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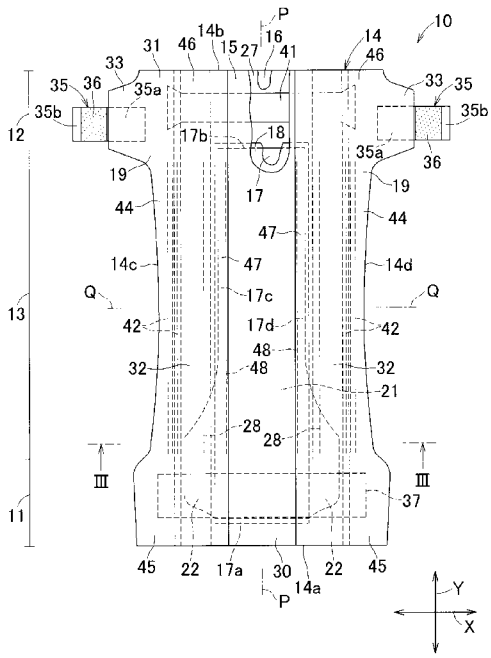
(54) Title: ABSORBENT WEARING ARTICLE

[Fig. 2]



(57) Abstract: An absorbent wearing article designed so that, at least in the front waist region, both lateral edges of the liquid-absorbent structure can be kept in close contact with the wearer's inguinal regions and sideways leakage of bodily fluids can be reliably prevented. A liquid-absorbent structure (17) includes, at least on the side of a front waist region of front and rear waist regions, a central region (21) extending from the crotch region (13) to the front waist region (11) and side ears (22) extending outward from the central region (21) in the transverse direction X wherein a stiffness of the side ears (22) is lower than a stiffness of the central region (21). A pair of first elastic elements (28) extending in the longitudinal direction Y extend at least from the vicinity of a midsection of the crotch region (13) to the front waist region (11) and the first elastic elements (28) include crossover segments (28A) intersecting with the side ears (22) of the liquid-absorbent structure (17) in the front waist region (11) and non-crossover segments (28B) not intersecting with the liquid-absorbent structure (17) in the front crotch region (13).

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Description

Title of Invention: ABSORBENT WEARING ARTICLE

Technical Field

[0001] This disclosure relates to absorbent wearing articles adapted to absorb body waste and more particularly to absorbent wearing articles each provided with a liquid-absorbent structure including an absorbent core, such as disposable diapers, incontinent pants and the like.

Background

[0002] Absorbent wearing articles which are provided with liquid-absorbent structures including an absorbent core are well known. For example, JP H09-84826 A (PTL 1) discloses an absorbent wearing article designed so that, at least in a front waist region of front and rear waist regions, a thickness dimension of the liquid-absorbent structure is locally and gradually reduced toward a front end thereof.

Citation List

Patent Literature

[0003] {PTL 1} JP H09-84826 A

Summary

Technical Problem

[0004] In a wearing article in which a thickness dimension of the liquid-absorbent structure is locally and gradually reduced toward a front end thereof, a stiffness of the liquid-absorbent structure in the vicinity of the front end should be lower than the remaining region, and the region in the vicinity of the front end may be kept in close contact with the wearer's body and thereby may prevent leakage of bodily fluids.

[0005] Certainly, such construction allows a region of the liquid-absorbent structure in the vicinity of its front end to be kept in close contact with the wearer's body. However, it is impossible to keep both lateral edges of the liquid-absorbent structure facing the wearer's inguinal regions in close contact with the wearer's body. The lateral edges of the liquid-absorbent structure are likely to be wrinkled and/or folded and spaced apart from the wearer's body due to movements of the wearer's thighs and eventually may cause leakage of bodily fluids at a higher possibility than in the vicinity of the front end. Even if the thickness dimension of the lateral edges of the liquid-absorbent structure is gradually reduced and thereby stiffness thereof is kept at relatively low, it will be impossible for the both edges to conform to movements of the wearer's thighs and to be kept in close contact with the wearer's thighs.

Solution to Problem

[0006] According to this invention, there is provided an absorbent wearing article having a

longitudinal direction, a transverse direction being orthogonal to the longitudinal direction, including:

a skin-facing side, a non-skin-facing side, a front waist region, a rear waist region, a crotch region located between the front and rear waist regions, and

a liquid-absorbent structure extending across the crotch region into the front and rear waist regions and including at least an absorbent core.

[0007] This invention resides in that:

the liquid-absorbent structure includes, at least on the side of the front waist region of the front and rear waist regions, a central region, which extends from the crotch region to the front waist region, and a pair of side ears extending outward from the central region in the transverse direction, wherein a stiffness of the side ears is lower than a stiffness of the central region;

a pair of first elastic elements are provided extending in the longitudinal direction at least from a vicinity of a midsection of the crotch region to the front waist region ; and

the first elastic elements include crossover segments where the first elastic elements each overlap with a respective one of the side ears of the liquid-absorbent structure in the front waist region, the first elastic elements are joined to a bottom surface of the liquid-absorbent structure, defined on the non-skin facing side, in the crossover segments, and the first elastic elements overlap with the liquid-absorbent structure only in the crossover segments.

Brief Description of Drawings

[0008] [fig.1]Fig. 1 is a perspective view of a first embodiment of a disposable diaper illustrated as an example of the absorbent wearing article according to this invention.

[fig.2]Fig. 2 is a developed plan view of the diaper of Fig. 1.

[fig.3]Fig. 3 is a sectional view of the diaper of Fig. 1 taken along line III-III in Fig. 2.

[fig.4]Fig. 4 is an unfolded plan view of the diaper of Fig. 1 illustrating the liquid-absorbent structure and the first side elastic elements by solid lines.

[fig.5]Fig. 5 is a perspective view illustrating the diaper of Fig. 1 as put on the wearer's body.

[fig.6]Fig. 6 is a developed plan view similar to Fig. 4, illustrating a second embodiment of the diaper.

[fig.7]Fig. 7 is a sectional view similar to Fig. 3, illustrating a third embodiment of the diaper.

Description of Embodiments

[0009] <First Embodiment>

Referring to Figs. 1 and 2 exemplarily illustrating an absorbent wearing article according to this invention, a diaper 10 includes a chassis 14 having a longitudinal axis

P-P, a transverse axis Q-Q being orthogonal to the longitudinal axis P-P, a longitudinal direction Y extending along the longitudinal axis P-P, and a transverse direction X extending along the transverse axis Q-Q, a skin-facing side, a non-skin-facing side, a front waist region 11, a rear waist region 12 and a crotch region 13 located between the front and rear waist regions 11, 12. In Fig. 3, a thickness direction being orthogonal to the longitudinal direction Y and the transverse direction X is indicated by Z.

[0010] The chassis 14 includes front and rear ends 14a, 14b rectilinearly extending in the transverse direction X, opposite side edges 14c, 14d recessed inward in the crotch region 13, an inner sheet 15 lying on the skin-facing side, a liquid-impervious outer sheet 16 lying on the non-skin-facing side and a liquid-absorbent structure 17 sandwiched between the inner sheet 15 and the outer sheet 16. An intermediate sheet 18 is preferably interposed between the inner sheet 15 and the liquid-absorbent structure 17 and the skin-facing side of the inner sheet 15 is preferably provided with a pair of containment sheets 19 symmetrically about the longitudinal axis P-P.

[0011] The inner sheet 15 may be composed of various types of liquid-pervious fibrous nonwoven fabrics such as, for example, an air-through fibrous nonwoven fabric a perforated plastic film or a laminate sheet thereof, each preferably having a basis mass in a range of about 15 to about 45g/m^2.

[0012] The outer sheet 16 may be composed of various types of known poorly-liquid-pervious or liquid-impervious fibrous nonwoven fabrics such as, for example, a spunbond nonwoven fabric, a point-bonded nonwoven fabric, an SMS (spunbond/meltblown/spunbond) nonwoven fabric, a liquid-impervious plastic film each preferably having a basis mass in a range of about 10 to about 40g/m^2 or a laminate sheet thereof.

[0013] The intermediate sheet 18 may be composed of various types of known breathable and liquid-pervious fibrous nonwoven fabrics, for example, an air-through nonwoven fabric having a basis mass in a range of about 15 to about 45g/m^2. The intermediate sheet 18 improves cushioning properties and at the same restricts excessive dispersion of bodily fluids. In addition, the intermediate sheet 18 keeps the inner sheet 15 away from the liquid-absorbent structure 17 and thereby helps prevent bodily fluids from un-intentionally flowing back to the inner sheet 15. It should be noted that it is not essential to provide the diaper 10 with this intermediate sheet 18.

[0014] The containment sheets 19 may be composed of a hydrophobic fibrous nonwoven fabric, a moisture-pervious and liquid-impervious plastic film or a laminate thereof. When it is desired to compose the containment sheets 19 from nonwoven fabrics, an SMS fibrous nonwoven fabric, a spunbond fibrous nonwoven fabric or the like having a basis mass in a range of about 10 to about 30g/m^2 may be used for the containment sheets 19.

