined by a front waist retention region 49b on the side of the front waist panel 18 and a rear waist retention region 50b on the side of the rear waist panel 19. The front waist retention region 39b is the region which is identical to the front waist elastic region 49a.

The front waist retention region 49a is formed of the waist interior layer 24, the waist exterior layer 26, the reinforcing layer 30, the front leakage-barrier sheet 28, the topsheet 59 in the liquid-absorbent structure, the backsheet 60 and the leakage-barrier sheet 61 layered one upon another without including the absorbent core 58. Consequently, the front waist retention region 49b has a portion including seven sheets layered one upon another. In addition, the front waist retention region 49 includes a plurality of, for example, three front waist elastic members 31 and one front waist elastic member 33.

In the rear waist region 15, the rear waist retention region 50b extending over the length dimension L9 from the rear end edge 22b of the waist-opening includes a plurality of, for example, six front waist elastic members 32, the waist interior layer 25, the waist exterior layer 27 and the rear leakage-barrier sheet 29 layered one upon another without including the absorbent core 58 of the liquid-absorbent structure, the topsheet 59, the backsheet 60, the leakage-barrier sheet 61 and the reinforcing layer 30. Consequently, the rear waist retention region 50b partially includes four sheets layered one upon another. In this manner, the rear waist retention region 50b has a portion in which the number of the sheets forming the rear waist retention region 50b is fewer than the number of the sheets forming the front waist retention region 49b. For this reason, it is possible to set the thickness dimension of the rear waist retention region 50b in the rear waist panel 19 to be smaller than the thickness dimension of the front waist retention region 49b in the front waist panel 18 so that, in the rear waist region, the rear waist panel 19 may be tightly held to the wearer's body and, in the front waist region 14, the front waist panel 18 may be held to the wearer's body without any excessive force impressed thereupon. In this regard, it is possible to ensure such function effect also by forming the front and rear waist panels 18, 19 so that a mass per unit area of the sheet defining the rear waist retention region 50b may be lower than a mass per unit area of the sheet defining the front waist retention region 49b.

In the front and rear waist panels 18, 19, the waist central region 51b extends over the given dimension L10 in the vertical direction Y from the lower end edge of the front waist retention region 49b so as to border on the front waist retention region 49b. In this manner, the waist central region 51b is formed of a front waist central region 49c having the same position in the vertical direction Y as the waist central region 51b and the rear waist panel 19.

The front waist central region 49c is formed, for example, so as to include a portion of the front end edge 58a of the absorbent core 58 and one of the front waist elastic members 33.

A rear waist central region 50c is formed so that the absorbent core 58 is not included and, for example, one of the rear waist elastic members 34 is included.

As previously described, the fineness and the stretch ratio of the front and rear waist elastic members 33, 34 are set to be higher than those of the front and rear waist elastic members 31, 32 and thereby it is possible to set the tensile stress in the circumferential direction around the waist of the front and rear waist retention regions 49b, 50b per unit length in the vertical direction Y to be higher than the tensile stress in the circumferential direction around the waist of the front and rear waist central regions 49c, 50c per unit length in the vertical direction Y.

In consequence, the front and rear waist panels 18, 19 stably fit the wearer's body in the front and rear waist retention regions 49b, 50b and, for this reason, it is possible to keep the tensile stress in a leg-elastic region 62 and the tensile stress in the front and rear waist central regions 49c, 50c relatively low. In this way, it is possible to prevent the diaper 10 from being unintentionally displaced downward even when the tensile stress of the leg-elastic region 62 is kept relatively low.

<crotch panel>

The elastic crotch panel 13 is formed of a liquid-impermeable crotch sheet 44. As the crotch sheet 44, a monolayer- or multilayer-sheet member formed of various types of known fibrous nonwoven fabrics or moisture-permeable plastic films may be used.

The elastic crotch panel 13 has front and rear end portions 46, 47 and an intermediate portion 48 extending between the front and rear end portions 46, 47.

The front and rear end portions 46, 47 are fixed to the skin-facing surface of the front and rear waist panels 18, 19 in the vicinity of the inner end edges 18a, 19a thereof by adhesive regions located on the non-skin-facing surface side of the front and rear end portions 46, 47 and coated with hot melt adhesives.

<liquid-absorbent structure>

The liquid-absorbent structure 11 is vertically long pad-like shaped and includes front and rear end portions 54, 55, an intermediate portion 56, the absorbent core 58 extending in the vertical direction Y at least in the crotch region 16, the body-side liner (topsheet) 59 located on the side of the skin-facing surface of the absorbent core 58, the exterior cover (backsheet) 60 located on the side of the non-skin-facing surface of the absorbent core 58 and the leakage-barrier sheet 61 located on the side of the non-skin-facing surface of the external cover (backsheet). Almost entire non-skin-facing surface of the liquid-absorbent structure 11 is coated with appropriate adhesives, for example, hot melt adhesives in a known pattern. The front and rear end portions 54, 55 are respectively fixed to the skin-facing surface of the front and rear waist panels 18, 19 by the adhesive and the intermediate portion 56 is fixed to the skin-facing surface of the elastic crotch panel 13 by the adhesive. As illustrated in Fig. 3, the front end portion 54 of the liquid-absorbent structure 11 is fixed to the skin-facing surface of the waist interior layer 24 of the front waist panel 18 and the rear end portion 55 is fixed to the skin-facing surface of the waist external layer 27 between the waist interior layer 25 and the waist exterior layer 27 of the rear waist panel 19. The front end portion 54 of the liquid-absorbent structure 11 fixed to the skin-facing surface of the waist interior layer 24 making it possible for the elastic and relatively soft waist interior layer 24 to be put in direct contact with the wearer's skin and, in consequence, a texture is improved. The rear end portion 55 fixed between the waist interior layer 25 and the waist exterior layer 27 makes it possible to prevent the body exudates from directly touching the wearer's skin even when the discharged body exudates diffuses from the crotch region 16 to the rear end portion 55 of the liquid-absorbent structure 11 located in the rear waist region 15.

The absorbent core 58 includes a core material (not shown) formed of a mixture of wood fluff pulp, superabsorbent polymer particles (SAP) and, thermally fusible staple fibers as an option so as to have a mass per unit area ranging about

300 to about 900 g/m^2 and liquid-permeable fibrous nonwoven fabric (not shown) to wrap the core material. As materials for topsheet 59, various known types of fibrous nonwoven fabrics such as liquid-permeable spun bond fibrous nonwoven fabrics or SMS fibrous nonwoven fabrics each having a mass per unit area ranging about 10 to about 30 g/m^2 may be used. As materials for the backsheet 60, liquid-impermeable spun bond nonwoven fabrics, SMS nonwoven fabrics, moisture-permeable plastic sheets or laminate sheets of SMS nonwoven fabrics and plastic sheets each having a mass per unit area ranging about 10 to about 30 g/m^2 may be used.

The absorbent core 58 continuously extends in the vertical direction Y and the rear end edge 58b is located lower than the front end edge 58a.

The front end portion 54 of the liquid-absorbent structure 11 has the front end flap 54a formed of the topsheet 59, the backsheet 60 and the leakage-barrier sheet 61. The rear end portion 55 has a rear end flap 55a formed of the topsheet 59, the backsheet 60 and the leakage-barrier sheet 61.

Referring to Fig 6(a), a spacing dimension L3 in the vertical direction Y from the front end edge 58a of the absorbent core 58 to the waist-opening's front end edge 22a is smaller than a dimension L4 in the vertical direction Y of the absorbent core 58 in the front waist region 14.

Referring to Fig. 6(b), a dimension L5 in the vertical direction Y of a portion of the absorbent core 58 extending in the vertical direction Y from the rear end edge 58b to the rear end edge 22b of waist-opening is larger than a dimension L6 in the vertical direction Y of the absorbent core 58 in the rear waist region 15.

The spacing dimension L3 in the vertical direction Y from the front end edge 58a of the absorbent core 58 to the waist-opening's front end edge 22a in the front waist region 14 is smaller than the spacing dimension L5 in the vertical direction Y from the rear end edge 58b of the absorbent core 58 to the waist-opening's rear end edge 22b in the rear waist region 15.

In this diaper 10, the dimension L5 in the vertical direction Y of the portion extending from the rear end edge 58b to the waist-opening's rear end edge 22 is larger than the dimension L6 in the vertical direction Y of the absorbent core 58 in the rear waist region 15 and, in consequence, it is possible to reduce the length dimension in the vertical direction Y of the absorbent core 58 having a relatively high rigidity in the rear waist region 15, thereby, in the rear waist region 15, enlarging the length dimension in the vertical direction Y (L5 (see Fig. 6)) of a rear waist elastic region 50a in which the absorbent core 58 is not present. In this way, as illustrated in Fig. 8, an area of the rear waist elastic region 50a in which the absorbent core 58 is not present may be kept sufficiently large to prevent a gap from being left between a concavity of the wearer's back and the rear waist elastic region 50a of the rear waist panel 19 thereby to prevent body exudates from leaking out beyond the waist-opening's rear end edge 22b.

The wearer's waist has an abdominal region which is convex outward and a dorsal region which is concave inward. For this reason, in putting the diaper on the wearer's body, the front and rear waist panels are subjected to a force acting to push these waist panels outward. However, the front and rear waist panels are kept in tight contact with the wearer's waist under the contractile force of the waist elastic members. In this diaper 10, the spacing dimension L3 in the vertical direction Y from the front end edge 58a of the absorbent core 58 to the waist-opening's front end edge is smaller than the spacing dimension L5 in the vertical direction Y from the rear end edge 58b of the absorbent core 58 to the waist-opening's rear end edge 22b (see Fig. 6). For this reason, as illustrated in Fig. 7 and Fig. 8, it is possible to set the length dimension L4 in the vertical direction Y of the absorbent core in the front waist region 14 longer than the dimension L6 in the vertical direction Y of the absorbent core in the rear waist region 15, to set the stiffness of the front waist panel 18 to be put in contact with the wearer's abdominal region relatively high and to set the stiffness of the rear waist panel 19 to be put in contact with the wearer's dorsal region relatively low. In this way, it is possible to put the front waist panel 18 having a relatively high stiffness gently in contact with the abdominal region protruding outward and it is possible to put the rear waist panel 19 having a relatively low stiffness tightly in contact with the dorsal region having concave portions. In this diaper 10, the stiffness of the front waist panel 18 and the stiffness of the rear waist panel 19 are differentiated from each other in consideration of concavities and convexities in the wearer's waist so that the front and rear waist panels 18, 19 may be appropriately kept in contact with the wearer's body to prevent the diaper 10 from being unintentionally displaced downward. In addition to this advantageous effect, the spacing dimension L1 in the vertical direction Y from the outer end edge 28b of the front leakage-barrier sheet 28 in the front waist region 14 to the waist-opening's front end edge 22a is larger than the spacing dimension L2 in the vertical direction Y from the outer end edge 29b of the rear leakage-barrier sheet 29 in the rear waist region 15 so that the length dimension in the vertical direction Y of the rear leakage-barrier sheet 29 in the rear waist region may be sufficiently enlarged to prevent the body exudates from leaking out beyond the rear end edge 22b of the waist-opening 22 reliably.

<respective dimensions in diaper>

Referring to Fig. 2, preferably, a dimension L11 in the vertical direction Y of the diaper 10 ranges from about 350 to about 600 mm, a dimension W1 in the lateral direction X of the diaper 10 ranges from about 300 to about 430 mm, a dimension L12 in the vertical direction Y of the crotch region 16 ranges from about 180 to about 300 mm and a dimension L 13 in the vertical direction Y of the side edge 18d of the front waist region 14 (equal to the dimension in the vertical direction Y of the side edge 19d of the rear waist region 15) ranges from about 60 to about 130 mm.

<elastic side flaps>

Referring to Fig. 2 and Fig. 3, the elastic crotch panel 13 further includes a pair of the elastic side flaps 43 extending outward in the lateral direction X from both the side edges of the liquid-absorbent structure 11. The elastic side flaps 43 are formed of folded back regions defined by folding back the both the lateral portions of crotch sheet 44 and a plurality of string- or strand-like leg-elastic members 52 attached within the folded back regions and extending in the vertical direction Y. Front and rear end portions of the elastic side flaps 43 (respective parts of the front and rear end portions 46, 47 of the elastic crotch panel 13) are attached so as to extend outward in the lateral direction X. The elastic side flaps 43 respectively have inelastic regions 63 located along side edges 11c of the liquid-absorbent structure 11 and the leg-elastic regions 62 defined outside in the lateral direction X of the respective inelastic regions 63 and including the leg-elastic members 52 arranged therein.

