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(54) **Title:** DIAPER SIDE PANEL, DIAPER, MANUFACTURING METHOD FOR DIAPER SIDE PANEL, AND WEB FOR SIDE PANEL

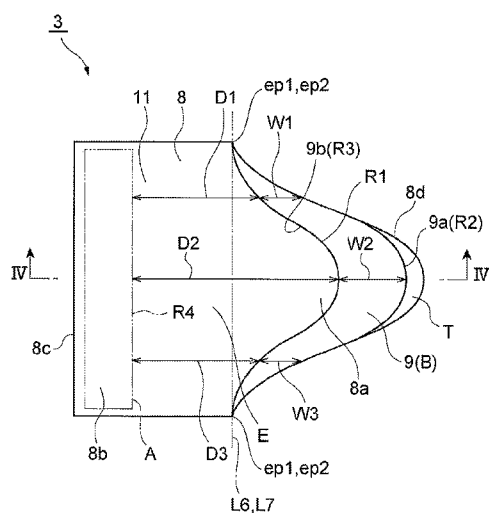


Fig. 3

(57) **Abstract:** Resolution Means: A side panel 3 for connecting an abdominal end part and a back end part of a sheet-like main body part on a left and right waist of a wearer so as to be freely attached and removed, the side panel being used in a diaper which covers the crotch of the wearer with the main body part from an abdominal side to a back side. The side panel 3 includes a stretchable part E which is composed of a stretchable material, having a band-shape along one direction, and being freely stretchable in the one direction; a fixed part A which is provided on one end side in the one direction of the stretchable part E and is fixed to the back end part of the main body part; and a removeably attachable part B which is provided on the other end side in the one direction of the stretchable part E and is joined to the abdominal end part of the main body part so as to be freely attached and removed; wherein a distance from the fixed part A to the removeably attachable part B at a central position in a direction orthogonal to the one direction is larger than a distance between the fixed part A and the removeably attachable part B at both flank positions sandwiching the central position in a direction orthogonal to the one direction.



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DIAPER SIDE PANEL, DIAPER, MANUFACTURING METHOD FOR DIAPER SIDE PANEL, AND WEB FOR SIDE PANEL

FIELD OF THE INVENTION

5 The present invention relates to a diaper side panel, a diaper, a manufacturing method for a diaper side panel, and a web for a side panel.

BACKGROUND

10 Japanese Unexamined Patent Application Publication No. 2010-136788A discloses an expandable diaper, wherein a side edge part of at least one side of the abdominal side and the back side is made stretchable, and a fastening tape is fixed and attached to the outer edge sides of this one stretchable side edge.

SUMMARY

15 A conventional diaper as described above can be worn easily. On the other hand, there is a demand for a diaper to be able to reliably prevent leakage while being worn, and the adhesion to the waist and legs of the wearer is important. Therefore, there is a demand to further improve the adhesion of a conventional diaper to the waist and legs of the wearer without sacrificing the ease of attaching and removing the diaper.

20 One embodiment of the present invention is a side panel for a diaper, which is a side panel for connecting an abdominal end part and a back end part of a sheet-like main body part on a left and right waist of a wearer so as to be freely attached and removed, the side panel being used in a diaper which covers the crotch of the wearer with the main body part from an abdominal side to a back side. The side panel includes a stretchable part which is composed of
25 a stretchable material, having a band-shape along one direction, and being freely stretchable in the one direction; a fixed part which is provided on one end side in the one direction of the stretchable part and is fixed to either the abdominal end part or the back end part of the main body part; and a removeably attachable part which is provided on the other end side in the one direction of the stretchable part and is joined to the other of the abdominal end part or the back
30 end part of the main body part so as to be freely attached and removed. A distance from the fixed part to the removeably attachable part at a central position in a direction orthogonal to the one direction is larger than a distance between the fixed part and the removeably attachable part at both flank positions sandwiching the central position in a direction orthogonal to the one direction.

35 In another embodiment, the removeably attachable part may be a male member or female member of a surface fastener.

 In another embodiment, the side panel may further have a gripping part provided farther toward the tip side than the removeably attachable part.