[0015] The liquid-absorbent structure 17 is preferably a flat structure contoured by front and rear ends 17a, 17b and opposite side edges 17c, 17d to have its width in the transverse direction gradually becoming larger from a sub-region of the crotch region 13 closer to the front waist region 11 toward the front waist region 11. More specifically, the liquid-absorbent structure 17 has a central region 21 longitudinally extending from the rear waist region 12 across the crotch region 13 to the front region 11 and side ears 22 defined, in the front waist region 11, on both sides of the central region 21 in the transverse direction X. In Figs. 3 and 4, border lines 24 between the central region 21 and the respective side ears 22 are indicated by dashed-dotted lines. The front end 17a of the liquid-absorbent structure 17 preferably has opposite curved corners.

[0016] The liquid-absorbent structure 17 preferably includes an absorbent core obtained by molding a mixture of superabsorbent polymer particles (SAP), fluff wood pulp fibers and, as optional extra, thermoplastic synthetic fibers (staple fibers) into a predetermined shape, and a liquid-dispersant sheet, for example, composed of a liquid-pervious fibrous nonwoven fabric sheet adapted to cover the absorbent core for the purpose of improvement of shape retention and liquid dispersible ability thereof. The liquid-absorbent structure 17 may have its bottom surface covered with a backing sheet 27 composed of a liquid-impervious plastic film or a liquid-impervious fibrous nonwoven fabric. It is possible for the liquid-absorbent structure 17 to be configured by the absorbent core alone so far as an advantageous effect of this embodiment can be achieved. In this case, it is preferable that the absorbent core should be configured to keep its shape better. The absorbent core may be molded by suitable compression, for example, under heat, or when its material is wet. In the compression under heat, it is preferable that the absorbent core should contain a suitable amount of thermoplastic plastic fibers.

[0017] Referring to Fig. 3, a basis mass of the liquid-absorbent structure 17 is preferably uniform and the side ears 22 in the front waist region 11 of the liquid-absorbent structure 17 respectively have a thickness dimension gradually reduced from the respective innermost positions thereof toward the respective outer ends. In consequence, the skin-facing sides of the respective side ears 22 define shapes which slope down and a stiffness of the side ears 22 is lower than that of the central region 21. More specifically, when the liquid-absorbent structure 17 has absorbed a given quantity of artificial urine, average thickness dimension H1 of the central region 21 is preferably in a range of about 12 to about 15mm and average thickness dimension H2 in generally middle segments of the respective side ears as viewed in the transverse direction X is preferably in a range of about 8 to about 11mm.

[0018] <Method for measuring thickness dimension of liquid-absorbent structure>

First, the whole of the diaper 10 including the liquid-absorbent structure 17

composed, for example, of a mixture of superabsorbent polymer particles in a basis mass of about 300g/m^2 and fluff wood pulp fibers in a basis mass of about 315g/m^2 was immersed from the side of the inner sheet 15 into artificial urine (aqueous solution of 200g of urea, 80g of sodium chloride, 80g of magnesium sulfate, 8g of calcium chloride and 1g of pigment (blue) in 10 liter of ion-exchanged water) filling a container. Five minutes after leaving the diaper 10 in this condition, the diaper 10 was taken out from the container and flatly developed on a table with the skin-facing side up. Five minutes after leaving the diaper 10 in this condition, thickness measurement was carried out for the central region 21 and the side ears 22, respectively. As for the thickness dimension H1 of the central region 21, measured values were obtained in the vicinity of a center point of the central region 21 defined in the longitudinal direction Y as well as in the transverse direction X and these measured values were averaged to determine the thickness dimension H1. As for the side ears 22, two or more diagonal lines were drawn along the shapes thereof and measured values were obtained in the vicinity of the diagonal crosses.

[0019] Alternatively, a basis mass of the absorbent core in the side ears 22 may be set to be lower than a basis mass of the absorbent core in the central region 21 and thereby a stiffness value of the side ears 22 may be set to be lower than a stiffness value of the central region 21 to form these regions 21, 22 when the thickness dimensions H1, H2 are substantially equal to each other. In this case, loss of shape and/or crack should not occur in the absorbent core due to a differential thickness dimension.

[0020] It is also possible, with a uniform basis mass of the liquid-absorbent structure 17 as a whole, to form the central region 21 exclusively with a plurality of compressed depressions arranged in a given pattern and thereby to set a stiffness value of the side ears 22 to be lower than a stiffness value of the central region 21. Anyway, it is preferable to configure the liquid-absorbent structure 17 so that the side ears 22 may have the stiffness lower than that of the central region 21. To assure the desired differential stiffness, it is possible to use known compositions and/or known means of processing commonly utilized compositions for such type of article so far as the advantageous effect of this invention to be described below is achieved.

[0021] Furthermore, it is also possible to form grooves along the border lines 24 between the respective side ears 22 and the central region 21, which grooves extend in the longitudinal direction Y. In this case, the respective grooves function as hinges and facilitate the opposite side ears 22 to be curved toward the wearer's body under the tensile stress of first elastic elements 28 and thereby to come in close contact with the wearer's body.

[0022] Thread, strand or string first elastic elements 28 interposed between the liquid-absorbent structure 17 and the backing sheet 27 extend into the side ears 22 of the

liquid-absorbent structure 17. Specifically, the first elastic elements 28 are kept in contact with a bottom surface of the liquid-absorbent structure 17 to extend along the central region 21 of the liquid-absorbent structure 17.

[0023] Referring to Fig. 4, the first elastic elements 28 extend from a sub-region of the crotch region 13 closer to the rear waist region 12 to the front waist region 11 and include crossover segments 28A intersecting (overlapping) with the respective side ears 22 on the non-skin-facing side of the liquid-absorbent structure 17 and non-crossover segments 28B extending across the crotch region 13 to lie outside the central region 21 of the liquid-absorbent structure 17 as viewed in the transverse direction X. Accordingly, the first elastic elements 28 overlap with the absorbent structure 17 only at the respective side ears 22. The first elastic elements 28 may be of elastic materials such as, for example, elastic threads having fineness in a range of about 320 to about 1240dtex, preferably in a range of about 620 to about 940dtex and a stretch ratio in a range of about 1.5 to about 2.5. Depending on factors such as the dimension of the crossover segments 28A, the first elastic elements 28 may extend at least from the vicinity of the midsection of the crotch region 13, i.e., the vicinity of the transverse axis Q-Q of the crotch region 13 to the front waist region 11 so far as the advantageous effect of this invention to be described below is achieved.

[0024] While a single elastic element 28 is shown to intersect with each of the side ears 22, it is possible to arrange two or more first elastic elements 28 to intersect with each of the respective side ears 22. When the first elastic elements 28 are arranged so that the two or more first elastic elements 28 intersect with the respective side ears 22, an elastic material of the first elastic elements 28 lying inboard on the respective side ears 22 as viewed in the transverse direction X preferably have a tensile stress lower than that of an elastic material of the first elastic elements 28 lying outboard on the respective side ears 22. This is because, if the elastic material lying outboard on the respective side ears 22 as viewed in the transverse direction X has a relatively high tensile stress, the outer sub-regions of the respective side ears come in relatively tight contact with the wearer's body due to the shapes of the respective side ears 22 and the inner sub-regions would otherwise be spaced from the wearer's body, causing leakage of bodily fluids.

[0025] The backing sheet 27 may be composed of a moisture-pervious and liquid-impervious plastic film, a liquid-impervious SMS (spunbond/meltblown/spunbond) fibrous nonwoven fabric, a spunbond fibrous nonwoven fabric, each having, for example, a basis mass in a range of about 10 to about 30g/m^2, or a laminated sheet thereof.

[0026] Referring again to Fig. 2, the chassis 14 preferably includes front and rear end flaps 30, 31 extending in the transverse direction X outboard of the front and rear ends 17a,

17b of the liquid-absorbent structure 17 in the longitudinal direction Y and a pair of side flaps 32 extending in the longitudinal direction Y outboard of the opposite side edges 17c, 17d of the liquid-absorbent structure 17 in the transverse direction X. The side flaps 32 have gasket functions in cooperation with second elastic elements 42 described later. The front and rear end flaps 30, 31 are defined by the containment sheets 19, the inner sheet 15, the backing sheet 27 and the outer sheet 16 respectively extending outward in the longitudinal direction Y beyond the front and rear ends 17a, 17b of the liquid-absorbent structure 17 and stacked one on another. The side flaps 32 may be defined by the inner sheet 15, the containment sheets 19, the backing sheet 27 and the outer sheet 16 respectively extending outward in the transverse direction X beyond the opposite side edges 17c, 17d of the liquid-absorbent structure 17 and stacked one on another.

[0027] In respective rear side flaps 33 each defined by an overlapping zone of the rear end flap 31 and the side flaps 32, respective fixed ends 35a of paired tape fastener tabs 35 may be interposed between opposite side edges of the containment sheets 19 and the outer sheet 16, respectively, and secured therebetween with hot melt adhesives (not shown) applied to the respective inner surfaces of these sheets 16, 19. Free ends 35b of the respective tape fastener tabs 35 extending outward from the side edges of the rear side flaps 33 (i.e., the side edges of the rear waist region 12) in the transverse direction X may be provided with first fastening elements 36 including a multiplicity of hooks. With the diaper 10 put on the wearer's body, the first fastening elements 36 are releasably engaged with a second fastening element 37 extending on the outer surface of the front waist region 11 in the transverse direction X and preferably including a multiplicity of loops whereupon a waist-opening 38 and a pair of leg-openings 39 are defined (See Fig. 1). The second fastening element 37 may be provided in the form of a band-like element having a width dimension larger than those of the first fastening elements 35 and extends across the front end of the liquid-absorbent structure 17.