In each of the leg-elastic regions 62, a plurality of thread-, string- or strand-like leg-elastic members 52 are arranged. In this regard, it is also possible to elasticize the regions 62 not only by arranging a plurality of thread-, string- or strand-like leg-elastic members 52 in these regions 62 but also by locating elastic sheets in these regions 62.

As materials for the leg-elastic members 52, for example, thread-, string- or strand-like elastic material having a fineness ranging 210 to 470 dtex may be attached under tension at about 1.8 to about 3.0 stretch ratio but in contractible manner.

As long as it was possible to cut out test pieces each having a length of about 30 mm from the elastic side flaps 43, the tensile stress of the leg-elastic region 62 was measured by the same method as used for the tensile stress of the front and rear elastic regions 37, 40. When it was impossible to cut out the test pieces each having a length of about 30 mm, test pieces of a given dimension in the vertical direction Y were cut out from the elastic side flaps 43 and measured values were converted to the tensile stress when the test piece has a width dimension of 30 mm.

Fineness and tensile stress of the leg-elastic members 52 may be set to be higher than those of the front and rear waist elastic members 31, 32 to keep the extensibility of the leg elastic region 62 lower than that of the front and rear waist exterior elastic regions 37, 40.

In the front and rear waist exterior elastic regions 37, 40, the front and rear waist panels 18, 19 are subjected to an elastic force in the lateral direction X and, in the leg elastic regions 62, the elastic crotch panel 13 is subjected to an elastic force in the vertical direction Y. In the regions in which the front and rear waist panels 18, 19 intersect with the elastic crotch panel 13, these regions are subjected to both the force in the lateral direction X and the force in the vertical direction Y. In the diaper 10 according to the present embodiment, the tensile stress of the front and rear waist exterior elastic regions 37, 40 is set to be higher than that of the leg elastic region 62. In this way, the elastic behavior of the front and rear waist exterior elastic regions 37, 40 is restricted in the vertical direction Y but not restricted in the lateral direction X so that the diaper 10 may fit the wearer's waist.

By setting the fineness and the stretch ratio of the front and rear waist elastic members 33, 34 to be higher than those of the leg elastic members 52, it is possible to set the extensibility of the leg elastic regions 62 to be lower than that of the front and rear waist intermediate elastic regions 39, 42.

In the front and rear waist intermediate elastic regions 39, 42, the front and rear waist panels 18, 19 are subjected to an elastic force in the lateral direction X and, in the leg elastic regions 62, the elastic crotch panel 13 is subjected to an elastic force in the vertical direction Y. In the regions in which the front and rear waist panels 18, 19 intersect with the elastic crotch panel 13, these regions are subjected to both the force in the lateral direction X and the force in the vertical direction Y. In the diaper 10 according to the present embodiment, the tensile stress of the front and rear waist intermediate elastic regions 39, 42 is set to be higher than that of the leg elastic region 62. In this way, the elastic behavior of the front and rear waist exterior elastic regions 37, 40 is restricted in the vertical direction Y but not restricted in the lateral direction X so that the diaper 10 may fit the wearer's waist.

While the diaper 10 having the front waist panel 18 and the rear waist panel 19 segmentalized in the vertical direction Y connected by the liquid-absorbent structure 11 has been exemplarily described hereinabove as the present embodiment, it is also possible to use a chassis formed of the sheet member including the front and rear waist regions and the crotch region 16 arranged in a continuous manner and the liquid-absorbent structure 11 located on the skin-facing surface of the chassis. However, the diaper formed in the manner that the front waist panel and the rear waist panel segmentalized in the vertical direction Y is connected to each other by the liquid-absorbent structure is generally provided merely with the elastic members extending in the vertical direction and the elastic members extending in the lateral direction. With such arrangement, the front and rear waist panels 18, 19 may be unintentionally displaced downward along the wearer's waist. In view of this, the present embodiment as previously described is particularly advantageous compared to such alternative since it is possible to prevent the front and rear waist panels 18, 19 from unintentionally displaced downward.

While the diaper 10 wherein the front and rear leakage-barrier sheets 28, 29 are liquid-impermeable and are printed with the graphics composed of various visual elements which are externally recognizable have been exemplarily described as the present embodiment, it is also possible to arrange a liquid-permeable film and a sheet printed with the graphics, separately.

While the diaper 10 wherein the front waist panel 18 includes the front leakage-barrier sheet 28 and the rear waist panel 19 includes the rear leakage-barrier sheet 29 has been exemplarily described above as the embodiment, the front and rear leakage-barrier sheets 28, 29 need not be provided separately in the front waist panel 18 and in the rear waist panel 19 and it is also possible to provide a single leakage-barrier sheet extending in the vertical direction Y from the front waist region 14 to the rear waist region 15.

While the front waist region 14 including the elastic member-free region between the front waist interior elastic region 38 and the front waist intermediate elastic region 39 in the vertical direction Y has been exemplarily described, the elastic member-free region need not be provided.

While the rear waist region 15 including the elastic member-free region between the rear waist interior elastic region 42 and the rear waist intermediate elastic region 42 in the vertical direction Y has been exemplarily described, the elastic member-free region need not be provided.

With respect to the diaper 10 according to the embodiment as previously described, the tensile stress in the front and rear waist exterior elastic regions 37, 41 has been described to be higher than the tensile stress in the front and rear intermediate elastic regions 39, 42. However, the present invention is not limited to such case and the tensile stress in the front and rear waist intermediate elastic regions 39, 42 may be the same as the tensile stress in the front and rear exterior elastic regions 37, 41.

Second Embodiment

Referring to Fig. 9, according to this embodiment, the liquid-absorbent structure 11 is formed of the absorbent core 58, the body-side liner (topsheet), the exterior cover (backsheet) 60 and the leakage-barrier sheets 61. Meanwhile, the front waist panel 18 includes neither the front leakage-barrier sheet 28 nor the reinforcing layer 30 and the leakage-barrier sheet 61 of the liquid-absorbent structure 11 extends toward the waist-opening's front end edge 22a. The waist interior layer 24 extends in the vertical direction Y to the vicinity of the waist-opening's front end edge 22a. The front waist elastic members 31, 33, 35 are arranged between the waist interior layer 24 and the waist exterior layer 26. The leakage-barrier sheet 61 is arranged between the waist interior layer 24 and the backsheet 60. The absorbent core 48 is wrapped in a core wrapping sheet (not shown).

Referring to Fig. 10, the rear waist panel 19 includes neither the rear leakage-barrier sheet 29 nor the reinforcing layer 30 and the leakage-barrier sheet 61 of the liquid-absorbent structure 11 extends toward the waist-opening's rear end edge 22b. The waist interior layer 25 extends in the vertical direction Y to the vicinity of the waist-opening's rear end edge 22b. The rear waist elastic members 32, 34, 36 are arranged between the waist interior layer 25 and the waist exterior layer 27. The leakage-barrier sheet 61 is located between the waist interior layer 25 and the backsheet 60.

Referring to Fig. 9 and Fig. 10, the spacing dimension L7 in the vertical direction Y from one outer end edge 61a of the leakage-barrier sheet 61 in the front waist region 14 to the front end edge 22a of waist-opening is larger than a spacing dimension L8 in the vertical direction Y from the other outer end edge 61b of the leakage-barrier sheet 61 in the rear waist region 15.

The diaper according to the second embodiment has the same function-effect as those ensured by the diaper 10 according to the first embodiment. In addition, it is unnecessary to provide the front and rear waist panels 18, 19 individually with the front and rear leakage-barrier sheets 28, 29 and, for this reason, it is possible to reduce the component cost and to facilitate the production.

Third Embodiment

Referring to Fig. 11, according to the present embodiment, first graphics 71 which are visually recognizable through the non-skin-facing surface are arranged on both lateral portions of the elastic crotch panel 13. In Fig. 11, regions in which the first graphics 71 are formed are indicated by a reference sign 72. The first graphics 71 respectively include first elements 73 extending in the lateral direction X.

According to the present embodiment, a second graphic 74a is formed on the non-skin-facing surface of the front leakage-barrier sheet 28 and visually recognizable through the non-skin-facing surface of the diaper 10. In Fig. 11, a region in which the second graphic 74a is formed is indicated by a reference sign 75. The second graphic 74a is formed, for example, across the full width of the front leakage-barrier sheet 28. The second graphic 74a includes second elements 76 extending in the vertical direction Y. In the front waist panel 18 the region 75 in which the second graphic 74a is formed includes, in the vicinity of the waist-opening's front end edge 22a, a non-graphic -display region 80 in which the second graphic 74a is not formed.

In a similar fashion, a second graphic 74b is formed on the non-skin-facing surface of the rear leakage-barrier sheet 29 and visually recognizable through the non-skin-facing surface of the diaper 10. In Fig. 11, a region in which the second graphic 74b is formed is indicated by a reference sign 77. The second graphic 74b is formed, for example, across the full width of the rear leakage-barrier sheet 29. The second graphic 74b includes second elements 78 extending in the vertical direction Y. In the rear waist panel 19 the region 77 in which the second graphic 74b is formed includes, in the vicinity of the waist-opening's rear end edge 22b, a non-graphic display region 81 in which the second graphic 74b is not formed.

Referring to Fig. 12, a plurality of wrinkles 79 extending in the vertical direction Y are formed in the rear waist region 15 under contraction of the first and second rear waist elastic members 32, 34. The direction of the wrinkles 79 formed in the rear waist region 15 may be brought in line with the direction in which the forming elements 78 of the second graphic 74b to distinguish the waist-opening's rear end edge 22b in the rear waist region 15. Therefore, if the rear waist panel 19 gets turned up, the wearer or the third person is easily aware of this from the state of the second elements 78. The same is true of the side of the front waist region 14.

Besides, the first graphics 71 and the second graphic 74b may be formed in the same manner to make it easy for the wearer to understand where the regions functioning to prevent leakage of body exudates are located.

Fourth Embodiment

Referring to Fig. 13, the front waist panel 18 according to the present embodiment has, in addition to the front waist elastic members 31, 33, 35 arranged at given intervals in the vertical direction Y, a front outer end region 137 located on the side of the waist-opening's front end edge 22a, a front inner end region 138 located on the side of the crotch region 16 and a front intermediate region 139 defined between the front outer end region 137 and the front inner end region 138 so as to trisect the length dimension in the vertical direction Y from the waist-opening's front end edge 22a to the lower end edge.

Referring to Fig. 14, the rear waist panel 19 according to the present embodiment has, in addition to the rear waist elastic members 32, 34, 36 arranged at given intervals in the vertical direction Y, a rear outer end region 140 located on the side of the waist-opening's rear end edge 22b, a rear inner end region 141 located on the side of the crotch region 16 and a rear intermediate region 142 defined between the rear outer end region 140 and the rear inner end region 141 so as to trisect the length dimension in the vertical direction Y from the waist-opening's rear end 22b to the lower end edge.

The fineness and the stretch ratio of the respective waist elastic members 31 through 36 set as described above result in a correlation of the tensile stresses in the respective regions 140 through 142 in the rear waist region 15 represented by the rear outer end region 140 ≥ intermediate region 142 > the rear inner end region 141. In consequence, it is possible to prevent the diaper 10 from being

PANT-TYPE DISPOSABLE ABSORBENT ARTICLE

Description

Technical Field

The present invention relates to pant-type disposable absorbent articles such as a disposable diaper, a disposable toilet-training pant and a disposable incontinence pant.

Background

Conventionally, pant-type disposable absorbent articles are known having a vertical direction and a lateral direction being orthogonal to the former and including a skin-facing surface, a non-skin-facing surface opposite to the former, a front waist region, a rear waist region, a crotch region located between the front and rear waist regions and an absorbent core located at least in the crotch region wherein a waist-opening and a pair of leg-openings are defined by joining respective opposite side edge portions of the waist region to each other. For example, Patent Literature 1 discloses the absorbent article wherein the absorbent core extends in the vertical direction from the crotch region across the front and rear waist regions to the vicinity of the end portion of the waist-opening, each of the front and rear waist regions includes a liquid-permeable topsheet located on the side of the skin-facing surface and a liquid-impermeable backsheet located on the side of the non-skin-facing surface so that the liquid-impermeable backsheet extends in the vertical direction beyond the liquid-permeable topsheet and respective protruding portions of the liquid-impermeable backsheet are folded back along respective end portions of the front and rear waist regions onto the skin-facing surface of the liquid-permeable topsheet and fixed to the respective liquid-permeable sheets.