40 In one aspect of the present invention, a diaper having the diaper side panel described above is provided.

In another aspect, a manufacturing method for the diaper side panel described above is provided, wherein a junction material serving as a removeably attachable part is provided on a tape-shaped base material serving as a stretchable part along a first meander line which cyclically meanders with respect to the center line of the base material; the base material is divided in a width direction along a second meander line which meanders roughly in sync with the period of the meandering of the junction material and at an amplitude allowing the line to pass farther to the outside than the inner edge of the curved part of the junction material; and each of the divided sections is divided in the longitudinal direction at positions corresponding to valley parts of the second meander line.

In another aspect, the present invention is a web used for the diaper side panel. The web has a tape-shaped base material serving as a stretchable part, and a junction material serving as a removeably attachable part that is disposed along a first meander line which cyclically meanders with respect to a center line of the base material.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of an expandable diaper.

FIG. 2 is a perspective view illustrating a state in which an abdominal end part and a back end part of the diaper in FIG. 1 are connected.

FIG. 3 is a plan view of a diaper side panel in FIG. 1.

FIG. 4 is a cross-sectional view along the line IV-IV in FIG. 3.

FIG. 5 is a plan view illustrating a tape-shaped base material (elastic member) used in the manufacture of the diaper side panel.

FIG. 6 is a plan view illustrating a state in which a surface fastener is attached to the tape-shaped base material in FIG. 5.

FIG. 7 is a plan view illustrating a state in which the tape-shaped base material in FIG. 6 is divided in the width direction.

FIG. 8 is a plan view illustrating a state in which each long segment in FIG. 7 is divided in the longitudinal direction.

FIG. 9 is a plan view illustrating a modified example of the manufacturing method for the diaper side panel.

FIG. 10 is a plan view illustrating another modified example of the manufacturing method for the diaper side panel.

FIG. 11 is a plan view illustrating another modified example of the manufacturing method for the diaper side panel.

FIG. 12 is a plan view illustrating another modified example of the manufacturing method for the diaper side panel.

FIG. 13 is a plan view illustrating another modified example of the manufacturing method for the diaper side panel.

FIG. 14 is a plan view illustrating another modified example of the diaper side panel.

FIG. 15 is a plan view illustrating another modified example of the diaper side panel.

FIG. 16 is a plan view illustrating another modified example of the diaper side panel.

DETAILED DESCRIPTION

Preferred embodiments of the diaper side panel, the diaper, the manufacturing method for the diaper side panel, and the web for a side panel will be described in detail hereinafter with reference to the drawings. In each drawing, identical elements or elements having equivalent functions are labeled with the same symbols, and duplicate explanations will be omitted here. FIG. 1 is a perspective view of an expandable diaper, and FIG. 2 is a perspective view illustrating a state in which an abdominal end part and a back end part of the diaper in FIG. 1 are connected.

As illustrated in FIGS. 1 and 2, an expandable diaper 1 includes a sheet-shaped main body part 2 which covers the crotch of a wearer from the abdominal side to the back side and a pair of side panels 3 and 3 which connect an abdominal end part 2a and a back end part 2b of the main body part 2 on a left and right waist of the wearer so as to be freely attached and removed. Hereinafter, in the description of each part of the diaper 1, the surface of the diaper 1 on the wearer's side is referred to as the 'interior surface', and the surface on the opposing side thereof is referred to as the 'exterior surface'.

The main body part 2 includes a liquid-impermeable outside film 4, a liquid-permeable inside film 5 laminated on the inside of the outside film 4, and a liquid-absorbent polymer absorbent 6 held between the outside film 4 and the inside film 5. A band-shaped female side surface fastener (female member of the surface fastener) 7 extending in the width direction of the main body part 2 is provided on the exterior surface of the abdominal end part 2a of the main body part 2. Multiple loops with which hooks engage are provided on the surface of the female side surface fastener 7. A female side surface fastener 7 made of a non-woven fabric or the like which enables hooks to engage with the fibers thereof may also be used instead of a female side surface fastener 7 with loops provided on the surface. In addition, instead of providing the female side surface fastener 7, the outside film 4 may be made of a material provided with multiple loops with which hooks engage, or the outside film 4 may be made of a non-woven fabric or the like which enables hooks to engage with the fibers thereof.