[0028] Between the inner sheet 15 and the backing sheet 27 both defining a part of the rear end flap 31, an elastic waist-band 41 is preferably sandwiched, which may be composed, for example, of plastic materials having cushioning effects such as soft urethane foams having interconnected cells. Between the outer sheet 16 and the containment sheets 19 both defining parts of the side flaps 32, two or more thread, strand or string second elastic elements 42 are preferably contractibly secured in the longitudinal direction Y and bonded under tension with hot melt adhesives (not shown).

[0029] The containment sheets 19 respectively are preferably arranged to have proximal edges 44 forming parts of the side flaps 32, front and rear fixed ends 45, 46 fixed to the skin-facing side of the inner sheet 15 and to the skin-facing side of the extensions of the outer sheet 16 extending outward in the transverse direction X beyond the inner

sheet 15 and in the front and rear waist regions 11, 12 with hot melt adhesives (not shown) and distal edges 47 extending in the longitudinal direction Y between the front and rear fixed ends 45, 46 and formed by turning the inner side edges of the respective containment sheet 19 inward. The distal edges 47 are preferably provided with thread, strand or string elastic elements 48 secured thereto contractibly in the longitudinal direction Y. With the diaper 10 put on the wearer's body, the distal edges 47 are spaced apart upward from the skin-facing side of the inner sheet 15 under contraction of the elastic elements 48 to form a pair of leakage-barrier cuffs adapted to help prevent body waste from leaking sideways.

[0030] Referring to Fig. 4, the liquid-absorbent structure 17 and the first elastic elements 28 are illustrated by solid lines and the remaining components are indicated by imaginary lines.

[0031] In Fig. 4, in the front waist region 11, the crossover segments 28A of the first elastic elements 28 extend into the side ears 22 of the liquid-absorbent structure 17 on the non-skin-facing side thereof and, in consequence, the side ears 22 of the liquid-absorbent structure 17 are directly under the tensile stress of the first elastic elements 28. In the side ears 22 of the liquid-absorbent structure 17, the thickness is gradually reduced from the inner side to the outer side in the transverse direction X, as will be apparent from Fig. 3. Consequently, the side ears 22 have a stiffness value lower than that of the central region 21. With the structure described hereinabove, the diaper 10 according to this invention provides an advantageous effect to be described below.

[0032] As will be apparent from Fig. 5, the side ears 22 of the liquid-absorbent structure 17 respectively define the regions facing the wearer's inguinal regions. With the diaper put on the wearer's body, these regions are likely to get wrinkled and/or to be folded and to be spaced apart from the wearer's body as the wearer's inguinal regions move. Without taking any effective countermeasure, these regions possibly cause leakage of bodily fluids. According to this embodiment, the side ears 22 of the liquid-absorbent structure 17 are configured to slope down from the inner side to the outer side in the transverse direction and correspondingly to have the thickness dimension thereof gradually reduced in this direction. As a result, a stiffness of these ears 22 is sufficiently low to be smoothly curved along a contour of the wearer's body. In addition, the crossover segments 28A of the first elastic elements 28 extend into these ears 22 to put them in close contact with the wearer's body under the tensile stress and thereby to help prevent bodily fluids from leaking sideways.

[0033] Of the first elastic elements 28, the crossover segments 28A overlapping the liquid-absorbent structure 17 practically have a tensile stress thereof restricted under the effect of stiffness of the liquid-absorbent structure 17. However, with the diaper 10 put on the wearer's body, the non-crossover segments 28B of the first elastic elements 28

not overlapping the liquid-absorbent structure 17 are stretched in a curved posture in the crotch region 13 and the tensile stress thereof acts on the crossover segments 28A to put the side ears 22 in close contact with the wearer's body. While the side ears 22 of the liquid-absorbent structure 17 respectively include areas not overlapping the crossover segments 28A of the first elastic elements 28, the side ears may be partially kept in close contact with the wearer's body to assure the side ears as a whole are prevented from being spaced apart from the wearer's body. In this way, it is possible to prevent bodily fluids from leaking sideways.

[0034] This embodiment of the invention is applicable not only to open-type disposable diapers but also to pant-type disposable diapers. It should be noted that the absorbent structure 17 and first elastic elements 28, as described above, may be taken in isolation of the remaining structural features of the described diaper and may be used with various other diapers or absorbent articles, as will be readily appreciated by those skilled in the art. The present invention is not limited to the diaper described. In the open-type diaper, the region of the side ears 22 not overlapping the crossover segments 28A of the first elastic elements 28, in other words, the region defined above the crossover segments 28A (i.e., the front end) is preferably provided on the outer surface thereof with the band-like second fastener element 37. The second fastener element 37 may be engaged with the first fastening element 36 of the tape fastener tabs 35 to press the upper end against the wearer's body and thereby to put the upper end region in close contact with the wearer's body. In this way, the upper end region should not be spaced apart from the wearer's body and it is assured that the side ears 22 as a whole fit to the wearer's body.

[0035] Referring to Fig. 4, the second elastic elements 42 extend in parallel to the first elastic elements 28 in the longitudinal direction Y and it may be considered that the tensile force thereof partially helps the side ears 22 of the liquid-absorbent structure 17 to have slope down shapes, respectively. In other words, it may be considered that the first elastic elements 28, the second fastening element 37 and the second elastic elements 42 cooperate together to keep the side ears 22 as a whole in close contact with the wearer's body.

[0036] To achieve such effects, each of the first elastic elements 28 preferably has a tensile stress value in a range of about 0.2 to about 0.8N at the 93% (based on the maximum stretching of 100%) stretched moment in the elastic zone subjected to the tensile force of this elastic element 28. This is because if the tensile stress value is less than 0.2N, it will be harder to fold the side ears 22 of the liquid-absorbent structure 17 along the contour of the wearer's body and if the tensile stress is more than 0.8N, the liquid-absorptive property of the side ears 22 is restricted by such a high tensile stress and bodily fluids may be insufficiently absorbed and may eventually leak sideways.

[0037] <Method for measuring tensile stress of first elastic elements 28>

For measurement of tensile stress of the first elastic elements 28, Tensile Tester (AUTOGRAPH AGS-1kWG manufactured by Shimadzu Corporation) was used. Measurement was carried out under the condition of initial spacing dimension between upper and lower chucks is 250mm and tension rate is 100mm/min. Specifically, the elastic region of a given width dimension (more specifically, the elastic region provided with the first elastic elements 28 including both side margins each having width of about 5mm outboard of the first elastic elements 28 in the transverse direction. This is the same when the first elastic elements 28 are composed of a plurality of elastic threads) was taken out from the diaper (this test piece does not include the liquid-absorbent structure) and fixed in its contracted state between chucks. Tensile stress of this elastic region at a moment of 93% stretched was calculated.

[0038] Assuming, for example, that a standard disposable diaper 10 for baby of M-size is selected as the object of this embodiment of the invention, dimension L1 of the liquid-absorbent structure 17 in the longitudinal direction Y (spacing dimension between the front end 17a and the rear end 17b in the longitudinal direction Y) is about 320 to about 360mm, dimension W1 between the opposite side edges 17c, 17d in the transverse direction X in the central region 21 is a range of about 80 to about 100mm and spacing dimension W2 between the opposite side edges 17c, 17d of the both ears 22 in the transverse direction X is in a range of about 90 to about 120mm, dimension L2 of the side ears 22 of the liquid-absorbent structure 17 in the longitudinal direction Y is in a range of about 100 to about 160mm and dimension W3 in the transverse direction X of both ears 22 in the front waist region 11 is in a range of about 15 to about 40mm.

[0039] Dimension L3 of the first elastic elements 28 in the longitudinal direction Y is in a range of about 210 to about 230mm, dimension L4 of the crossover segments 28A of the first elastic elements 28 in the longitudinal direction Y is in a range of about 30 to about 50mm and dimension L5 of the non-crossover segments 28B in the longitudinal direction Y is in a range of about 160 to about 200mm. Spacing dimension W4 between the opposite side edges 17c, 17d and the non-crossover segments 28B of the first elastic elements 28 in the transverse direction X is in a range of about 3 to about 20mm.

[0040] In the first elastic elements 28, the dimension L4 of the crossover segments 28A in the longitudinal direction Y is in a range of about 5 to about 25%, preferably in a range of about 8 to about 20% of the dimension L5 of the non-crossover segments 28B in the longitudinal direction Y. This is because, if the dimension L4 of the crossover segments 28A exceeds the dimension L5 of the non-crossover segments 28B, it will be difficult to curve the side ears 22 of the liquid-absorbent structure 17 along the contour

of the wearer's body and the side ears 22 will be spaced apart from the wearer's body, causing sideways leakage of body wastes. If the dimension L4 is less than 5% of the non-crossover segments 28B, the tensile stress acting on the crossover segments 28A will be locally concentrated and will act to compress the liquid-absorbent structure more than necessary, which may result in the liquid-absorbent structure 17 being partially cracked and the liquid-absorptive property thereof being deteriorated.