Citation List

Patent Literature

PTL 1: JUM H03-122823 A

Summary

unintentionally displaced downward even if the tensile stress of the leg-elastic region 62 is set relatively low.

A correlation of the extensibility in the leg-elastic region 62 and the rear outer end region 140 preferably satisfies the relation represented by the leg-elastic regions 62 < the rear outer end region 140 and a correlation of the extensibility between the leg-elastic region 62 and the rear intermediate region 142 preferably satisfies the relation represented by the leg-elastic region 62 < the rear intermediate region 142.

For the infants wearing the diaper 10, the wearers often show movements peculiar to the infants, for example, floats their waists to put their toes in their mouths and/or crosses their legs in side lying position. Such movements may cause some problems, for example, the rear inner end region 141 may be pulled under contraction of the leg elastic region 62, whereby the rear waist region 15 as a whole may be displaced forward and the dorsal region of the infant may be exposed. In such situation, if the extensibility of the leg-elastic region 62 is higher than those of the respective regions 140 through 142 in the rear waist region 15, the rear waist region 15 may be easily moved forward. However, according to the present embodiment, the extensibility of the leg elastic region 62 is set to be lower than those of both the rear outer end region 140 and the rear intermediate region 142 thereby to prevent the rear inner end region 141 from being remarkably displaced and also to prevent the rear waist region 15 as a whole from being displaced forward even when the rear inner end region 141 is subjected to a force pulling this region 141 forward under contraction of the leg-elastic region 62. In addition, the respective extensibilities of the rear intermediate region 142 and the rear outer end region 140 are set relatively high so that the portion defined by the rear intermediate region 142 and the rear outer end region 140 may fit the wearer's body and be reliably caught by an upper ends of the buttocks.

The constituent elements of the pant-type disposable diaper 10 are not limited to those described in the specification but the other various types of material widely used in the relevant technical field may be used without limitation unless otherwise stated. Terms "first", "second" and "third" used in the specification and Claims of the present invention are used merely to distinguish the similar elements, similar positions or the other similar items.

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

First Aspect of the Invention

A pant-type disposable absorbent article having a vertical direction, a lateral direction orthogonal to the former, a skin-facing surface and a non-skin-facing surface opposed to the former and including a front waist region, a rear waist region, a crotch region located between the front and rear waist regions, an absorbent core located at least in the crotch region, and a waist-opening and a pair of leg-openings defined by joining both side edge portions of the front waist region to both side edge portions of the rear waist region wherein the front waist region includes the waist-opening's front end edge defining a portion of the waist-opening, a front waist retention region circumferentially elastic around the wearer's waist and located on the side of the waist-opening's front end edge and a leakage-barrier sheet located on the side of the non-skin-facing surface of the absorbent core, the rear waist region includes the waist-opening's rear end edge defining a portion of the waist-opening, a rear waist retention region circumferentially elastic around the wearer's waist and located on the side of the waist-opening's rear end edge and the leakage-barrier sheet located on the side of the non-skin-facing surface of the absorbent core and a spacing dimension in the vertical direction from an outer end edge of the leakage-barrier sheet in the front waist region to the waist-opening's front end edge is larger than a spacing dimension in the vertical direction from an outer end edge of the leakage-barrier sheet in the rear waist region and a spacing dimension in the vertical direction from the front end edge of the absorbent core to the waist-opening's front end edge is smaller than a spacing dimension in the vertical direction from the rear end edge of the absorbent core to the waist-opening's rear end edge.

Second Aspect of the Invention

A pant-type disposable absorbent article having a vertical direction, a lateral direction orthogonal to the former, a skin-facing surface and a non-skin-facing surface opposed to the former and including a front waist region, a rear waist region, a crotch region located between the front and rear waist regions, an absorbent core located at least in the crotch region, and a waist-opening and a pair of leg-openings defined by joining both side edge portions of the front waist region to both side edge portions of the rear waist region wherein the rear waist region includes a waist-opening's end edge defining a portion of the waist-opening, a waist elastic region circumferentially elastic around the wearer's waist, a sheet defining the waist elastic region and a leakage-barrier sheet located on the side of the non-skin-facing surface of the absorbent core, the leakage-barrier sheet extends beyond a rear end edge of the absorbent core toward the waist-opening's end edge, the waist elastic region is formed at least between the rear end edge of the absorbent core and the waist-opening's end edge and a dimension in the vertical direction of the portion of the leakage-barrier sheet extending beyond the rear end edge of the absorbent core toward the waist-opening's end edge is larger than a dimension in the vertical direction of the absorbent core in the rear waist region.

The present invention disclosed in the paragraph {0098} may include embodiments at least as described below and these embodiments may be taken in isolation or in combination.

(1) Being provided with a liquid-absorbent structure including the absorbent core, a topsheet located on the skin-facing surface of the absorbent core, a backsheet located on the non-skin-facing surface of the absorbent core and the leakage-barrier sheet located on the non-skin-facing surface of the backsheet.

(2) Being provided with a liquid-absorbent structure including the absorbent core, a topsheet located on the skin-facing surface of the absorbent core, a backsheet located on the non-skin-facing surface of the absorbent core and a liquid-impermeable sheet located on the non-skin-facing surface of the backsheet, and the leakage-barrier sheet is located on the non-skin-facing surface of the liquid-absorbent structure.

(3) The absorbent core continuously extends in the vertical direction and a position in the vertical direction of the rear end edge of the absorbent core is lower than a position of the front end edge of the absorbent core.

(4) The front waist retention region and the rear waist retention region are set on the basis of a length dimension from the waist-opening's front end edge in the front waist region to the front end edge of the absorbent core and the rear waist retention region has a portion in which the number of sheets is fewer than the number of sheets forming the front waist retention region.

(5) A mass per unit area of a sheet forming the rear waist retention region is smaller than a mass per unit area of the front waist retention region.

(6) The front waist region and the rear waist region respectively have a front waist central region and a rear waist central region extending in the vertical direction over a given length dimension from a lower end edge of the front waist retention region toward the crotch region and bordering on the front and rear waist retention regions, and a circumferential tensile stress around the wearer's waist per unit length in the vertical direction of the rear waist retention region is larger than a circumferential tensile stress around the wearer's waist per unit length in the vertical direction of the rear waist central region.

(7) The rear waist retention region includes rear waist elastic members arranged on the side of the non-skin-facing surface of the liquid-absorbent structure so as to extend in the lateral direction and the rear waist elastic members continuously extend around the wearer's waist.

(8) An externally recognizable graphic is displayed on the non-skin-facing surface of the leakage-barrier sheet and the graphic has forming elements extending in the vertical direction.

(9) The rear waist region has a rear outer end region located on the side of the waist-opening's rear end edge, a rear inner end region located on the side of the crotch region and a rear intermediate region located between the rear outer end region and the rear inner end region so as to trisect a length dimension in the vertical direction from the waist-opening's rear end edge to the lower end edge of the side of the crotch region wherein a correlation of the tensile stresses in the rear outer end region, the rear inner end region and the rear intermediate region is represented by the rear outer end region ≥ the rear intermediate region > the rear

inner end region.

(10) Further including leg-elastic regions arranged along respective portions of the leg-openings and a correlation between respective extensibilities in the leg-elastic regions and the rear outer end region is represented by the leg-elastic regions < the rear outer end region and a correlation of respective extensibilities between the leg-elastic regions < the intermediate region.

Reference Signs List

10	pant-type disposable absorbent article (disposable pull-on diaper)
11	liquid-absorbent structure
14	front waist region
15	rear waist region
16	crotch region
18	front waist panel
19	rear waist panel
22	waist-opening
22a	front end edge of waist-opening
22b	rear end edge of waist-opening
23	leg-openings
28	front leakage-barrier sheet
29	rear leakage-barrier sheet
32	first rear waist elastic members
34	second rear waist elastic members
49a	front waist elastic region
49b	front waist retention region
49c	front waist central region
50a	rear waist elastic region
50b	rear waist retention region
50c	front waist central region
58	absorbent core
58a	front end edge
58b	rear end edge
59	body side liner (topsheet)

60 exterior cover (backsheet)

61 leakage-barrier sheet

62 leg elastic region

74a second graphics

76 second elements

137 front outer end region

138 front inner end region

139 front intermediate region

140 rear outer end region

141 rear inner end region

142 rear intermediate region

L1 spacing dimension in vertical direction from outer end edge of front leakage-barrier sheet in front waist region to waist-opening's front end edge

L2 spacing dimension in vertical direction from outer end edge of rear leakage-barrier sheet in rear waist region to waist-opening's rear end edge

L3 spacing dimension in vertical direction from front end edge of absorbent core to waist-opening's front end edge

L5 spacing dimension in vertical direction from rear end edge of absorbent core to waist-opening's front end edge

L6 dimension in vertical direction of absorbent core in rear waist region

L9 dimension in vertical direction of waist retention region (length dimension from waist-opening's front edge to front end edge of absorbent core in front waist region)

L10 dimension in vertical direction of waist central region (length dimension extending in vertical direction from lower end edge in front waist retention region)

X lateral direction

Y vertical direction

Technical Problem

In the absorbent article disclosed in Patent Literature 1, the protruding portions of the respective liquid-impermeable backsheets are folded back onto the skin-facing surface of the respective liquid-permeable topsheets and fixed thereto, whereby leakage of body exudates from the vicinity of end portions in the vertical direction of the front and rear waist regions may be prevented.

Meanwhile, infants such as it is still difficult to stand on their legs lie on their back nearly the whole day over and often excretes feces, inclusive of loose fecal matter.

The absorbent core located so as to extend across the crotch region to a region in the vicinity of the waist-opening's end edge defining a portion of the waist-opening as disclosed in Patent Literature 1 caused a problem such that, when not a liquid-absorbent structure having a high stiffness but the region may be exclusively contracted under an extensional stress of the elastic members, this region may be formed with significant wrinkles and undulations preventing the absorbent article from being kept in close contact with the wearer's waist, leaving a gap between the wearer's waist and the absorbent article and the body exudates may leak out from the waist-opening's end edge.

An object of the present invention is to improve the conventional absorbent articles and to provide a pant-type disposable absorbent article making it possible to prevent body exudates from leaking through the waist-opening.

Solution to Problem

To solve the problem set forth above, a first aspect of the present invention is directed to a pant-type disposable absorbent article having a vertical direction, a lateral direction orthogonal to the former, a skin-facing surface and a non-skin-facing surface opposed to the former and including a front waist region, a rear waist region, a crotch region located between the front and rear waist regions, an absorbent core located at least in the crotch region, and a waist-opening and a pair of leg-openings defined by joining both side edge portions of the front waist region to both side edge portions of the rear waist region wherein the front waist region includes the waist-opening's front end edge defining a portion of the waist-opening, a front waist retention region circumferentially elastic around the wearer's waist and located on the side of the waist-opening's front end edge and a leakage-barrier sheet located on the side of the non-skin-facing surface of the absorbent core, the rear waist region includes the waist-opening's rear end edge defining a portion of the waist-opening, a rear waist retention region circumferentially elastic around the wearer's waist and located on the side of the waist-opening's rear end edge and the leakage-barrier sheet located on the side of the non-skin-facing surface of the absorbent core and a spacing dimension in the vertical direction from an outer end edge of the leakage-barrier sheet in the front waist region to the waist-opening's front end edge is larger than a spacing dimension in the vertical direction from an outer end edge of the leakage-barrier sheet in the rear waist region and a spacing dimension in the vertical direction from the front end edge of the absorbent core to the waist-opening's front end edge is smaller than a spacing dimension in the vertical direction from the rear end edge of the absorbent core to the waist-opening's rear end edge.