Side panel 3 projects from the back end part 2b in the width direction of the main body part 2. Hereinafter, "tip side" and "base end side" of the side panel 3 refer to the tip side and base end side in the projection direction. The side panel 3 includes a stretchable part E, a fixed part A, and a removeably attachable part B. The stretchable part E is composed only of a stretchable material, has a band-shape along the projection direction of the side panel 3, and is freely stretchable in the projection direction of the side panel 3. The fixed part A is provided on the base end side of the stretchable part E, is fixed to the exterior surface of the back end part 2b by adhesion, sewing, deposition, or the like. The removeably attachable part B is provided on the tip side of the stretchable part E, and is joined to the abdominal end part 2a so as to be freely attached and removed. Note that, the side panel 3 is an element that includes an ear projecting from the diaper 1 and a tab extended from the tip of the ear.

The side panel 3 is formed of an elastic member 8 composed of a stretchable material,

and a male side surface fastener (male member of a surface fastener) 9 is provided on the interior surface of the tip part 8a of the elastic member 8. Multiple hooks which engage with the loops of the female side surface fastener 7 are provided on the surface of the male side surface fastener 9. As a result, as illustrated in FIG. 2, it is possible to join the male side surface fastener 9 to the female side surface fastener 7 so as to be freely attached and removed. A base end 8b of the elastic member 8 composes the fixed part A. The male side surface fastener 9 composes the removeably attachable part B. In other words, the removeably attachable part B is the male member of a surface fastener. Also, the removeably attachable part B may be the female member of a surface fastener. In this case, the male member of a surface fastener is provided on the exterior surface of the abdominal end part 2a.

The fixed part A and the removeably attachable part B are formed on the elastic member 8 as described above, and the part of the elastic member 8 between the fixed part A and the removeably attachable part B composes a stretchable part E. The structure of the side panel 3 is not limited to this, and for example, the side panel 3 may be configured to have a separately formed fixed part A, stretchable part E, and removeably attachable part B connected in line.

As illustrated in FIGS. 3 and 4, the elastic member 8 is composed of a stretchable core sheet 10 and cover sheets 11 and 12 each having stretchability and sandwiching the core sheet 10. The core sheet 10 is preferably made of an elastomer with a permanent elongation of at most 30% (preferably at most 20% and more preferably at most 10%) when measured in accordance with JIS K6301 and a breaking strength of at least 7 MPa (preferably at least 13 MPa and more preferably at least 20 MPa) when measured in accordance with JIS K6251-93. Examples of such an elastomer include styrene-based thermoplastic elastomers, olefin-based thermoplastic elastomers (TPO), vinyl chloride-based thermoplastic elastomers, urethane-based thermoplastic elastomers, ester-based thermoplastic elastomers, amide-based thermoplastic elastomers, and similar thermoplastic elastomers. When a styrene-based thermoplastic elastomer is used, it is preferable to use an elastomer with a melt index (200°C, 5 kg) of at most 100 g/10 min (preferably at most 50 g/10 min and more preferably at most 30 g/10 min) when measured by JIS K7210-76. When an olefin-based thermoplastic elastomer is used, it is preferable to use an elastomer with a melt index (230°C, 2.16 kg) of at most 50 g/10 min (preferably at most 30 g/10 min and more preferably at most 10 g/10 min).

A thermoplastic elastomer is made of a hard segment and a soft segment, and the hard segment primarily has the function of molecular restriction. An example of a styrene-based thermoplastic elastomer is one in which the hard segment is a polystyrene and the soft segment is a polybutadiene, polyisoprene, or a hydrogenated product thereof (restriction form: frozen phase). An example of an olefin-based thermoplastic elastomer is one in which the hard segment is a polyethylene or polypropylene and the soft segment is an ethylene propylene rubber (EPDM, EPM, EEM), or a hydrogenated (styrene) butadiene rubber (restriction form: crystalline phase). An example of a vinyl chloride-based thermoplastic elastomer is one in which the hard segment is a crystalline polyvinyl chloride and the soft segment is a non-crystalline polyvinyl chloride or NBR (restriction form: crystalline phase). An example of a urethane-based thermoplastic

elastomer is one in which the hard segment is a urethane structure and the soft segment is a polyester or polyether (restriction form: hydrogen bond or crystalline phase). An example of an ester-based thermoplastic elastomer is one in which the hard segment is a polyester and the soft segment is a polyether or polyester (restriction form: crystalline phase). An example of an amide-based thermoplastic elastomer is one in which the hard segment is a polyamide and the soft segment is a polyether or polyester (restriction form: hydrogen bond or crystalline phase).

The thermoplastic elastomer may consist of one type or may be a mixture of two or more types and may form an interpenetrating polymer network (IPN) or be manufactured by dynamic vulcanization.