[0041] The dimension L4 of the crossover segments 28A of the first elastic elements 28 in the longitudinal direction Y is preferably in a range of about 15 to about 36% of the dimension L2 of the side ears 22 in the longitudinal direction Y. This is because, if the dimension L4 is less than 15%, the tensile stress of the first elastic elements 28 to act on the side ears 22 as a whole will be localized and it will be harder to curve the side ears 22 along the contour of the wearer's body and, if the dimension L4 is more than 36%, the crossover segments 28A will fully overlap the side ears 22 or the distal ends of the crossover segments 28A will be located at upper positions of the side ears 22, wherein the crossover segments 28A may bend or curve the side ears 22 and act to drag them down. If the first elastic elements 28 extend forward (upward) beyond the side ears 22 and intersect with the second fastening element 37 attached to the outer surface, the second fastening element 37 may be subjected to force acting to pull the second fastening element 37 downward and the diaper 10 as a whole might slip down.

[0042] Referring to Fig. 4, respective lower edges 49 of the side ears 22 preferably have a circular arc-shape being concave inward so that the side ears 22 may be further smoothly curved along the contour of the wearer's inguinal regions when the side ears 22 are put in close contact with the inguinal regions. Specifically, the lower edges 49 may be curved at an angle alpha of the lower edges 49 to the border line 24 preferably in a range of about 45 to about 60 degrees. This is because, if the angle alpha is less than 45 degrees, the lower ends of the side ears 22 will be excessively tapered and it will be harder to curve the side ears 22 along the wearer's body and, if the angle alpha is more than 60 degrees, the lower ends of the side ears 22 will become relatively wide and the tensile stress of the crossover segments 28A of the first elastic elements 28 may not sufficiently act on the lower ends to keep the lower ends in close contact with the wearer's body. In each case, leakage of bodily fluids could occur.

[0043] Referring again to Fig. 3, while the side ears 22 of the liquid-absorbent structure 17 are flat on the non-skin-facing side and, on the skin-facing side, shaped to slope down outward gradually in the transverse direction according to this embodiment, it is possible to form the skin-facing side and the non-skin-facing side to slope downward in the transverse direction X toward the center of the diaper. In the side ears 22 having a thickness dimension gradually reduced outward in the transverse direction X, it is advantageous in that the outer edges thereof can be further reliably kept in close contact

with the wearer's body and thereby it is possible to help prevent the side ears 22 from being spaced apart from the wearer's body. In addition, it is also possible to form steps in vicinities of the respective border lines 24 between the central region 21 and side ears 22 rather than to adjust the thickness dimension H2 of side ears 22 to be gradually reduced and thereby to define the slope down shape so far as the thickness dimension H2 of the side ears 22 is smaller than that of the central region 21.

[0044] <Method for forming absorbent core of liquid-absorbent structure 17>

Now a method for forming the absorbent core of the liquid-absorbent structure 17 in the process of making the diaper 10 will be described below.

[0045] An apparatus (not shown) includes a hopper for feeding absorbent. Discrete materials such as wood pulp fibers and superabsorbent polymer particles are fed to a rotary suction drum, which is provided with a series of recessed molds for depositing the materials along its peripheral surface. The materials are fed from the hopper into the molds for forming the absorbent core. Bottom surfaces of the molds each are formed of meshes through which the materials may be sucked into the molds and deposited therein.

[0046] In each of the molds of the drum, a first recessed region extends in a rotary direction of the drum and corresponds to the central region 21 of the absorbent core and second recessed regions respectively extend from the first recessed region by, for example, about 15mm (corresponding to the width dimension W3 of each of the side ears 22) in a cross direction being orthogonal to the rotary direction. The absorbent, discrete materials fed from the hoppers are apt to be concentrated to the central region of the respective recessed regions and therefore the quantity of the materials deposited in the second recessed regions are likely to be smaller than the quantity deposited in the first recessed regions. In consequence, it is possible to set a basis mass of the side ears 22 to be less than a basis mass of the central region 21. In order that the basis mass of the side ears 22 can be reliably smaller than the basis mass of the central region 21, it is also possible to set depth of the second recessed region deposited or/and the other factors such as opening area of the openings formed in the bottom and mesh size smaller than those in the first recessed regions.

[0047] Referring to Fig. 3, in the crotch region 13, a spacing dimension W5 in the transverse direction X between inner edges 44a of the proximal edges 44 of the containment sheets 19 is preferably in a range of about 120 to about 140mm and the proximal edges 44a are located outside the crossover segments 28A of the first elastic elements 28 as viewed in the transverse direction X. If the proximal edges 44a lie inside the first elastic elements 28 as viewed in the transverse direction X, the proximal edges 44a may be bend or curve when the side ears 22 of the liquid-absorbent structure 17 are curved toward the wearer's body under contraction of the first elastic elements 28 and

the distal edges 47 of the containment sheets 19 may be put in contact with the wearer's body before spaced apart upward from the inner sheet 15 under the effect of the tensile stress of the elastic elements 48. Consequently, it may be difficult for the containment sheets 19 to sufficiently help prevent sideways leakage of body waste.

[0048] In contrast, according to this embodiment, the proximal edges 44a are preferably located outboard of the first elastic elements 28 as viewed in the transverse direction X so that, even if the side ears 22 of the liquid-absorbent structure 17 are curved toward the wearer's body under the effect of the tensile stress of the first elastic elements 28, the proximal edges 44a should not be spooled up and the containment sheet 19 may raise themselves under contraction of the elastic elements 48. In this way, the containment sheet 19 can sufficiently function to contain body waste.

[0049] <Second Embodiment>

Fig. 6 is a plan view similar to Fig. 4, illustrating the disposable diaper according to a second embodiment of this invention. A basic arrangement of the diaper 10 according to this embodiment is similar to that of the first embodiment and therefore this embodiment given hereunder will be described on the features distinguished from those of the first embodiment.

[0050] Referring to Fig. 6, the liquid-absorbent structure 17 according to this embodiment includes a front region 50 lying in the front waist region 11, a rear region 51 lying in the rear waist region 12, and a relatively narrow intermediate region 52 extending in the longitudinal direction Y between the front and rear regions 50, 51. Both the front and rear regions 50, 51 have a width dimension larger than that of the intermediate region 52 and include side ears 22 extending outward in the transverse direction X from the central regions 21.

[0051] Though not illustrated, the side ears 22 in the front and rear regions 50, 51 respectively preferably have a thickness dimension gradually reduced from the inner side toward the outer side to define a shape sloping down from the inner side toward the outer side in the transverse direction X. However, it should be appreciated that the side ears 22 of this embodiment may be configured in accordance with any of the arrangements for the side ears 22 described above in respect of the first embodiment. The first elastic elements 28 extend across the crotch region 13 into the front and rear waist regions 11, 12 and intersect with parts of each of the side ears 22. More specifically, the first elastic elements 28 include crossover segments 28A intersecting with the side ears 22 in the front and rear regions 50, 51 of the liquid-absorbent structure 17 and non-crossover segments 28B not intersecting with the liquid-absorbent structure 17 in the crotch region 13. By forming both the front and rear regions 50, 51 with the side ears 22 similar to those in the first embodiment, the side ears 22 of the liquid-absorbent structure 17 can be curved along the contour of the wearer's body not

only in the front waist region 11 but also in the rear waist region 12 and thereby sideways leakage of body waste can be effectively prevented in the front and rear waist regions 11, 12.

[0052] <Third Embodiment>

Fig. 7 is illustrating the disposable diaper 10 according to a third embodiment of this invention. A basic arrangement of the diaper 10 according to this embodiment is similar to that of the first or second embodiments and therefore this embodiment given hereunder will be described on the features distinguished from those of the first and second embodiments.

[0053] Referring to Fig. 7, in the disposable diaper 10 according to this embodiment, the inner sheet 15 is composed of a sheet having a plurality of ridges 55 extending on the skin-facing side thereof in the longitudinal direction Y and a plurality of grooves 56 alternating with the ridges 55. The sheet preferably includes a fibrous nonwoven fabric. Fibers forming the inner sheet 15 are preferably oriented at random in all directions (inclusive of three-dimensional directions) and such a shape may be obtained by gas jet processing of the inner sheet 15, when it is still in the form of a continuous fibrous web, by a series of nozzle arrays provided above the web. Water jets processing, steam jets processing, or hot air jets processing may equally be used. Consequentially, a density of the ridges 55 is higher than that of the grooves 56. It should be noted here that the ridges 55 and the grooves 56 may alternatively be formed by gear processing. In this processing, a density of the ridges 55 is lower than that of the grooves 56.

[0054] In this way, the inner sheet 15 is alternately formed with the high density zones (ridges) 55 extending in the longitudinal direction Y and the low density zones (grooves) 56 extending in the longitudinal direction Y wherein a stiffness differential between the ridges 55 and grooves 56 due to the density differential therebetween facilitates the inner sheet 15 to be curved in the transverse direction X. Specifically, in response of curving of the side ears 22 of the liquid-absorbent structure 17, the inner sheet 15 is also smoothly curved and thereby further improves fit of the side ears 22 to the wearer's body.