To solve the problem set forth above, a second aspect of the present invention is directed to a pant-type disposable absorbent article having a vertical direction, a lateral direction orthogonal to the former, a skin-facing surface and a non-skin-facing surface opposed to the former and including a front waist region, a rear waist region, a crotch region located between the front and rear waist regions, an absorbent core located at least in the crotch region, and a waist-opening and a pair of leg-openings defined by joining both side edge portions of the front waist region to both side edge portions of the rear waist region wherein the rear waist region includes a waist-opening's end edge defining a portion of the waist-opening, a waist elastic region circumferentially elastic around the wearer's waist, a sheet defining the waist elastic region and a leakage-barrier sheet located on the side of the non-skin-facing surface of the absorbent core, the leakage-barrier sheet extends beyond a rear end edge of the absorbent core toward the waist-opening's end edge, the waist elastic region is formed at least between the rear end edge of the absorbent core and the waist-opening's end edge, and a dimension in the vertical direction of the portion of the leakage-barrier sheet extending beyond the rear end edge of the absorbent core toward the waist-opening's end edge is larger than a dimension in the vertical direction of the absorbent core in the rear waist region.

Advantageous Effects of Invention

In the pant-type disposable absorbent article according to the first aspect of the present invention including one or more embodiments, the spacing dimension in the vertical direction from the waist-opening's front end edge to the front end edge of the absorbent core is smaller than the spacing in the vertical direction from the waist-opening's rear end edge to the rear end edge of the absorbent core and, in consequence, a likelihood that the rear waist retention region may be spaced from the wearer's skin owing to the rigidity of the absorbent core is sufficiently reduced to assure that the rear waist region of the absorbent article fits the wearer's back. In addition, the spacing dimension in the vertical direction from the outer end edge of the leakage-barrier sheet in the front waist region to the waist-opening's front end edge is larger than the spacing dimension in the vertical direction from the outer end edge of the leakage-barrier sheet in the front waist region to the waist-opening's rear end edge and, in consequence, it is possible to prevent the body exudates from leaking out beyond the waist-opening's end edge of the rear waist region.

In the pant-type disposable absorbent article according to the second aspect of the present invention including one or more embodiments, the dimension in the vertical direction of the portion extending from the rear end edge of the absorbent core toward the waist-opening's end edge is larger than the dimension in the vertical direction of the absorbent core in the rear waist region. With such dimension control, it is possible to reduce the likelihood that the waist elastic region may be spaced from the wearer's skin owing to the rigidity of the absorbent core, thereby to ensure that the rear waist region of the absorbent article fits the wearer's back and to prevent the body exudates from leaking out beyond the waist-opening's end edge of the rear waist region.

Brief Description of Drawings

The drawings illustrate specific embodiments of the present invention including optional and preferred embodiments as well as essential features of the invention.

Fig. 1 Perspective view of a pant-type disposable diaper according to a first embodiment as an example of the pant-type disposable absorbent article according to the present invention.

Fig. 2 Partially cutaway plan view of the diaper extended in vertical and lateral directions up to the maximum extensibilities of respective elastic members (to such a degree that gathers formed under contraction of the elastic members disappear).

Fig. 3 Partially cutaway exploded perspective view of the diaper.

Fig. 4 Schematic sectional view taken along line IV-IV in Fig. 2.

Fig. 5 Schematic sectional view taken along line V-V in Fig. 2.

Fig. 6 (a) Partially cutaway scale-enlarged view of a rear waist region; and (b) partially cutaway scale-enlarged view of a front waist region

Fig. 7 Perspective front view of the diaper put on the wearer's body.

Fig. 8 Perspective back view of the diaper put on the wearer's body.

Fig. 9 Schematic sectional view similar to Fig. 4, illustrating the diaper according to a second embodiment.

Fig. 10 Schematic sectional view similar to Fig. 5, illustrating the diaper according to the second embodiment.

Fig. 11 Partially cutaway plan view similar to Fig. 2, illustrating the diaper according to a third embodiment.

Fig. 12 Perspective view similar to Fig. 8, illustrating the diaper according to the third embodiment.

Fig. 13 Schematic sectional view similar to Fig. 4, illustrating the diaper according to a fourth embodiment.

Fig. 14 Schematic sectional view similar to Fig. 5, illustrating the diaper according to the fourth embodiment.

Description of Embodiments

The embodiments described below is directed to a pant-type disposable diaper illustrated in Figs. 1 through 14 including optional and preferred embodiments as well as essential features of the invention.

First Embodiment

Referring to Figs. 1 through 3, a diaper 10 has a vertical axis P, a lateral axis Q, a vertical direction Y, a lateral direction X, a skin-facing surface and a non-skin-facing surface opposite to the former and includes an annular elastic waist panel 12 circumferentially extending around a wearer's waist, a liquid-absorbent structure joined to the skin-facing surface of the elastic waist panel 12 and an elastic crotch panel 13 attached to the skin-facing surface of the elastic waist panel 12. In addition, the diaper 10 has a front waist region 14, a rear waist region 15 and a crotch region 16 located between the front and rear waist regions 14, 15 wherein the diaper 10 is symmetric about the vertical axis P.

<elastic waist panel>

The elastic waist panel 12 functions as an elastic belt to hold the liquid-absorbent structure in a crotch of the wearer and has a front waist panel 18 defining the front waist region 14 and a rear waist panel 19 defining the rear waist region 15. The front waist panel 18 has a laterally long rectangular shape defined by an inner end edge 18a, an outer end edge 18b and both side edges 18c, 18d extending between the inner and outer end edges 18a, 18b. The rear waist panel 19 has a laterally long rectangular shape defined by an inner end edge 19a, an outer end edge 19b and both side edges 19c, 19d extending between the inner and outer end edges 19a, 19b. The side edges 18c, 18d of the front waist panel 18 and the corresponding side edges 19c, 19d of the rear waist panel 19 are overlapped and joined to each other at seams arranged continually in the vertical direction Y by known welding means, for example, heat embossing/debossing or ultrasonic welding so that a waist-opening 22 and a pair of leg-openings may be formed. The waist-opening 22 is defined by a front end edge 22a of the waist-opening in the front waist panel 18 and a rear end edge 22b of the waist-opening in the rear waist panel 19. The present invention is directed to the diaper 10 wherein the front and rear waist panels 18, 19 are overlapped each other so that both the respective upper end portions thereof may be aligned in the waist-opening and both respective lower end portions thereof also may be aligned and not to a diaper wherein the upper and/or lower end portions in any one of the front and rear waist panels 18, 19 protrude up- and/or downward beyond the upper and/or lower end portions of the other waist panel. In this regard, the expression "both the respective upper and lower end portions of the front and rear waist panels 18, 19 may be aligned" used herein includes an instance in which the upper and/or lower end portions of the front and rear waist panels 18, 19 are out of alignment to a certain degree caused by a production error. The term "out of alignment to a certain degree" used herein specifically suggests that, in producing the diaper 10, the upper end portions and/or the lower end portions of the front and rear waist panels 18, 19 may be sometimes out of alignment in the vertical direction Y within a range of 10 mm. In this regard, the front and rear waist regions 14, 15 respectively have both the side edge portions joined by the seams 20 and the inner end edges 18a, 19a mean lower ends of the respective joint regions defined by the seams 20 but not defined by respective inner edges of the front and rear waist regions 14, 15 located on the side of the crotch region 16.

The front and rear waist panels 18, 19 respectively have waist interior layers (waist interior layer sheets) 24, 25 located on the skin-facing surface and waist exterior layers (waist exterior layer sheets) 26, 27 located on the non-skin-facing surface. The waist exterior sheets 26, 27 have a width dimension in the vertical direction Y larger than the waist interior sheets 24, 25 and extend outward in the vertical direction Y beyond respective outer end edges 24a, 25a of the waist interior layers 24, 25.

<waist exterior layers>

As material for the waist exterior layers 26, 27, SMS (spun bond/melt blown/spun bond) fibrous nonwoven fabrics, spun bond nonwoven fabrics, air-through nonwoven fabrics, plastic sheets or laminate sheets of any of these fibrous nonwoven fabrics and the plastic sheet each having a mass per unit area ranging about 15 to about 30 g/m^2 may be used. The waist interior layers 24, 25 and the waist exterior layers 26, 27 are bonded to each other by suitable adhesives, for example, hot melt adhesives distributed to interior surfaces of at least respective one of the interior and exterior surfaces or by known thermal welding means.

<waist interior layer>

To form the waist interior layers 24, 25, known elastic fibrous nonwoven fabrics such as spun bond fibrous nonwoven fabrics, melt blown fibrous nonwoven fabrics, heat-roll fibrous nonwoven fabrics, SMS fibrous nonwoven fabrics, air-laid fibrous nonwoven fabrics and air-through fibrous nonwoven fabrics may be used in isolation or in combination. The elastic nonwoven fabric may be formed from, for example, elastomer resins of polyethylene series or polyurethane series or thermoplastic resins obtained from polyethylene, polypropylene, polyester or

Claims:

1. A pant-type disposable absorbent article having a vertical direction, a lateral direction orthogonal to the former, a skin-facing surface and a non-skin-facing surface opposed to the former and including a front waist region, a rear waist region, a crotch region located between the front and rear waist regions, an absorbent core located at least in the crotch region, and a waist-opening and a pair of leg-openings defined by joining both side edge portions of the front waist region to both side edge portions of the rear waist region wherein:

the front waist region includes the waist-opening's front end edge defining a portion of the waist-opening, a front waist retention region circumferentially elastic around the wearer's waist and located on the side of the waist-opening's front end edge and a leakage-barrier sheet located on the side of the non-skin-facing surface of the absorbent core;

the rear waist region includes the waist-opening's rear end edge defining a portion of the waist-opening, a rear waist retention region circumferentially elastic around the wearer's waist and located on the side of the waist-opening's rear end edge and the leakage-barrier sheet located on the side of the non-skin-facing surface of the absorbent core; and

a spacing dimension in the vertical direction from an outer end edge of the leakage-barrier sheet in the front waist region to the waist-opening's front end edge is larger than a spacing dimension in the vertical direction from an outer end edge of the leakage-barrier sheet in the rear waist region and a spacing dimension in the vertical direction from the front end edge of the absorbent core to the waist-opening's front end edge is smaller than a spacing dimension in the vertical direction from the rear end edge of the absorbent core to the waist-opening's rear end edge.

2. A pant-type disposable absorbent article having a vertical direction, a lateral direction orthogonal to the former, a skin-facing surface and a non-skin-facing surface opposed to the former and including a front waist region, a rear waist region, a crotch region located between the front and rear waist regions, an absorbent core located at least in the crotch region, and a waist-opening and a pair of leg-openings defined by joining both side edge portions of the front waist region to both side edge portions of the rear waist region wherein:

the rear waist region includes a waist-opening's end edge defining a portion of the waist-opening, a waist elastic region circumferentially elastic around the wearer's waist, a sheet defining the waist elastic region and a leakage-barrier sheet located on the side of the non-skin-facing surface of the absorbent core;

the leakage-barrier sheet extends beyond a rear end edge of the absorbent core toward the waist-opening's end edge;

the waist elastic region is formed at least between the rear end edge of the absorbent core and the waist-opening's end edge; and

a dimension in the vertical direction of the portion of the leakage-barrier sheet extending beyond the rear end edge of the absorbent core toward the waist-opening's end edge is larger than a dimension in the vertical direction of the absorbent core in the rear waist region.

3. The absorbent article according to claim 1 or 2 provided with a liquid-absorbent structure including the absorbent core, a topsheet located on the skin-facing surface of the absorbent core, a backsheet located on the non-skin-facing surface of the absorbent core and the leakage-barrier sheet located on the non-skin-facing surface of the backsheet.

4. The absorbent article according to claim 1 or 2 provided with a liquid-absorbent structure including the absorbent core, a topsheet located on the skin-facing surface of the absorbent core, a backsheet located on the non-skin-facing surface of the absorbent core and a liquid-impermeable sheet located on the non-skin-facing surface of the backsheet; and

the leakage-barrier sheet is located on the non-skin-facing surface of the liquid-absorbent structure.

5. The absorbent article according to claim 1 wherein the absorbent core continuously extends in the vertical direction and a position in the vertical direction of the rear end edge of the absorbent core is lower than a position of the front end edge of the absorbent core.

6. The absorbent article according to claim 1 wherein:

the front waist retention region and the rear waist retention region are set on the basis of a length dimension from the waist-opening's front end edge in the front waist region to the front end edge of the absorbent core; and

the rear waist retention region has a portion in which the number of sheets is fewer than the number of sheets forming the front waist retention region.

7. The absorbent article according to claim 1 wherein a mass per unit area of a sheet forming the rear waist retention region is smaller than a mass per unit area of the front waist retention region.