Here, styrene-based thermoplastic elastomers and olefin-based thermoplastic elastomers will be described in further detail. Various types of ternary block polymer materials having an aromatic vinyl-conjugated diene (or a substance in which some or all of the unsaturated bonds thereof are hydrogenated)-aromatic vinyl block copolymer as a basic structure can be used in a styrene-based thermoplastic elastomer.

Styrene is desirable as the vinyl monomer constituting the aromatic vinyl polymer. In addition, examples of monomers constituting the conjugated diene include 1,3-butadiene, isoprene, 2,3-dimethyl-1,3-butadiene, 2-chloro-1,3-butadiene, 1,3-pentadiene, and 1,3-hexadiene, and some or all of the unsaturated bonds thereof may be hydrogenated at the point when the substance is used as a styrene-based thermoplastic elastomer.

Examples of representative styrene-based thermoplastic elastomers include styrene-isoprene-styrene block copolymers (SIS), styrene-ethylene-butylene-styrene block copolymers (SEBS), styrene-butadiene-styrene block copolymers (SBS), styrene-ethylene-propylene-styrene block copolymers (SEPS), styrene-ethylene-ethylene/propylene-styrene block copolymers (SEEPS), and styrene-butadiene-butylene-styrene block copolymers (SBBS). The structure of these styrene-based elastomers may be linear, radial, or star-shaped.

The styrene-based thermoplastic elastomer may contain a binary block polymer having an aromatic vinyl-conjugated diene (or a substance in which some or all of the unsaturated bonds thereof are hydrogenated) as a basic structure. However, in order to reduce the permanent elongation, the amount of such a binary block polymer is preferably at most 10 wt.% and more preferably at most 3 wt.% when the total weight of the styrene-based thermoplastic elastomer component is defined as 100 wt.%.

Further, if an SIS is used as a styrene-based thermoplastic elastomer, the ratio of styrene when the total weight of the SIS is defined as 100 wt.% is preferably at least 35 wt.% and more preferably approximately 40 wt.%.

The ratio of the binary block polymer in the styrene-based thermoplastic elastomer is preferably at most 10 wt.% and more preferably at most 3 wt.% when the total weight of the styrene-based thermoplastic elastomer (that is, the total amount of the SIS and the SI binary block polymer) is defined as 100 wt.%. The shape of the styrene domain preferably has a spherical or cylindrical structure and more preferably has a spherical structure.

Examples of SIS block copolymers include the brand name Quintac (registered trademark) SL-159 (melt index: at most 20 g/10 min (200°C, 5 kg), binary block polymer: at most 1 wt.%, styrene ratio: 48 wt.%) made by the Zeon Corporation and a mixture including 75 wt.% of the brand name Vector (registered trademark) 4411 (melt index: 40 g/10 min (200°C, 5 kg), binary block polymer: at most 1 wt.%, styrene ratio: 44 wt.%) made by Dexco Polymers, and 25 wt.% of the brand name D1117 (melt index: 33 g/10 min (200°C, 5 kg), binary block polymer: 33 wt.%, styrene ratio: 17 wt.%) made by Kraton Polymers.

Examples of olefin-based thermoplastic elastomers include simple blend-type TPO, implanted TPO, dynamically vulcanized TPO, and the like. In an implanted TPO, the ethylene ratio is preferably at least 14%. An example of a preferable olefin-based thermoplastic elastomer is an olefin-based elastomer block copolymer polymerized using a metallocene catalyst (Vista Maxx 6102, gravimetric ethylene content: 16%, melt index: 3 g/10 min (230°C, 2.16 kg)).

In addition to the polymers described above, the styrene-based thermoplastic elastomer or olefin-based thermoplastic elastomer may contain additives such as a tackifier. Tackifiers having good compatibility with the polymers are preferable. For example, it is preferable to use a tackifier such as a rosin-based, terpene-based, or petroleum-based tackifier, or the like in the SIS copolymer. Two or more types of tackifiers may also be used in combination. An example of a rosin-based tackifier is the brand name Pine Crystal (registered trademark) made by Arakawa Chemical Industries, Ltd. An example of a terpene-based tackifier is the brand name YS Polystar made by Yasuhara Chemical Co., Ltd. Examples of petroleum-based tackifiers include the brand name Wingtack Plus made by Cray Valley and the brand name Alcon (registered trademark) made by Arakawa Chemical Industries, Ltd. The amount of the tackifier can be set, for example, to approximately 0.1 to 10 wt.% using the total amount of the raw material composition of the core sheet 10 as a reference. The raw material composition of the core sheet 10 may further contain various additives (antioxidants, weather resistance agents, ultraviolet absorbents, colorants, inorganic fillers, oils, and the like).