[0055] The inner sheet in this embodiment preferably has a basis mass of about $20g/m^2$ or more, more preferably of about $25g/m^2$ or more, and preferably has a thickness dimension of about 0.5mm or more, more preferably of about 0.8mm or more. If the inner sheet 15 has the basis mass of less than $20g/m^2$ and has the thickness dimension of less than 0.5mm, the inner sheet 15 may not help the side ears 22 to maintain a properly curved shape and, even when the inner sheet is formed with the ridges 55 and the grooves 56, contribution of the inner sheet thereto will be of limited significance.

[0056] Though not illustrated, the respective grooves may be formed with high density zones and low density zones to be alternated in the transverse direction X, i.e., cor-

relation of stiffness values in the ridges and grooves 55, 56 may be set as: the ridges 55 being higher than the high density zones of the grooves 56 being higher than the low density zones of the grooves 56, to assure that the inner sheet 15 can be easily curved along the contour of the wearer's body. While the ridges and the grooves 55, 56 extend in parallel to the longitudinal axis P-P in this embodiment, it is possible to form these ridges and the grooves 55, 56 obliquely to the longitudinal axis P-P to adjust the direction in which the side ears 22 of the liquid-absorbent structure 17 are bent.

[0057] The component members of the diaper 10 are not limited to those described in this specification but the other various types of materials widely used in the relevant technical field may be used without limitation. Embodiments are also not limited to those described in the specification and illustrated in the accompanying drawings and, for example, the technical features described in the respective Claims (except Claim 1) may be appropriately combined to obtain various effective embodiments.

[0058] The aspect(s) of the present invention described above may be arranged in at least the following items:

(i) An absorbent wearing article having a longitudinal direction, a transverse direction being orthogonal to the longitudinal direction, including:

a skin-facing side, a non-skin-facing side, a front waist region, a rear waist region, a crotch region located between the front and rear waist regions, and

a liquid-absorbent structure extending across the crotch region into the front and rear waist regions and including at least an absorbent core, wherein:

the liquid-absorbent structure includes, at least on the side of the front waist region of the front and rear waist regions, a central region, which extends from the crotch region to the front waist region, and a pair of side ears extending outward from the central region in the transverse direction, wherein a stiffness of the side ears is lower than a stiffness of the central region;

a pair of first elastic elements are provided extending in the longitudinal direction at least from a vicinity of a midsection of the crotch region to the front waist region ; and

the first elastic elements include crossover segments where the first elastic elements each overlap with a respective one of the side ears of the liquid-absorbent structure in the front waist region, the first elastic elements are joined to a bottom surface of the liquid-absorbent structure, defined on the non-skin facing side, in the crossover segments, and the first elastic elements overlap with the liquid-absorbent structure only in the crossover segments.

[0059] The aspect described in the above item (i) may provide one or more of the following advantageous effects:

(a) At least in the front waist region, the side ears of the liquid-absorbent structure have a stiffness lower than that of the central region and the first elastic elements

extending in the longitudinal direction partially intersect with the side ears so that the side ears may be curved along the contour of the wearer's inguinal regions and kept in close contact therewith. In consequence, leakage out of body waste should be prevented from occurring in the vicinity of these side ears.

[0060] The aspect described in the above item (i) may include at least the following embodiments, which may be taken in isolation or in combination with one another:

(ii) The crossover segment of each of the first elastic elements has a dimension in the longitudinal direction corresponding to a range of about 5 to about 25% of a dimension of a non-crossover segment, which is a section of the first elastic element in the longitudinal direction that does not overlap with the liquid-absorbent structure.

(iii) The liquid-absorbent structure has a uniform basis mass.

(iv) The side ears of the liquid-absorbent structure have a thickness dimension gradually reduced outward in the transverse direction.

(v) The side ears of the liquid-absorbent structure are flat on the non-skin-facing side and are shaped to slope down outwardly in the transverse direction on the skin-facing side.

(vi) The side ears of the liquid-absorbent structure have skin-facing and non-skin-facing sides in the form of slanted surfaces.

(vii) In the liquid-absorbent structure, a basis mass of the absorbent core in the side ears is lower than a basis mass of the absorbent core in the central region.

(viii) Compressed grooves are formed along border lines between the respective side ears and the central region.

(ix) The liquid-absorbent structure includes a front region defined on the side of the front waist region, a rear region defined on the side of the rear waist region, and an intermediate region having a width smaller than those of the front and rear regions, wherein side ears are formed in the front and rear regions, and wherein the crossover segments of the first elastic elements are provided in the front and rear regions where the first elastic elements overlap with respective side ears of the liquid-absorbent structure in the front and rear regions.

(x) The liquid-absorbent structure is sandwiched between a liquid-pervious inner sheet lying on the skin-facing side and a liquid-impervious outer sheet lying on the non-skin-facing side and the inner sheet is formed on its skin-facing side with a plurality of ridges extending in the longitudinal direction and a plurality of grooves extending alternately with and in parallel to the ridges.

(xi) The inner sheet is alternately formed in the transverse direction with high and low density zones which high and low density zones extend in the longitudinal direction.

(xii) One or more further elastic elements are provided, which extend parallel to the

first elastic elements and are spaced transversely outwardly therefrom, the further elastic elements including crossover segments where the further elastic elements each overlap with a respective one of the side ears of the liquid-absorbent structure at least on the side of the front waist region at a position spaced transversely outwards from the crossover segments of the first elastic members, the further elastic elements are joined to a bottom surface of the liquid-absorbent structure in the crossover segments, and the further elastic elements overlap with the liquid-absorbent structure only in the crossover segments.

(xiii) Side flaps extending outside the opposite side edges of the liquid-absorbent structure as viewed in the transverse direction are provided with second elastic elements contractibly attached thereto to extend in parallel to the first elastic elements and to be spaced outwardly therefrom by a given dimension in the transverse direction.

(xiv) The absorbent wearing article includes fastener means adapted to fasten opposite side edges of the front waist region to opposite side edges of the rear waist region wherein the fastener means at least include a fastening element extending on the outer surface of the front waist region in the transverse direction so that the fastening element may extend across a front end of the liquid-absorbent structure , the first elastic elements being arranged such that they do not intersect with the fastening element.

(xv) The lower edges of the side ears have a circular arc shape being inwardly concave.

[0061] According to the embodiments in the above (ii) to (xv), the advantageous effect(s) set forth at (a) is/are better ensured.

[0062] This application claims the benefit of Japanese Application No. 2011-043537 the entire disclosure of which is incorporated by reference herein.

Claims

[Claim 1] An absorbent wearing article having a longitudinal direction, a transverse direction being orthogonal to the longitudinal direction, comprising:
a skin-facing side, a non-skin-facing side, a front waist region, a rear waist region, a crotch region located between the front and rear waist regions, and
a liquid-absorbent structure extending across the crotch region into the front and rear waist regions and including at least an absorbent core, wherein:
the liquid-absorbent structure includes, at least on the side of the front waist region of the front and rear waist regions, a central region, which extends from the crotch region to the front waist region, and a pair of side ears extending outward from the central region in the transverse direction, wherein a stiffness of the side ears is lower than a stiffness of the central region;
a pair of first elastic elements are provided extending in the longitudinal direction at least from a vicinity of a midsection of the crotch region to the front waist region ; and
the first elastic elements include crossover segments where the first elastic elements each overlap with a respective one of the side ears of the liquid-absorbent structure in the front waist region, the first elastic elements are joined to a bottom surface of the liquid-absorbent structure, defined on the non-skin facing side, in the crossover segments, and the first elastic elements overlap with the liquid-absorbent structure only in the crossover segments.

[Claim 2] The absorbent wearing article defined by claim 1, wherein the crossover segment of each of the first elastic elements has a dimension in the longitudinal direction corresponding to a range of about 5 to about 25% of a dimension of a non-crossover segment, which is a section of the first elastic element in the longitudinal direction that does not overlap with the liquid-absorbent structure.

[Claim 3] The absorbent wearing article defined by claim 1 or 2, wherein the liquid-absorbent structure has a uniform basis mass.

[Claim 4] The absorbent wearing article defined by claim 1, 2 or 3, wherein the side ears of the liquid-absorbent structure have a thickness dimension gradually reduced outward in the transverse direction.

[Claim 5] The absorbent wearing article defined by claim 4, wherein the side ears of the liquid-absorbent structure are flat on the non-skin-facing side and are shaped to slope down outwardly in the transverse direction on the skin-facing side.

[Claim 6] The absorbent wearing article defined by claim 4, wherein the side ears of the liquid-absorbent structure have skin-facing and non-skin-facing sides in the form of slanted surfaces.

[Claim 7] The absorbent wearing article defined by claim 1 or 2, wherein, in the liquid-absorbent structure, a basis mass of the absorbent core in the side ears is lower than a basis mass of the absorbent core in the central region.

[Claim 8] The absorbent wearing article defined by any preceding claim, wherein compressed grooves are formed along border lines between the respective side ears and the central region.