8. The absorbent article according to claim 6 wherein:

the front waist region and the rear waist region respectively have a front waist central region and a rear waist central region extending in the vertical direction over a given length dimension from a lower end edge of the front waist retention region toward the crotch region and bordering on the front and rear waist retention regions; and

a circumferential tensile stress around the wearer's waist per unit length in the vertical direction of the rear waist retention region is larger than a circumferential tensile stress around the wearer's waist per unit length in the vertical direction of the rear waist central region.

9. The absorbent article according to claim 6 wherein:

the rear waist retention region includes rear waist elastic members arranged on the side of the non-skin-facing surface of the liquid-absorbent structure so as to extend in the lateral direction; and

the rear waist elastic members continuously extend around the wearer's waist.

10. The absorbent article according to claim 5 wherein:

an externally recognizable graphic is displayed on the non-skin-facing surface of the leakage-barrier sheet; and

the graphic has forming elements extending in the vertical direction.

11. The absorbent article according to claim 1 wherein the rear waist region has a rear outer end region located on the side of the waist-opening's rear end edge, a rear inner end region located on the side of the crotch region and a rear intermediate region located between the rear outer end region and the rear inner end region so as to trisect a length dimension in the vertical direction from the

waist-opening's rear end edge to the lower end edge of the side of the crotch region wherein a correlation of the tensile stresses in the rear outer end region, the rear inner end region and the rear intermediate region is represented by the rear outer end region ≥ the rear intermediate region > the rear inner end region.

12. The absorbent article according to claim 11 further including leg-elastic regions arranged along respective portions of the leg-openings and a correlation between respective extensibilities in the leg-elastic regions and the rear outer end region is represented by the leg-elastic regions < the rear outer end region; and

a correlation of respective extensibilities between the leg-elastic regions < the intermediate region.