From the perspective of achieving flexibility and favorable external appearance of the obtained side panel 3, the basis weight of the core sheet 10 used in the elastic member 8 is preferably at most 60 g/m², more preferably at most 50 g/m², and even more preferably at most 45 g/m². On the other hand, from the perspective of maintaining durability of the side panel 3, the basis weight of the core sheet 10 is preferably at least 20 g/m² and more preferably at least 30 g/m².

The thickness of the core sheet 10 is, for example, approximately 20 to 150 μm. From the perspective of achieving flexibility and elastic conformance to the body of the side panel 3, the thickness of the core sheet 10 is preferably at most 60 μm and more preferably at most 50 μm. On the other hand, in order to maintain durability, the thickness of the core sheet 10 is preferably at least 20 μm and more preferably at least 30 μm. The core sheet 10 may have a single-layer structure or a multilayer structure. In the case of a multilayer structure, each layer can be made of a composition containing a different elastomer. In this case, at least one of the plurality of

layers is made of the thermoplastic elastomer described above.

In order to give the elastic member 8 breathability, the core sheet 10 may be subject to processing with small holes (perforation processing). In this case, using an SIS block copolymer for the thermoplastic elastomer constituting the core sheet 10 makes it possible to suppress tearing of the core sheet 10 originating from small holes. In addition, using an SIS block copolymer makes it possible to particularly increase the junction strength of the core sheet 10 and the cover sheets 11 and 12.

The cover sheets 11 and 12 are, for example, non-woven fabrics. The fiber materials constituting the cover sheets 11 and 12 are not particularly limited, and various conventionally known fiber materials may be used. In order to achieve stretchability, flexibility, and favorable skin feel of the cover sheets 11 and 12, the fiber materials constituting the cover sheets 11 and 12 are preferably polypropylene fibers, mixed fibers formed by blending polyester fibers and polyolefin fibers, concentric composite fibers formed by covering a polyethylene terephthalate core material with a polyethylene, or concentric composite fibers formed by covering a polypropylene core material with a polyethylene. The blending ratio of blended fibers formed by blending polyester fibers and polyolefin fibers is not particularly limited, but in order to achieve favorable stretchability, the ratio of polyester fibers is preferably higher than the ratio of polyolefin fibers. For example, the content of polyester fibers in the mixed fibers is preferably at least 80 wt.% and more preferably at least 90 wt.%. In addition, the ratio of the polypropylene and polyethylene (polypropylene:polyethylene) in concentric composite fibers formed by covering a polypropylene core material with a polyethylene may be set to from 75:25 to 25:75 when expressed as a weight ratio, and the ratio is preferably set to from 65:35 to 35:65 and more preferably from 60:40 to 40:60.

The manufacturing method of the cover sheets 11 and 12 is not particularly limited, and a conventionally known manufacturing method may be used, but in order to impart favorable stretchability of the elastic member 8, it is preferable to use a spunbond method, a spunlace method, a thermal bond method, or the like. Furthermore, using a spunlace method makes it possible to further improve the skin feel of the cover sheets 11 and 12.

The thickness of each of the cover sheets 11 and 12 is, for example, approximately 30 to 200 μm . In order to achieve a fabric-like texture and flexibility, the thickness of each of the cover sheets 11 and 12 is preferably at most 150 μm and more preferably at most 80 μm . On the other hand, in order to maintain durability, the thickness of each of the cover sheets 11 and 12 is preferably at least 30 μm and more preferably at least 35 μm . The basis weight of each of the cover sheets 11 and 12 is, for example, approximately 10 to 50 g/m^2 . In order to achieve flexibility, the basis weight of each of the cover sheets 11 and 12 is preferably at most 40 g/m^2 and more preferably at most 35 g/m^2 . On the other hand, in order to maintain durability, the basis weight of each of the cover sheets 11 and 12 is preferably at least 12 g/m^2 and more preferably at least 15 g/m^2 . The elastic member 8 does not necessarily have a three-layer structure including a core sheet 10 and cover sheets 11 and 12, and it may, for example, have a two-layer structure including a core sheet 10 and a cover sheet 11, or a single-layer structure

composed only of the core sheet 10, having no cover sheets 11 and 12.