[Claim 9] The absorbent wearing article defined by any preceding claim, wherein the liquid-absorbent structure includes a front region defined on the side of the front waist region, a rear region defined on the side of the rear waist region, and an intermediate region having a width smaller than those of the front and rear regions, wherein side ears are formed in the front and rear regions, and wherein the crossover segments of the first elastic elements are provided in the front and rear regions where the first elastic elements overlap with respective side ears of the liquid-absorbent structure in the front and rear regions.

[Claim 10] The absorbent wearing article defined by any preceding claim, wherein the liquid-absorbent structure is sandwiched between a liquid-pervious inner sheet lying on the skin-facing side and a liquid-impervious outer sheet lying on the non-skin-facing side and the inner sheet is formed on its skin-facing side with a plurality of ridges extending in the longitudinal direction and a plurality of grooves extending alternately with and in parallel to the ridges.

[Claim 11] The absorbent wearing article defined by claim 10, wherein the inner sheet is alternately formed in the transverse direction with high and low density zones which high and low density zones extend in the longitudinal direction.

[Claim 12] The absorbent wearing article defined by any preceding claim, wherein one or more further elastic elements are provided, which extend parallel to the first elastic elements and are spaced transversely outwardly therefrom, the further elastic elements including crossover segments

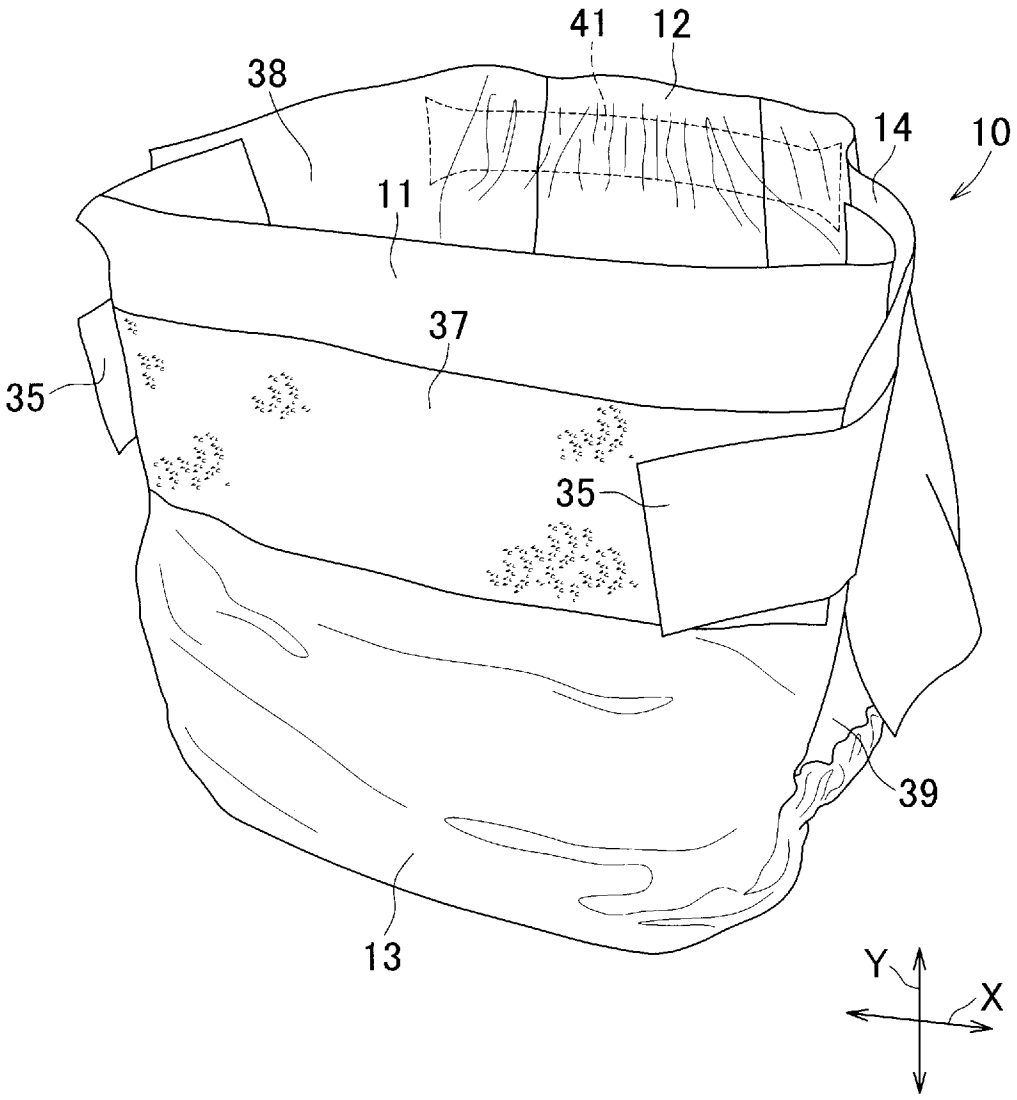
where the further elastic elements each overlap with a respective one of the side ears of the liquid-absorbent structure at least on the side of the front waist region at a position spaced transversely outwards from the crossover segments of the first elastic members, the further elastic elements are joined to a bottom surface of the liquid-absorbent structure in the crossover segments, and the further elastic elements overlap with the liquid-absorbent structure only in the crossover segments.

[Claim 13] The absorbent wearing article defined by any preceding claim, wherein side flaps extending outside the opposite side edges of the liquid-absorbent structure as viewed in the transverse direction are provided with second elastic elements contractibly attached thereto to extend in parallel to the first elastic elements and to be spaced outwardly therefrom by a given dimension in the transverse direction.

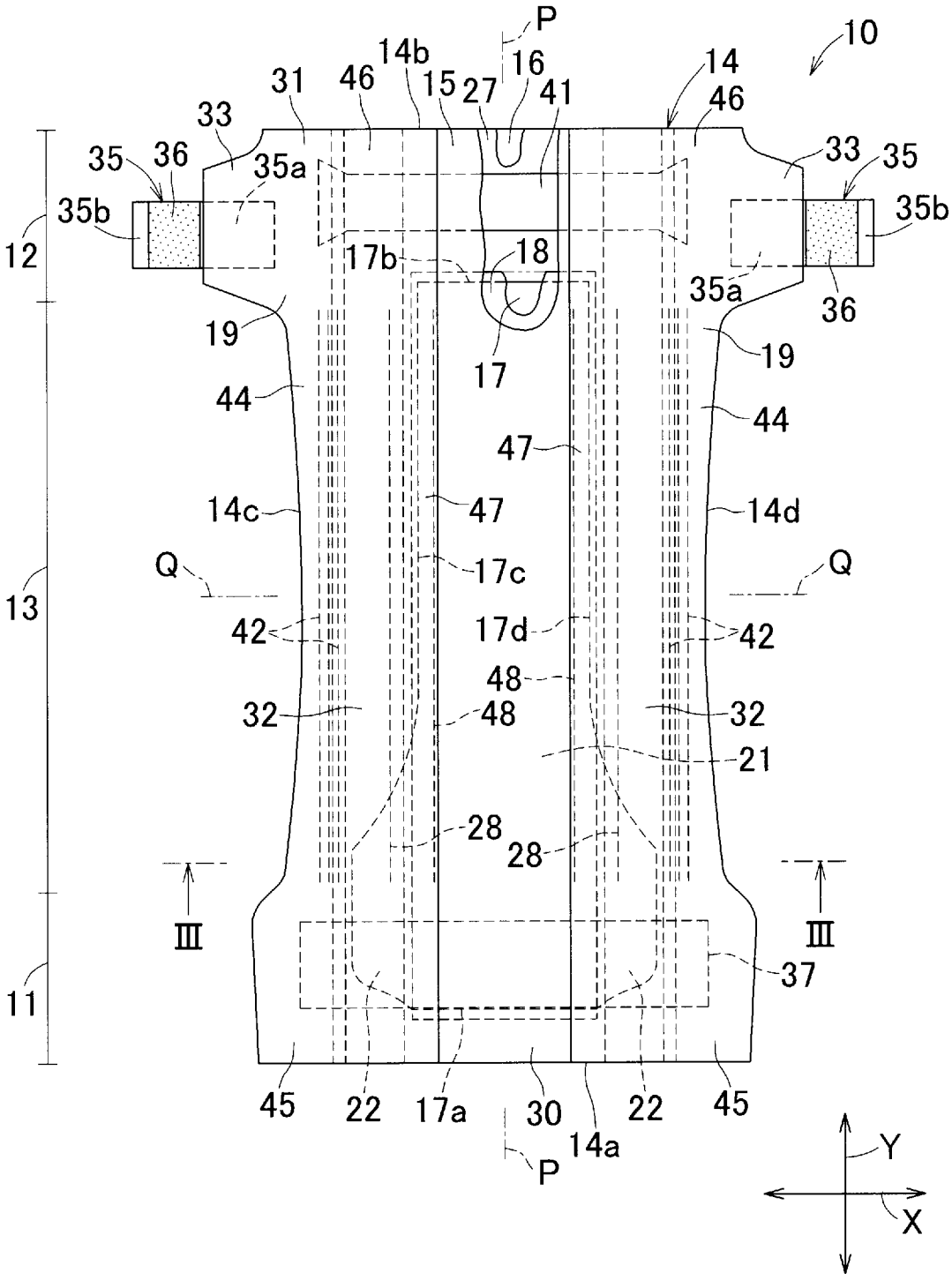
[Claim 14] The absorbent wearing article defined by any preceding claim, including fastener means adapted to fasten opposite side edges of the front waist region to opposite side edges of the rear waist region wherein the fastener means at least include a fastening element extending on the outer surface of the front waist region in the transverse direction so that the fastening element may extend across a front end of the liquid-absorbent structure, the first elastic elements being arranged such that they do not intersect with the fastening element.