FIG.1

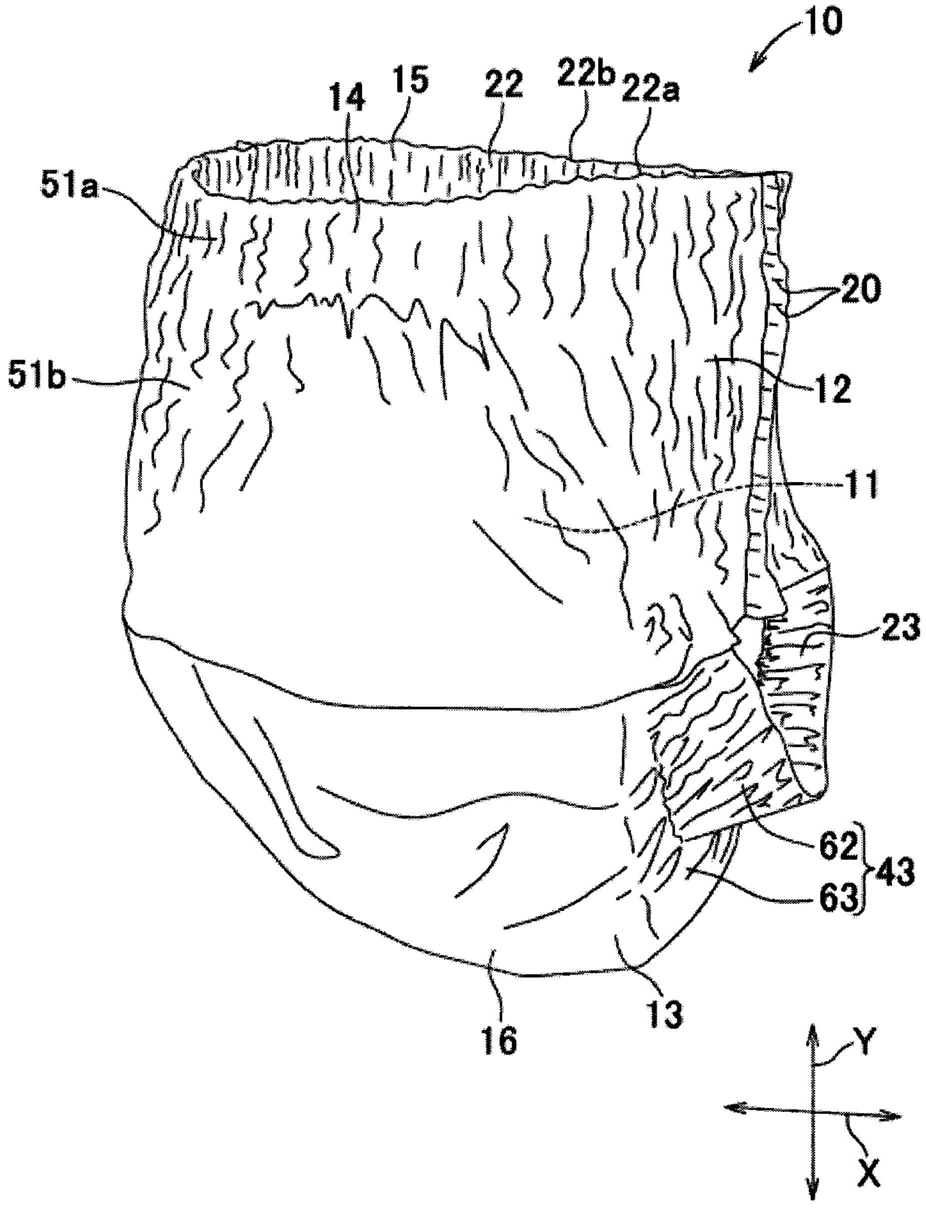

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FIG.2

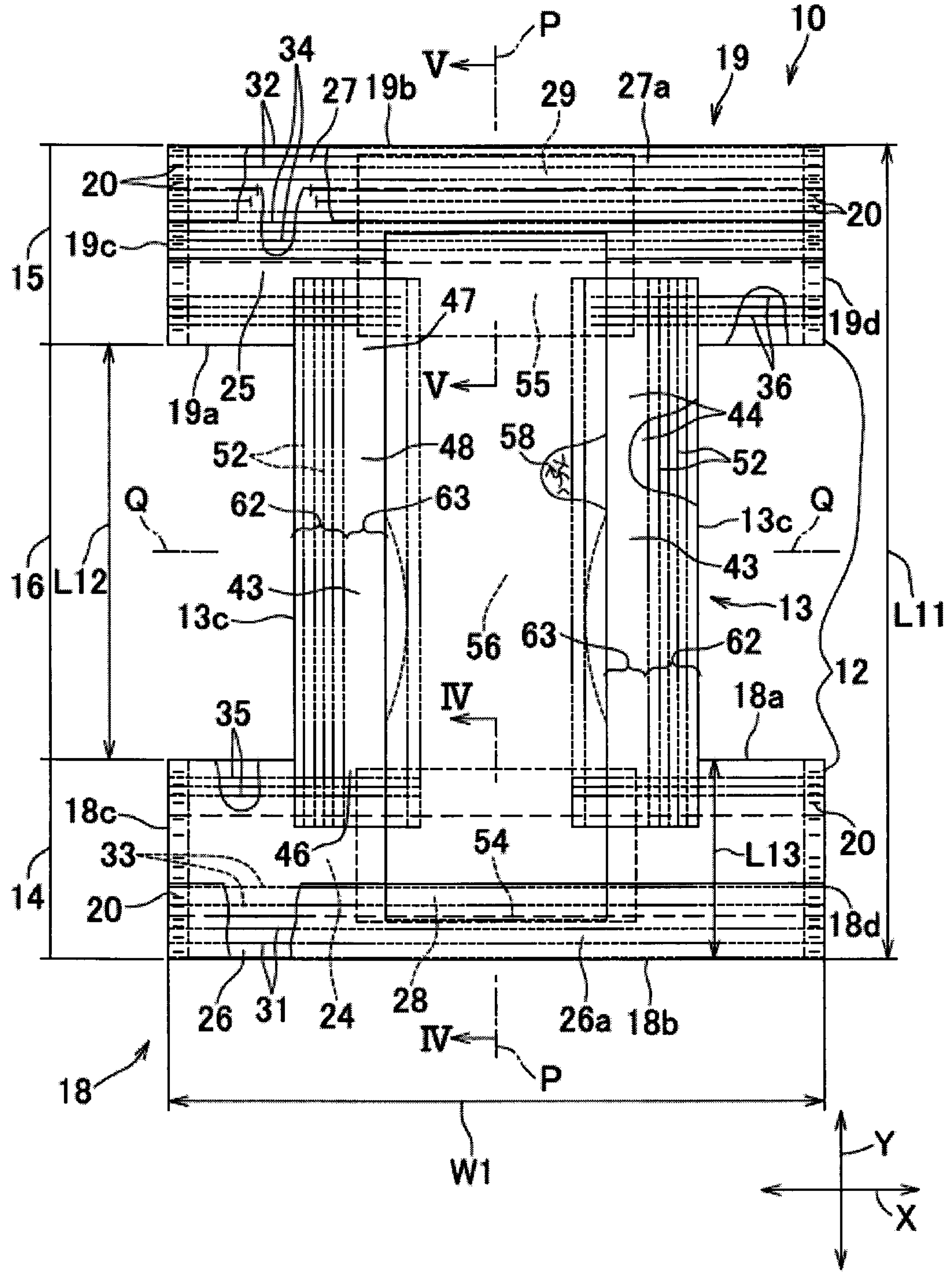

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FIG.3

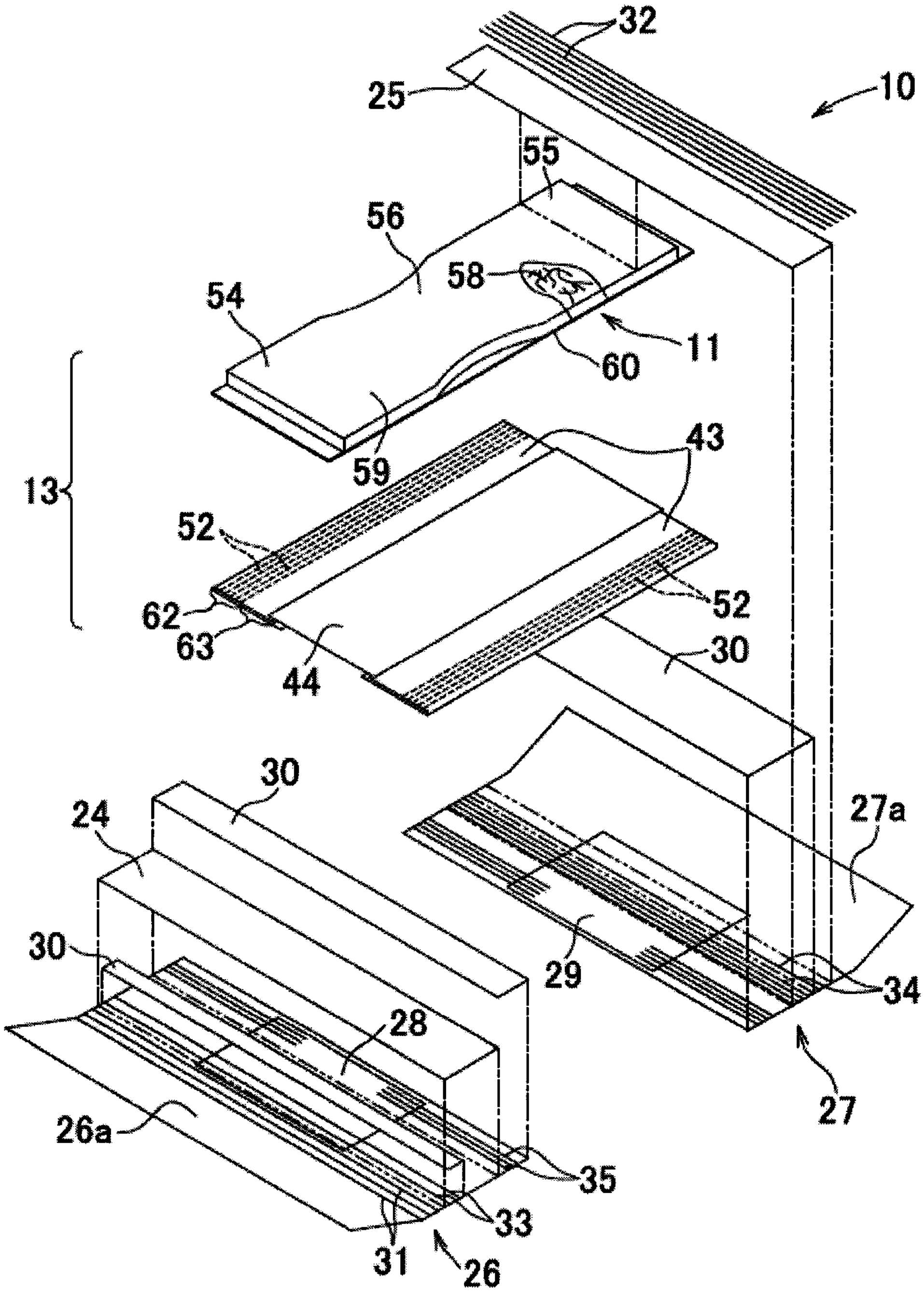

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FIG.4

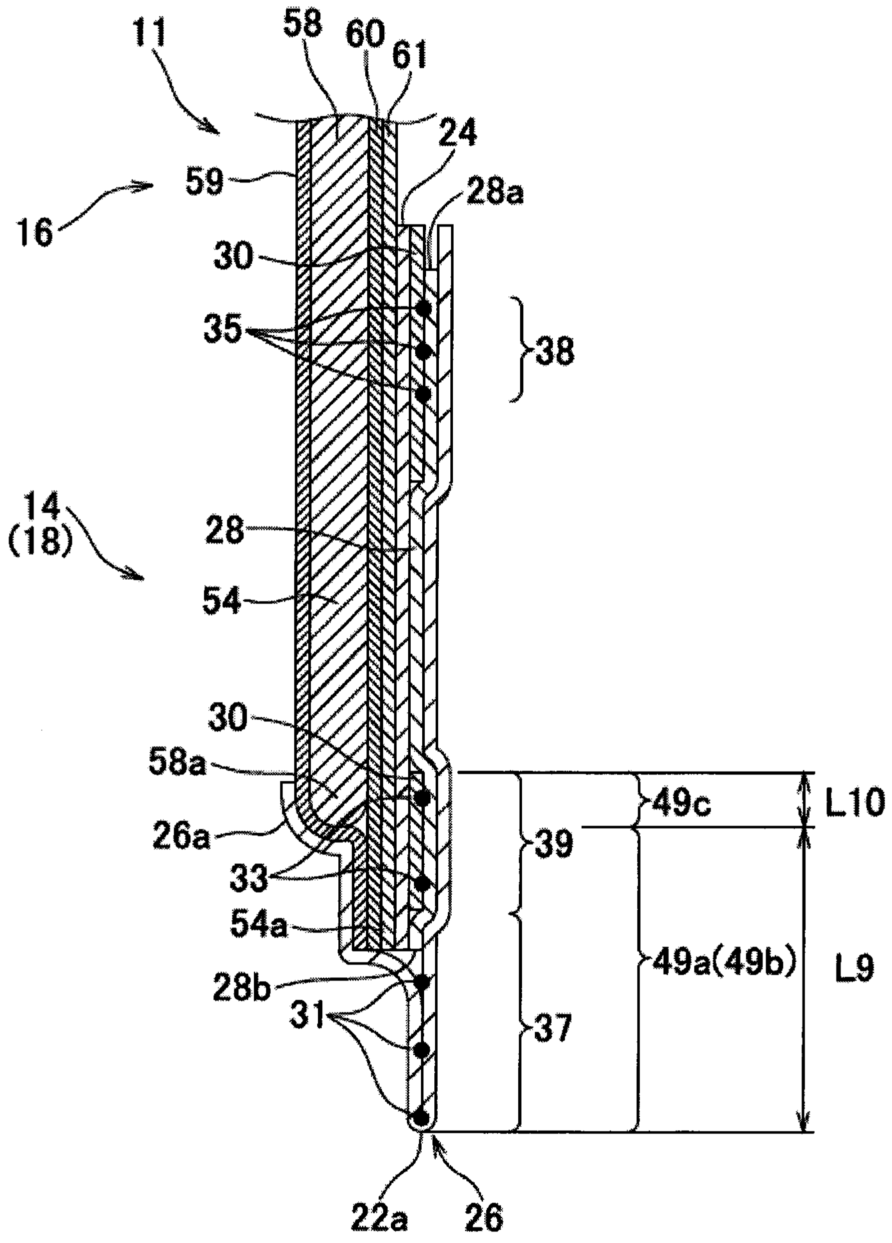

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FIG.5

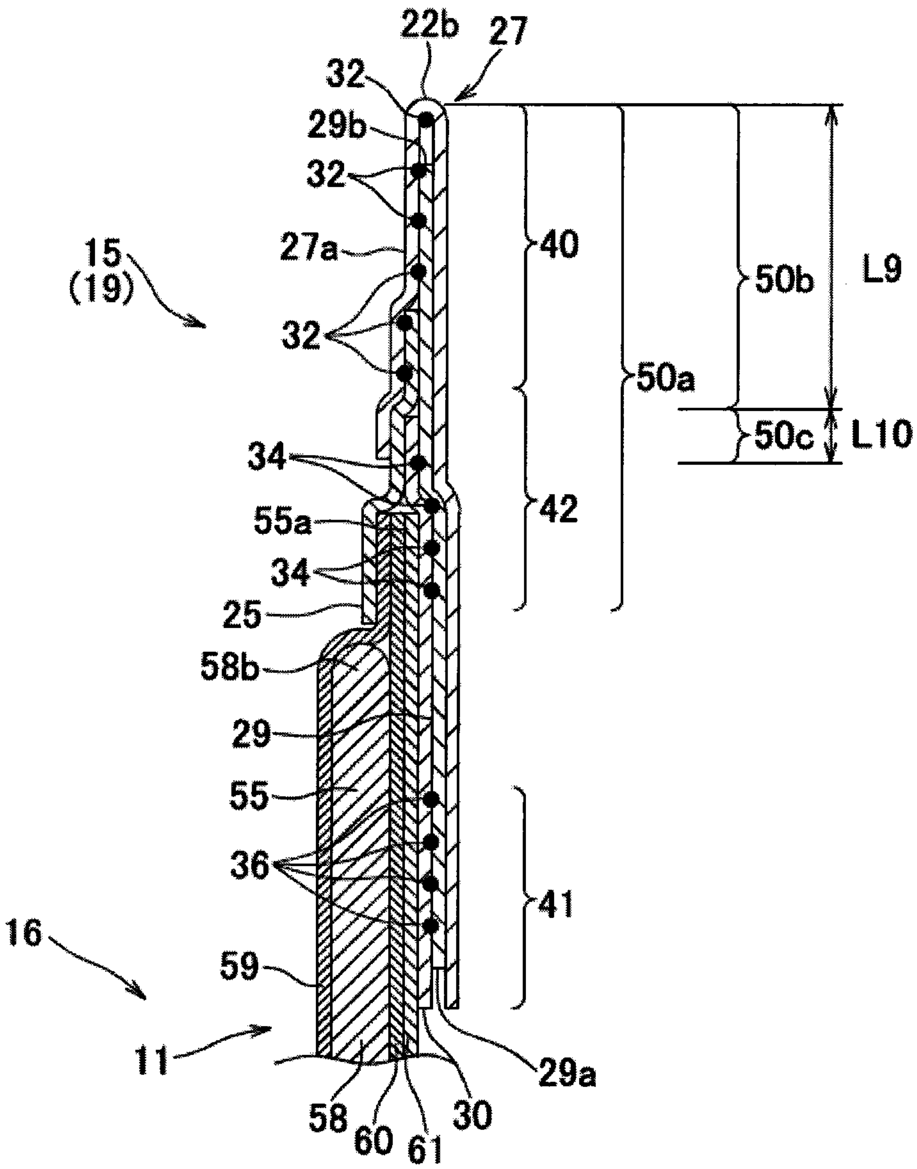