As illustrated in FIG. 3, in one embodiment of the present invention, the base edge 8c of the elastic member 8 has a linear shape and is orthogonal to the projection direction of the elastic member 8. The tip edge 8d of the elastic member 8 has a tapered shape. Specifically, the tip edge 8d of the elastic member 8 has a shape in which the center part projects farther toward the tip side than the parts on both end sides and curves without any angular parts.

The male side surface fastener 9 is provided with a band shape following the shape of the tip edge 8d of the elastic member 8 and is fixed to the surface of the cover sheet 11 of the elastic member 8 by adhesion, sewing, deposition, or the like. The tip edge 9a and the base edge 9b which define the shape of the male side surface fastener 9 both have shapes in which the center part projects farther toward the tip side than the parts on both end sides and curves without any angular parts, but the width of the male side surface fastener 9 gradually decreases toward both end sides from the center part. Therefore, the width W2 of the center part of the male side surface fastener 9 is larger than the widths W1 and W3 of the parts on both end sides of the male side surface fastener 9. The projection length of the center part of the tip edge 9a with respect to both ends ep2 and ep2 of the tip edge 9a (distance between a straight line L7 connecting both ends ep2 and ep2 and the center part of the tip edge 9a) is larger than the projection length of the center part of the base edge 9b with respect to both ends ep1 and ep1 of the base edge 9b (distance between a straight line L6 connecting both ends ep1 and ep1 and the center part of the base edge 9b). Since the center part of the tip edge 9a is positioned farther toward the base end side than the center part of the tip edge 8d of the elastic member 8, part of the elastic member 8 on the tip side projects farther toward the tip side than the male side surface fastener 9.

A plurality of fungi-form hooks, for example, is formed on the surface of the male side surface fastener 9. The plurality of hooks is preferably formed, for example, at a density of approximately 60 to 1550 hooks/cm², more preferably formed at a density of approximately 125 to 690 hooks/cm², and even more preferably formed at a density of approximately 248 hooks/cm². The height of each hook is preferably approximately 0.03 to 1.27 mm, more preferably approximately 0.1 to 0.51 mm, and even more preferably approximately 0.18 to 0.33 mm.

The diameter of the stem part of each hook is preferably, for example, approximately 0.076 to 0.635 mm and more preferably approximately 0.127 to 0.305 mm. The umbrella part of each hook has, for example, a discoid shape. The amount of overhang of the umbrella part from the outer peripheral surface of the stem part is preferably, for example, approximately 0.013 to 0.254 mm, more preferably approximately 0.025 to 0.127 mm, and even more preferably approximately 0.12 mm. The thickness of the umbrella part is preferably, for example, approximately 0.013 to 0.254 mm and more preferably approximately 0.025 to 0.127 mm. The planar shape of the umbrella part is not limited to a circular shape and may also be an elliptical shape or a polygonal shape. The thickness of the male side surface fastener 9 excluding each hook - that is, the thickness of the sheet part of the male side surface fastener 9 supporting each hook - is preferably approximately 0.025 to 0.512 mm and more preferably approximately 0.064

to 0.254 mm.

Such a male side surface fastener 9 is formed, for example, from a thermoplastic resin. When forming the male side surface fastener 9, a sheet material is formed with a plurality of columnar bodies constituting the original shapes of the plurality of hooks formed on the surface.

5 Next, each hook is formed by heating the tip part of each columnar body and crushing the tip into a discoid shape so as to obtain the male side surface fastener 9. Examples of thermoplastic resins include polyolefins such as polyethylene, polypropylene, and copolymers of polyethylene and polypropylene, poly(ethylene terephthalate), polyamides such as nylon, poly(styrene-acrylonitrile), poly(acrylonitrile-butadiene-styrene), plasticized vinyl chloride, 10 polyesters, and the like. One type of these thermoplastic resins may be used alone, or two or more types may be used as a mixture, but it is more preferable to use a copolymer of a polyethylene and polypropylene.