[Claim 15] The absorbent wearing article defined by any preceding claim, wherein the lower edges of the side ears have a circular arc shape being inwardly concave.

[Fig. 1]



[Fig. 2]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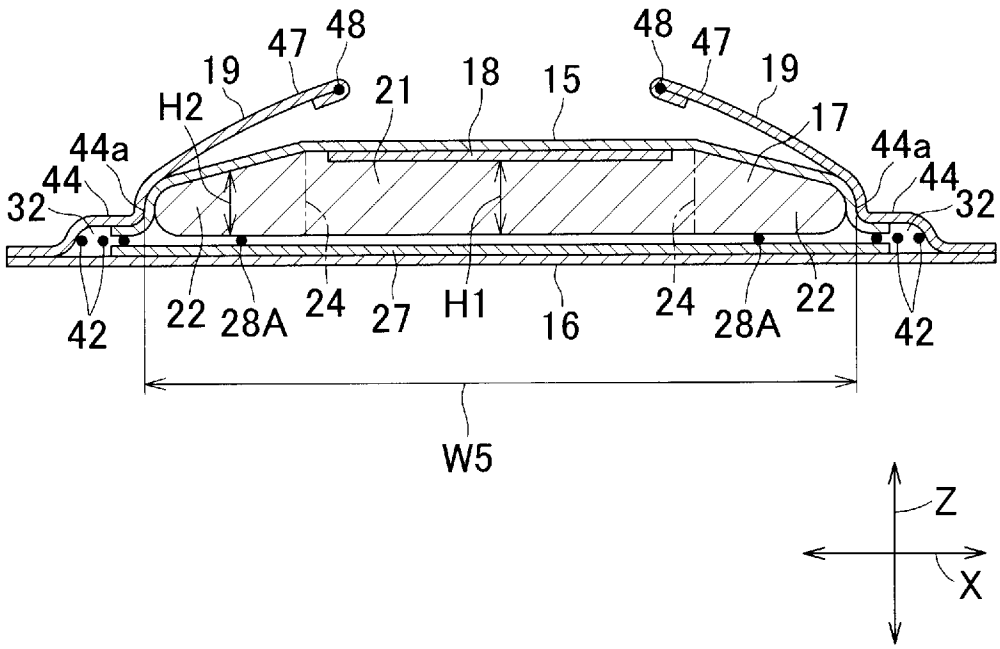
[Fig. 3]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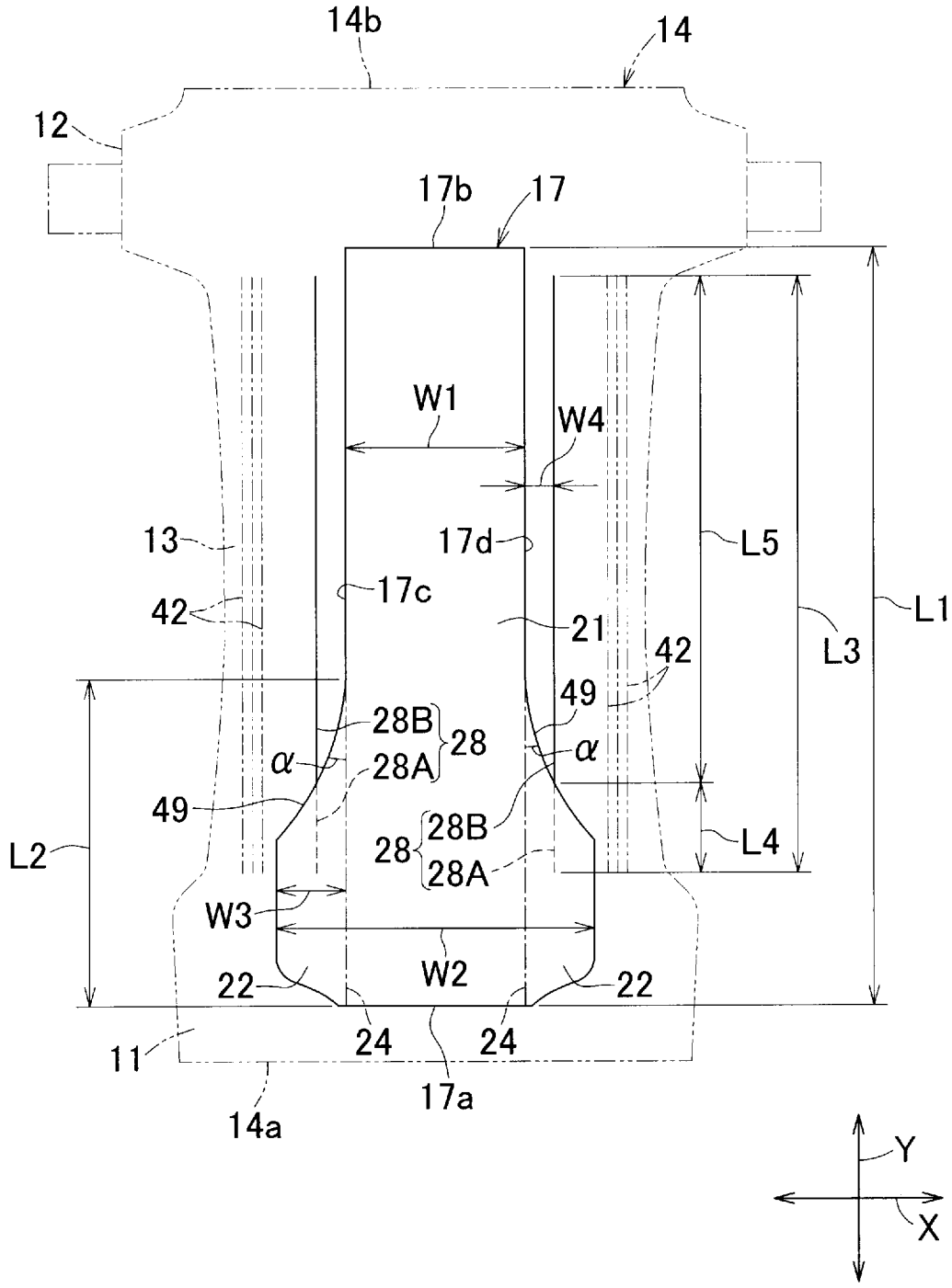
[Fig. 4]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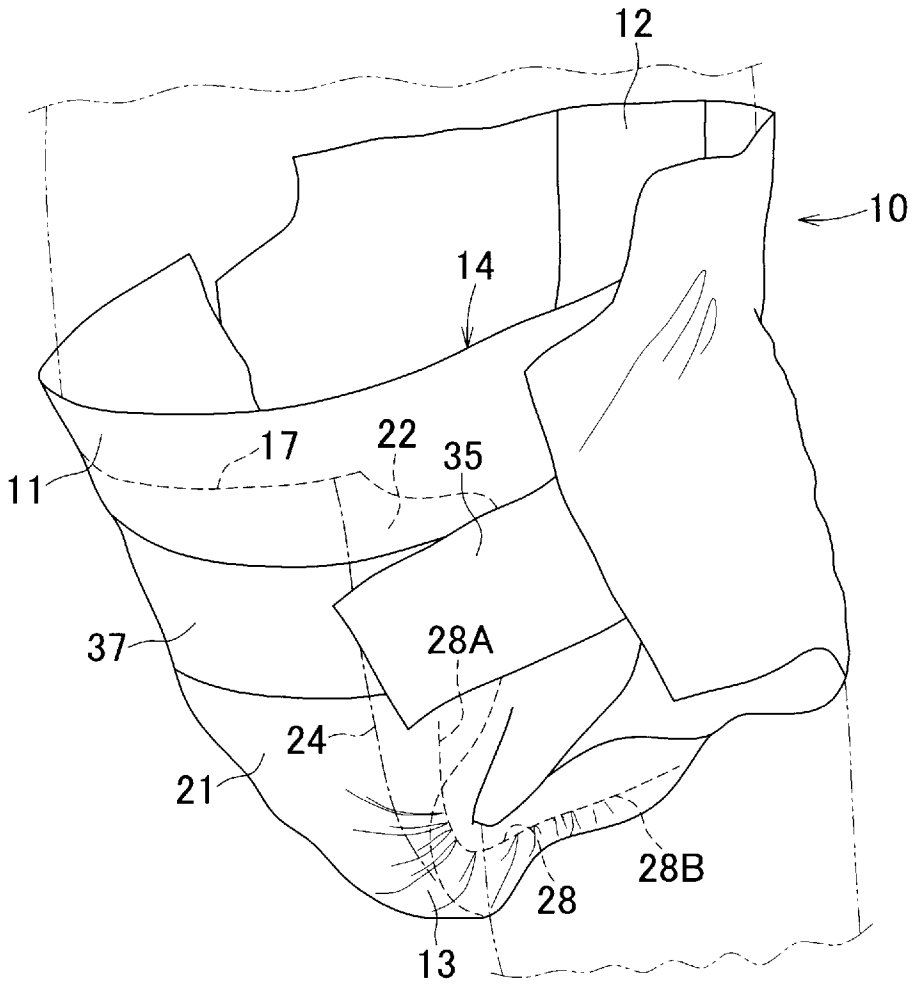
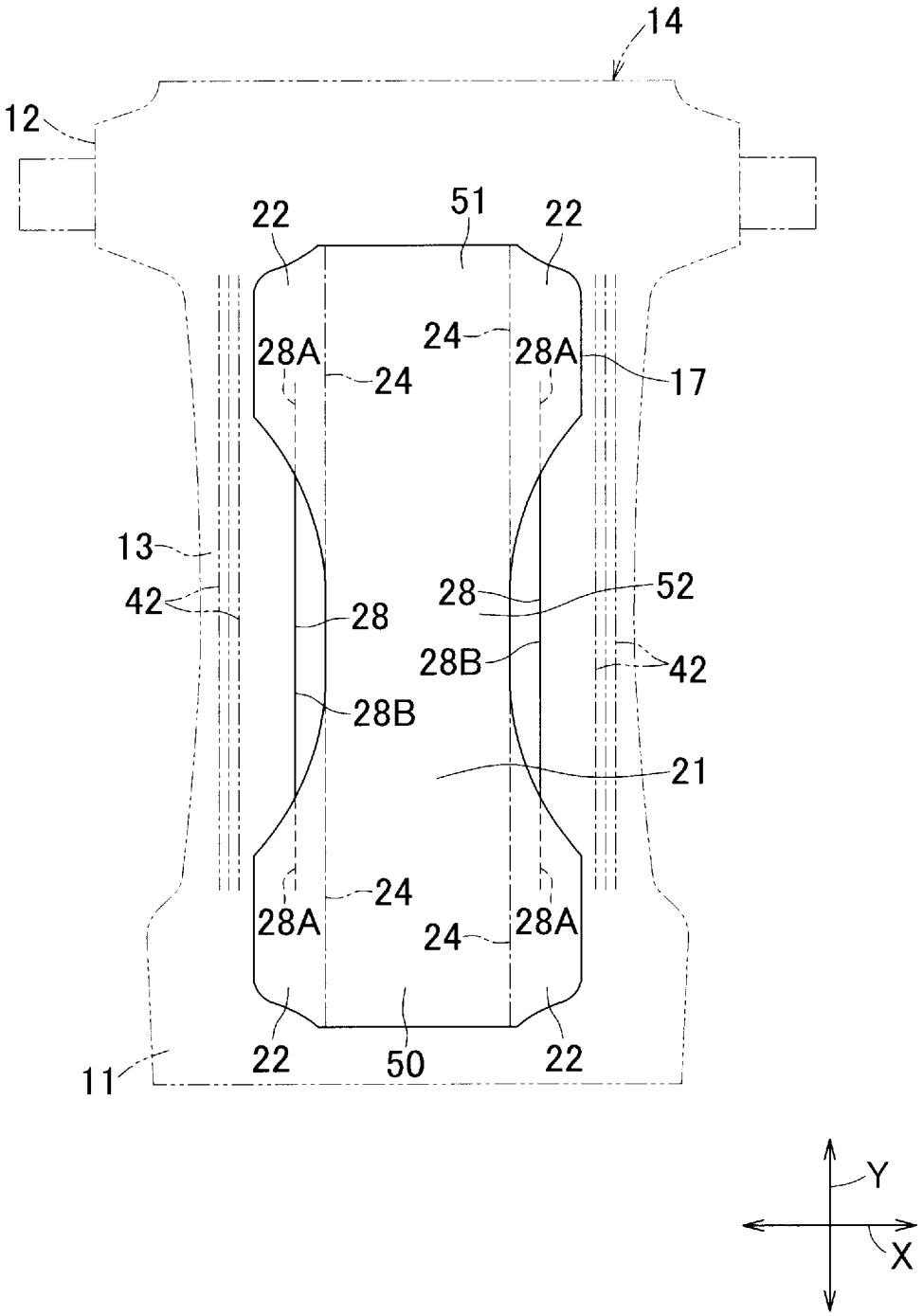
[Fig. 5]