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FIG.6

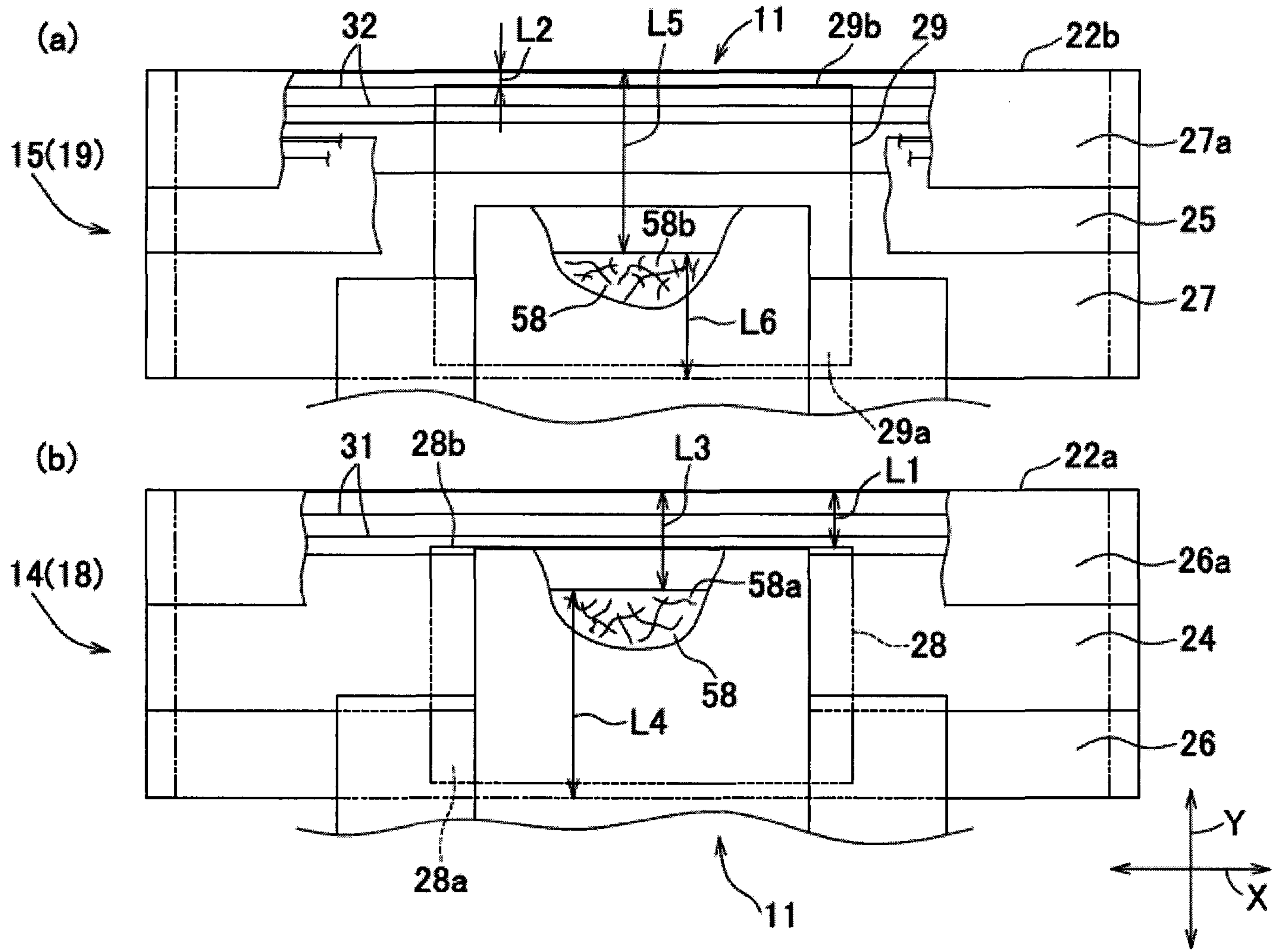

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FIG.7

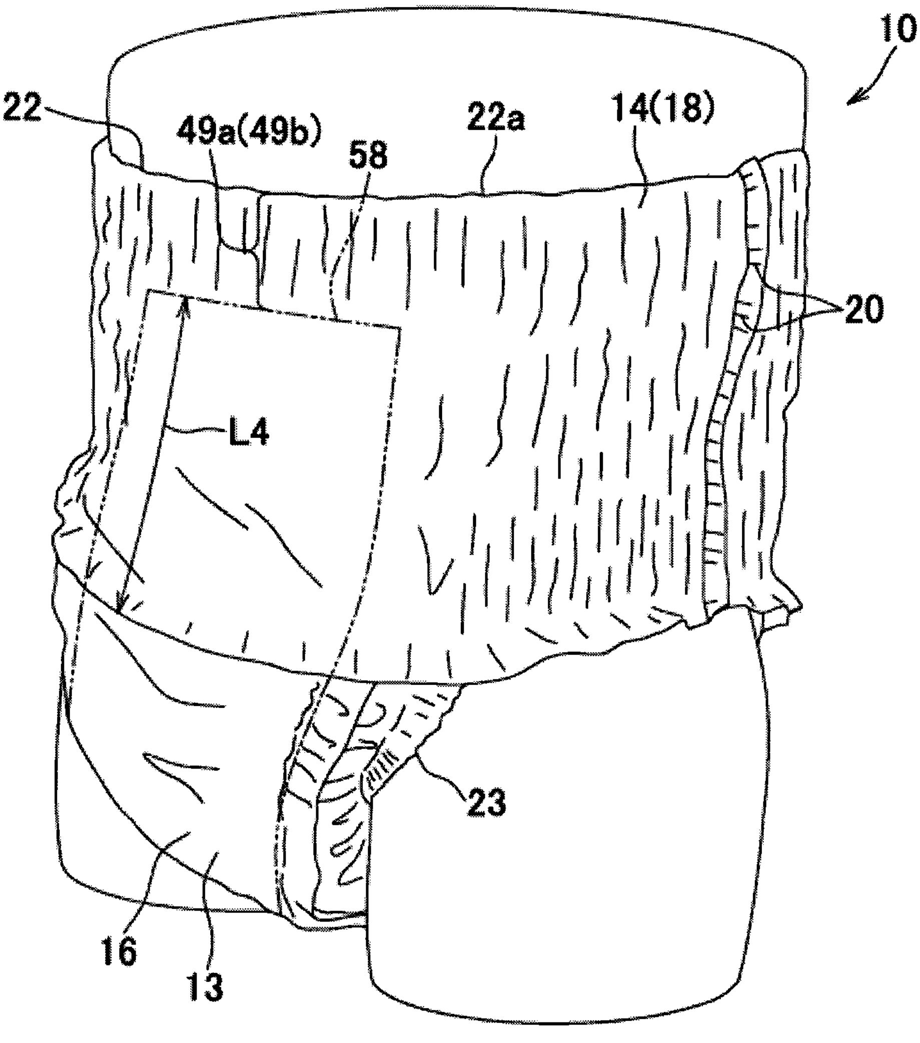

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FIG.8

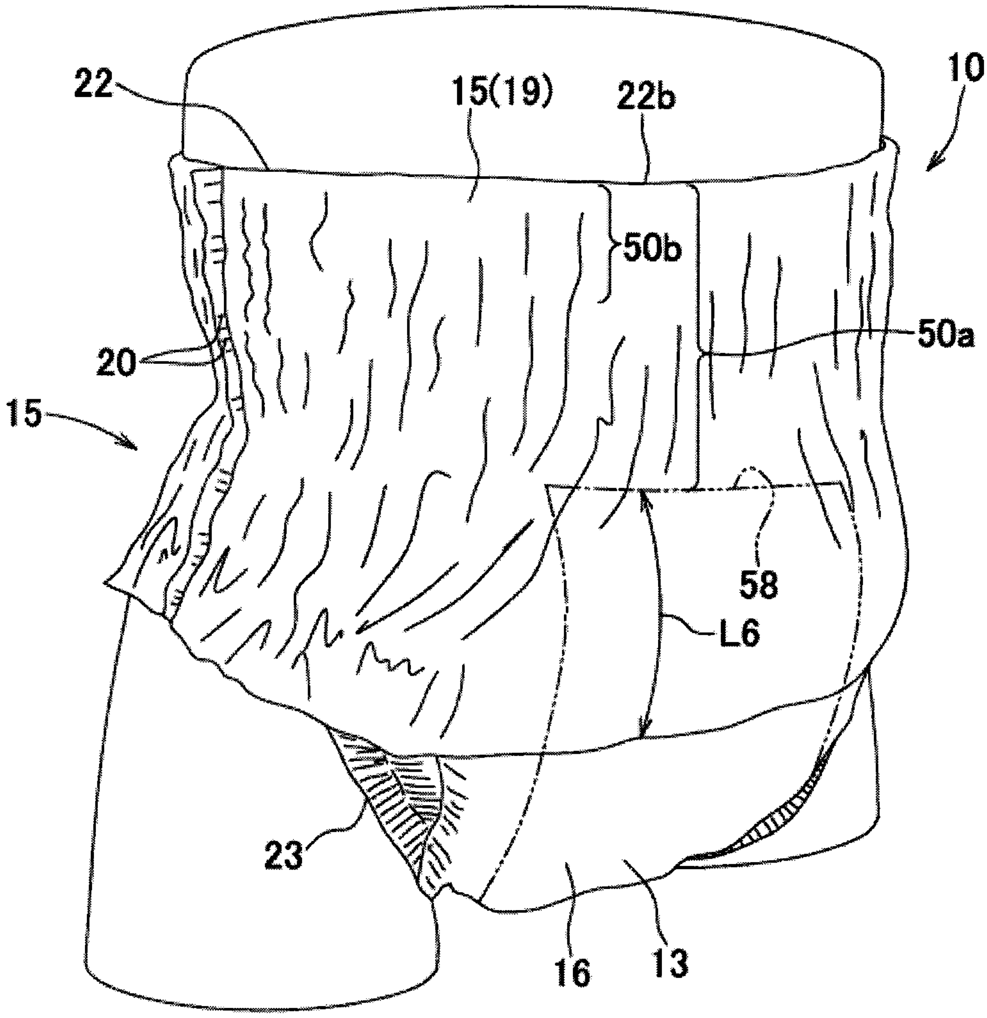

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FIG.9

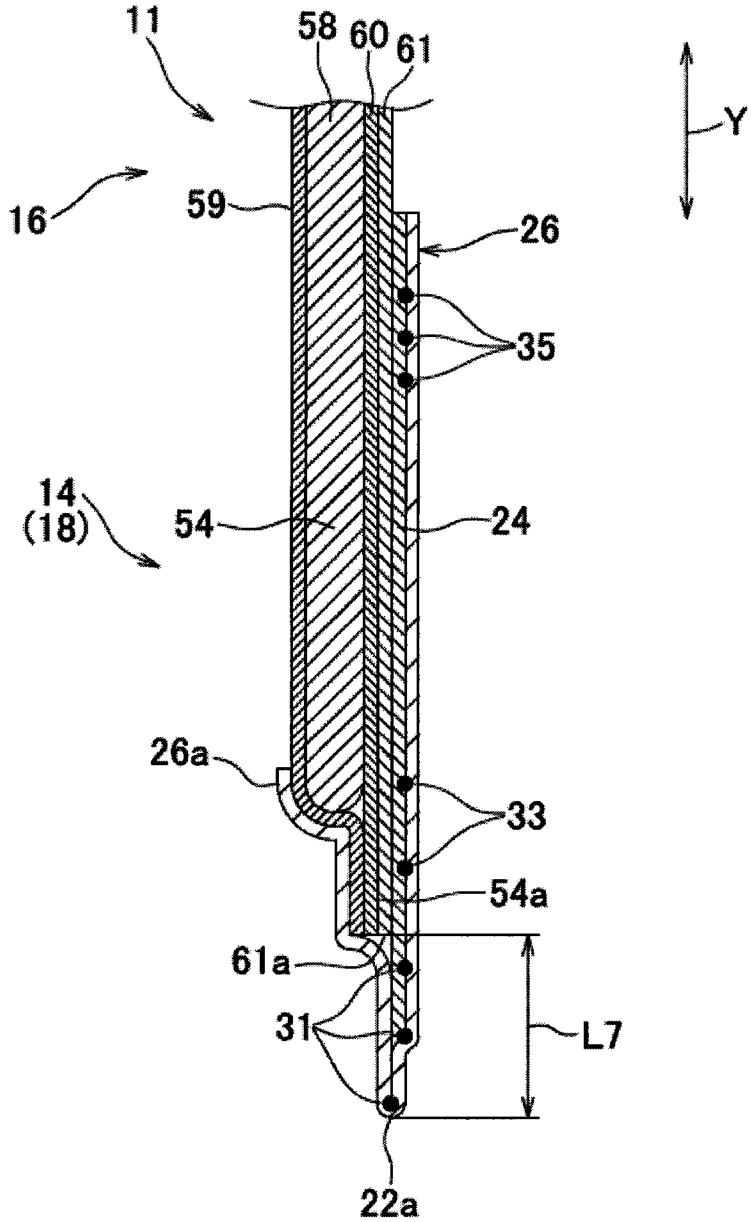

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FIG.10

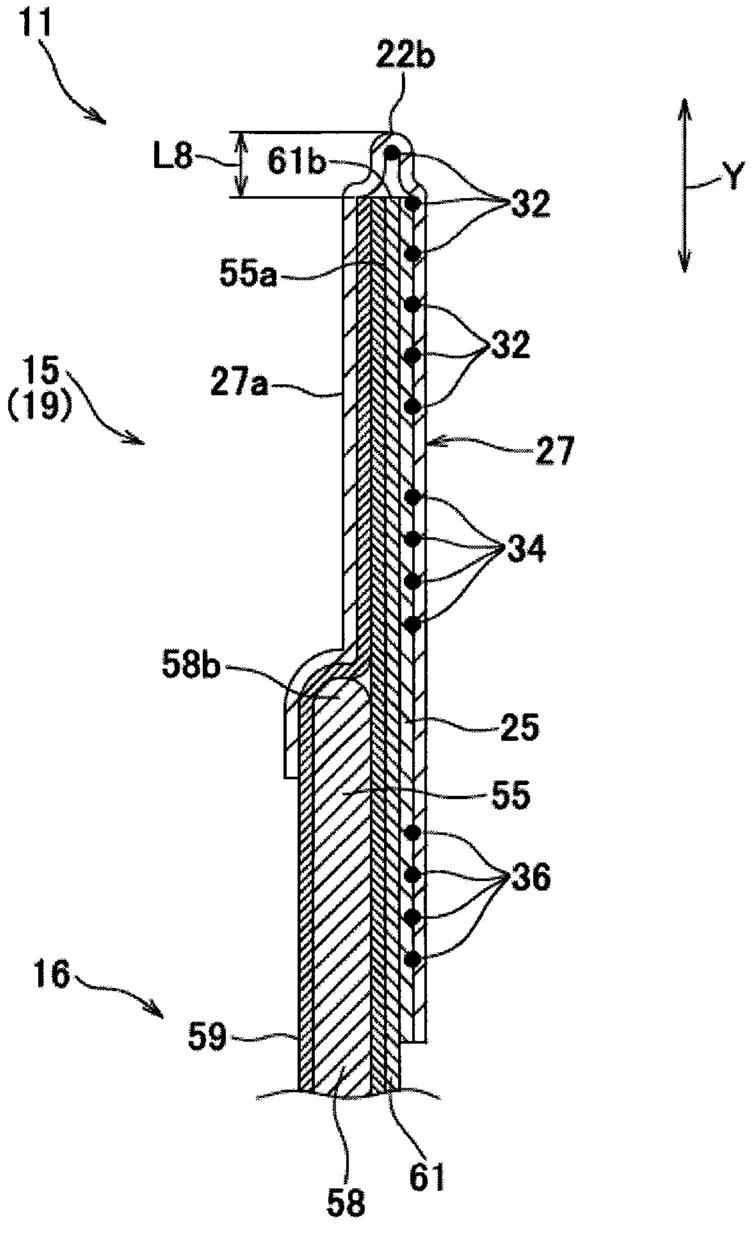