As described above, the base end 8b, i.e. the band-shaped part of the base edge 8c, of the elastic member 8 composes the fixed part A. The male side surface fastener 9 composes the 15 removeably attachable part B. The part of the elastic member 8 between the fixed part A and the removeably attachable part B composes the stretchable part E. The part of the elastic member 8 projecting farther toward the tip side than the male side surface fastener 9 is a gripping part T that can be easily gripped even if the male side surface fastener 9 is connected to the female side surface fastener 7. In other words, the side panel 3 further has a gripping part T 20 provided farther toward the tip side than the removeably attachable part B.

As described above, the base edge 9b of the male side surface fastener 9 has a shape in which the center part protrudes farther toward the tip side than the parts on both end sides and curves without any angular parts, so the tip edge R1 of the stretchable part E and the base edge R3 of the removeably attachable part B have curved tapered shapes without any angular parts. 25 In contrast, the tip edge R4 of the fixed part A follows a straight line orthogonal to the projection direction of the elastic member 8. Therefore, the distance between the fixed part A and the removeably attachable part B, i.e. the distance between the tip edge R4 of the fixed part A and the base edge R3 of the removeably attachable part B, gradually decreases toward both outer sides from the center position in the direction orthogonal to the projection direction of the elastic member 8, and the distance D2 from the fixed part A to the removeably attachable part B at the 30 center position in the direction orthogonal to the projection direction of the elastic member 8 is larger than the distances D1 and D3 from the fixed part A to the removeably attachable part B at both flank positions sandwiching the center position in the direction orthogonal to the projection direction of the elastic member 8.

Furthermore, the tip edge 9a of the male side surface fastener 9 has a shape in which the center part protrudes farther toward the tip side than the parts on both end sides and curves without any angular parts, so the tip edge R2 of the removeably attachable part B has a curved tapered shape without any angular parts. Therefore, the distance between the tip edge R2 of the removeably attachable part B and the tip edge R4 of the fixed part A gradually decreases toward 40 both outer sides from the center position in the direction orthogonal to the projection direction of

the elastic member 8, and the total length of the distance D2 and the width W2 is greater than any of the total length of the distance D1 and the width W1, and the total length of the distance D3 and the width W3. Further, the width W2 is greater than the widths W1 and W3, so the projection length of the center part of the tip edge R2 with respect to both ends ep2 and ep2 of the tip edge R2 of the removeably attachable part B is larger than the projection length of the center part of the tip edge R1 with respect to both ends ep1 and ep1 of the tip edge R1 of the stretchable part E.

The diaper 1 described above is worn by covering the crotch of the wearer with the main body part 2 from the abdominal side to the back side while the inside film 5 is facing the wearer side and connecting the abdominal end part 2a and the back end part 2b of the main body part 2 on the left and right waist of the wearer. The abdominal end part 2a and the back end part 2b are easily connected by drawing the stretchable part E of the side panel 3 of the back end part 2b in the projection direction and joining the male side surface fastener 9 serving as the removeably attachable part B of the side panel 3 to the female side surface fastener 7 of the abdominal end part 2a.

The distance D2 between the fixed part A and the removeably attachable part B at the center position in the direction orthogonal to the projection direction of the elastic member 8 is greater than the distances D1 and D3 between the fixed part A and the removeably attachable part B at both flank positions sandwiching the center position in the direction orthogonal to the projection direction of the elastic member 8. That is, the lengths of both flank parts of the stretchable part E positioned between the fixed part A and the removeably attachable part B at both flank positions are shorter than the length of the center part of the stretchable part E positioned between the fixed part A and the removeably attachable part B at the center position. The flank parts of the stretchable part E are positioned on the trunk side and the leg side of the wearer when the diaper 1 is worn. Therefore, if the amounts of elongation of the center part of the stretchable part E and both flank parts of the stretchable part E are equal, the percentages of elongation of both flank parts of the stretchable part E positioned on the trunk side and the leg side of the wearer are greater than the percentage of elongation of the center part of the stretchable part E positioned between the trunk side and the leg side. A large percentage of elongation leads to a large reactive force, so the reactive force becomes larger on the trunk side and the leg side of the stretchable part E than at the position between the trunk side and the leg side, and the adhesion to the waist and legs of the wearer is relatively increased. Accordingly, it is possible to further improve adhesion to the waist and legs of the wearer without sacrificing the ease of attaching and removing the diaper.

In addition, the tip edge R1 of the stretchable part E has a tapered shape, and the tip edge R2 of the removeably attachable part B also has a tapered shape. Therefore, the tip of the removeably attachable part B is easy to grip, which further facilitates the attachment and removal of the removeably attachable part B.