[Fig. 6]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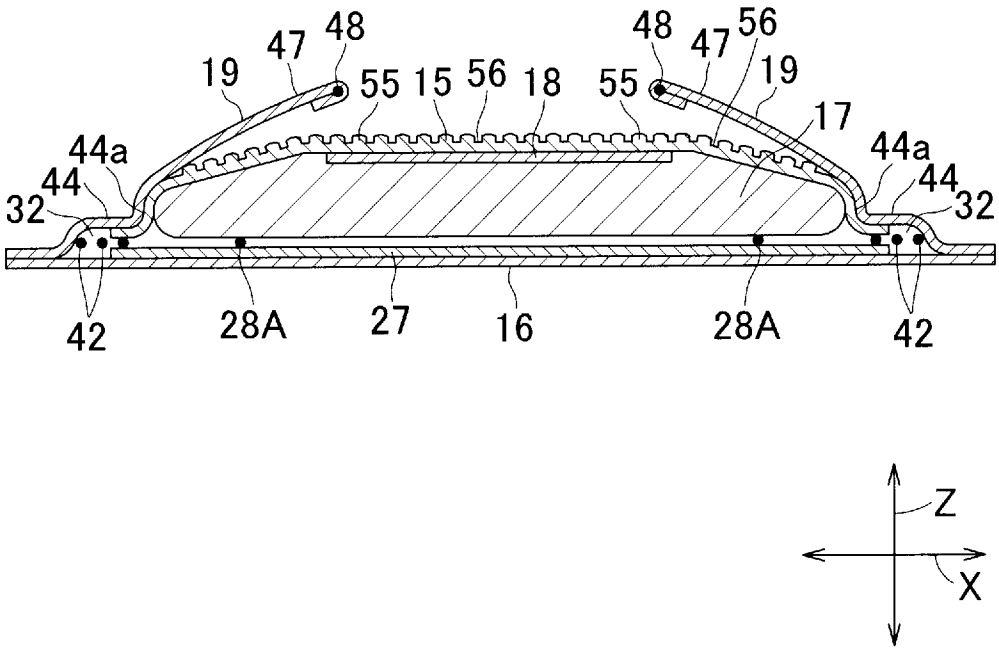
[Fig. 7]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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2012/001308

A. CLASSIFICATION OF SUBJECT MATTER

Int.Cl. A61F13/496(2006.01)i, A61F13/15(2006.01)i, A61F13/49(2006.01)i, A61F13/511(2006.01)i, A61F13/53(2006.01)i, A61F13/56(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Int.Cl. A61F13/00, A61F13/15-13/84

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan 1922-1996
Published unexamined utility model applications of Japan 1971-2012
Registered utility model specifications of Japan 1996-2012
Published registered utility model applications of Japan 1994-2012

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2003-275236 A (UNICHARM CORPORATION) 2003.09.30, entire text, Figs. 1-6 & US 2004/0006325 A1 & EP 1346713 A2 & TW 247598 B & CN 1444915 A	1-15
Y	JP 9-84826 A (UNICHARM CORPORATION) 1997.03.31, paragraphs [0009], [0012], [0020], Figs. 1-2 & JP 2003-111794 A & US 5941865 A & US 5916206 A & EP 806196 A2 & EP 753292 A2 & DE 69627248 T2 & AU 710555 B2 & CA 2204471 A1 & ID 16874 A & CN 1171233 A & AU 712652 B2 & CA 2180631 A1	1-15

☑ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
22.05.2012	29.05.2012

Name and mailing address of the ISA/JP	Authorized officer
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2012/001308

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2004-105376 A (DAIO PAPER CORPORATION) 2004.04.08, Fig. 3 (Family : none)	6, 8-15
Y	JP 2002-159526 A (UNICHARM CORPORATION) 2002.06.04, paragraph [0018] & US 6923797 B2 & EP 1208827 A1 & DE 60129523 T2 & CA 2363481 A1 & TW 524098 U & AU 783797 B2 & KR 10-2002-0040651 A & CN 1359666 A & SG 101520 A & MX PA01012205 A & CA 2363481 A1	7-15
Y	JP 2010-201093 A (KAO CORPORATION) 2010.09.16, paragraph [0034], Fig. 9(a) (Family : none)	10-15
Y	JP 54-133938 A (JOHNSON & JOHNSON) 1979.10.18, line 20,top right column to line 9, bottom left column, page 7, Fig. 3 & US 4352355 A & GB 2023431 A & FR 2421571 A1 & NZ 189979 A & AU 4406279 A & ES 247550 U & ES 251439 U & BR 7901592 A & ZA 7901588 A	15