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FIG.11

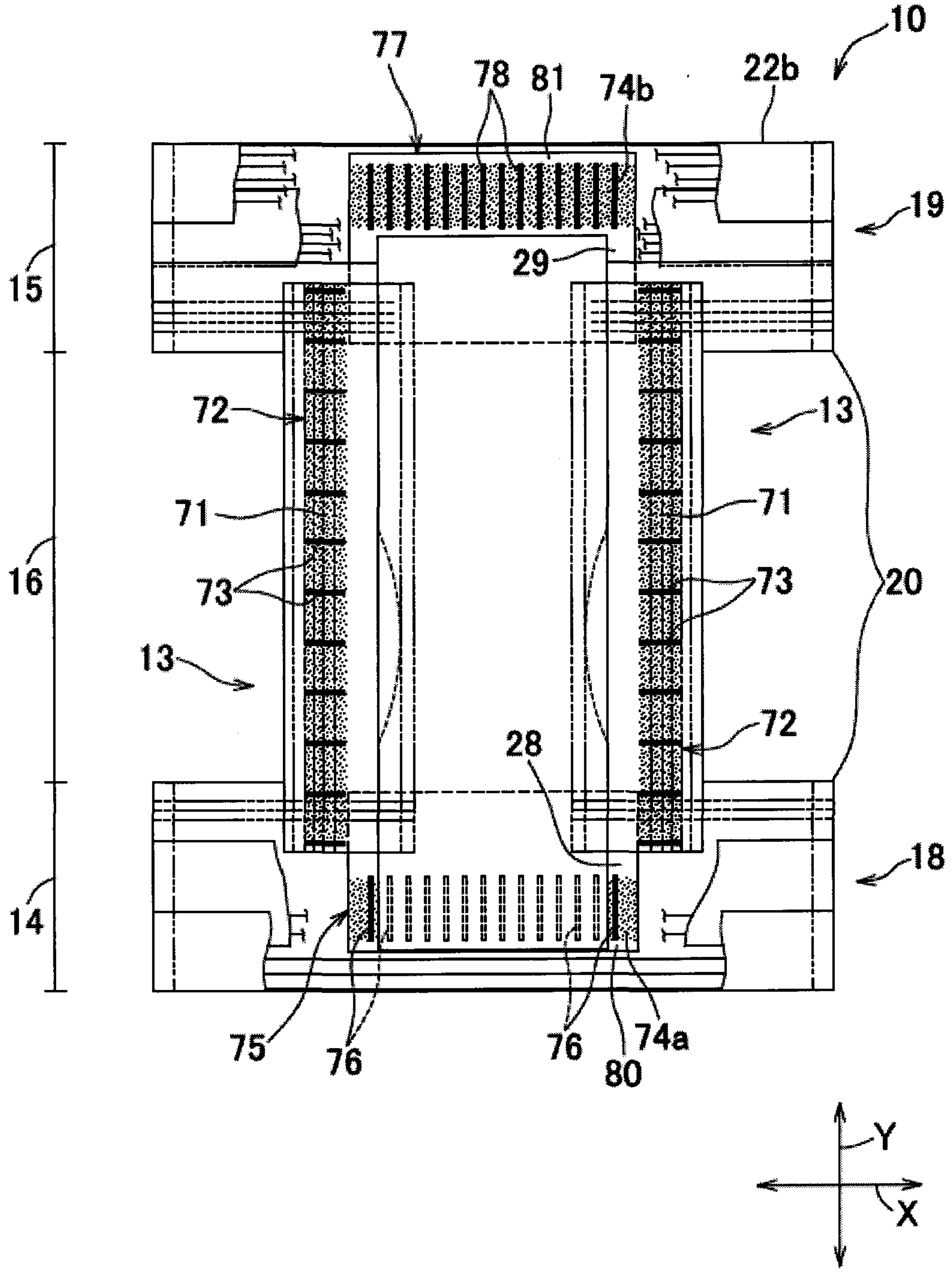

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FIG.12

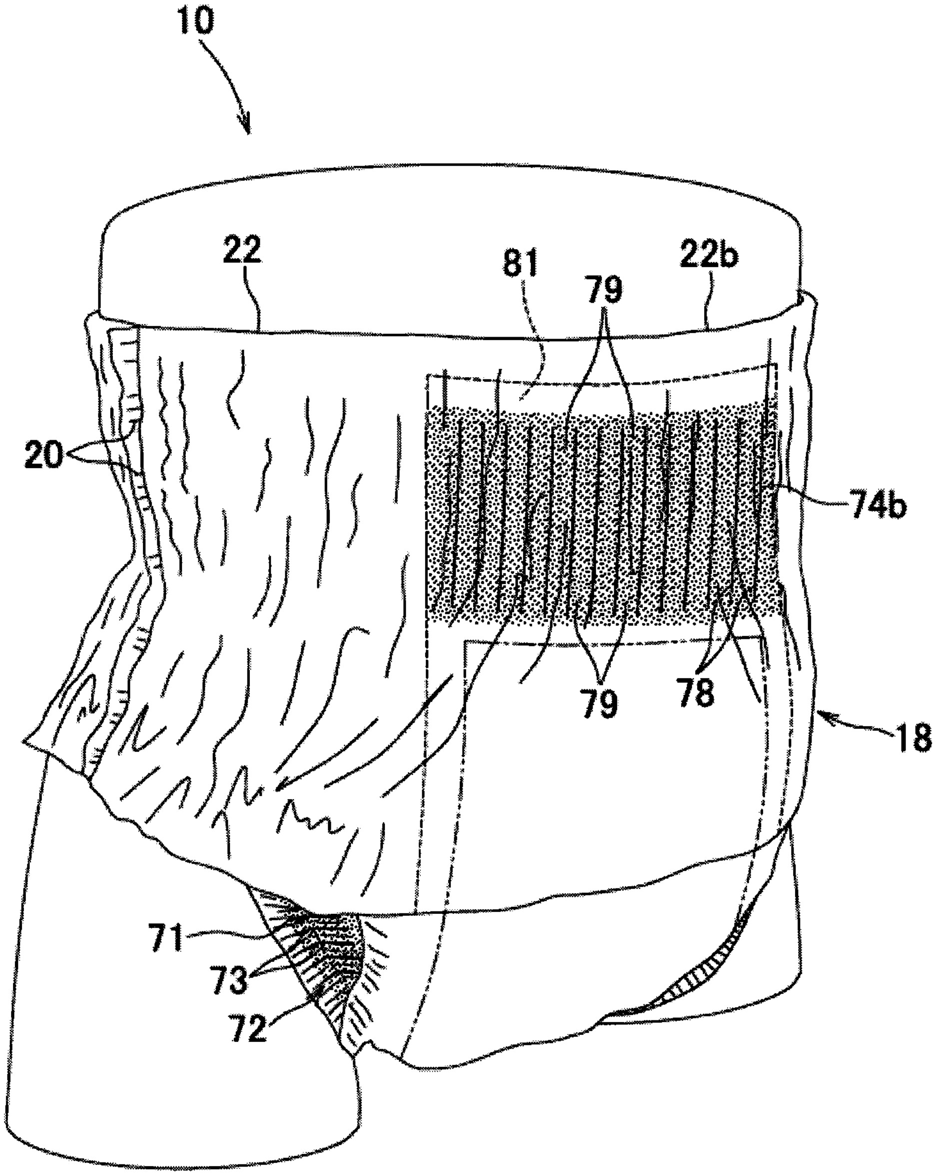

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FIG.13

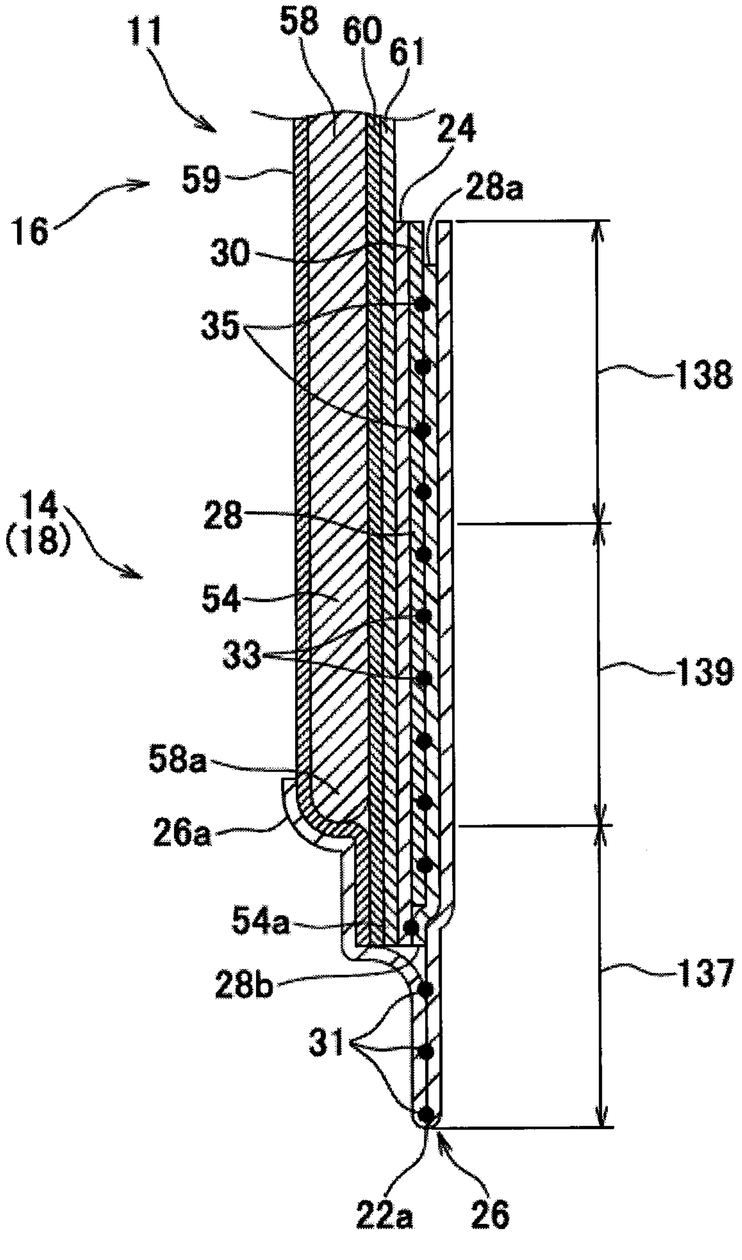

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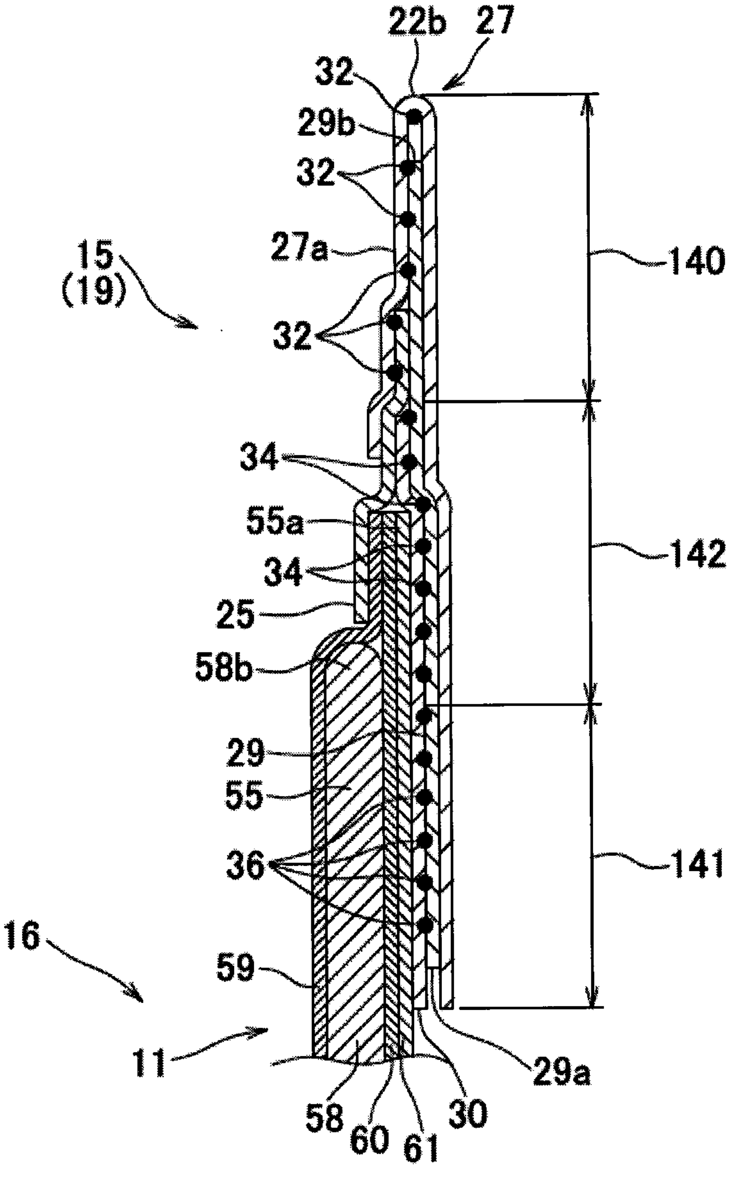
FIG.14



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