Moreover, since the tip edge R1 of the stretchable part E curves without any angular parts, the distance between the fixed part A and the removeably attachable part B changes

gradually depending on the position in the direction orthogonal to the projection direction of the elastic member 8. Therefore, when the diaper 1 is worn, it becomes difficult for the reactive force of the stretchable part E to be focused in a narrow range, which improves the comfort of the wearer.

5 In addition, since the projection length of the center part of the tip edge R2 with respect to the parts on both end sides of the tip edge R2 of the removeably attachable part B is larger than the projection length of the center part of the tip edge R1 with respect to the parts on both end sides of the tip edge R1 of the stretchable part E, the tip of the removeably attachable part B becomes even easier to grip, which further facilitates the attachment and removal of the
10 removeably attachable part B. Further, since the gripping part T is provided farther toward the tip side than the stretchable part E, the attachment and removal of the removeably attachable part B are even further facilitated.

Next, the manufacturing method of the side panel 3 will be described.

15 First, as illustrated in FIG. 5, a tape-shaped base material 13 serving as the stretchable part E is prepared. The base material 13 includes the material of the core sheet 10 and the materials of the cover sheets 11 and 12 sandwiching this material. Next, as illustrated in FIG. 6, a junction material 14 serving as the removeably attachable part B is disposed along a first meander line L2 which cyclically meanders with respect to a center line L1 of the base material 13 and is attached to the surface of the base material 13 by adhesion, sewing, deposition, or the
20 like, for example. The junction material 14 is, for example, a male side surface fastener material. Thereby, a web for a side panel P1 having the base material 13 serving as the stretchable part E, and the junction material 14 serving as the removeably attachable part B that is disposed along a first meander line L2 which cyclically meanders with respect to a center line L1 of the base material 13 is formed.

25 Next, the base material 13 is cut with a roller-type punch processing machine, for example, while the base material 13 is moved in the longitudinal direction. Specifically, as illustrated in FIG. 7, the base material 13 is cut along a second meander line L3 which meanders roughly in sync with the period of the meandering of the junction material 14 and with an amplitude allowing the line to pass farther to the outside than the outer edge R6 of the curved
30 part of the junction material 14. Note that passing farther to the outside than the outer edge R6 means that, of the two regions defined by the outer edge R6, the line passes through the region in which the outer edge R6 is convex (that is, of the two regions defined by the outer edge R6, the region on the opposite side of the inner edge R5). Since the second meander line L3 passes farther to the outside than the outer edge R6 of the curved part of the junction material 14, the
35 line also, of course, passes farther to the outside than the inner edge R5 of the curved part of the junction material 14. Note that passing farther to the outside than the inner edge R5 means that, of the two regions defined by the inner edge R5, the line passes through the region in which the inner edge R5 is convex (that is, of the two regions defined by the inner edge R5, the region on the outer edge R6 side). When cut along the meander line L3, the base material 13 is divided in
40 the width direction to form a pair of long segments 13a and 13b. In addition, as illustrated in

FIG. 8, in roughly the center of a valley part V of the cut ends of each of the long segments 13a and 13b, each of the long segments 13a and 13b is cut along the direction orthogonal to the longitudinal direction so as to divide each of the long segments 13a and 13b in the longitudinal direction. As a result, each of the divided segments forms a side panel 3. In FIG. 8, the part hatched with diagonal lines illustrates one side panel 3. The cutting to divide the base material 13 in the width direction and the cutting to divide the long segments 13a and 13b in the longitudinal direction may be performed simultaneously or separately.

In the manufacturing method described above, the second meander line L3 is roughly in sync with the period of the meandering of the junction material 14 and passes farther to the outside than the inner edge R5 of the curved part of the junction material 14, so a band-shaped junction material segment 14a following the edge of a mountain part M is cut into the inside of the mountain part M on the cut end of each of the long segments 13a and 13b. The mountain part M serves as the tip edge 8d of the elastic member 8. The junction material segment 14a serves as the male side surface fastener 9 - that is, the removeably attachable part B. Further, the second meander line L3 passes farther to the outside than the outer edge R6 of the curved part of the junction material 14, and the part between the outer edge R6 and the second meander line L3 serves as the gripping part T. In this way, each of the segments 13a and 13b is connected to the side panel 3 at each mountain part M, and each of the long segments 13a and 13b is divided in the longitudinal direction at positions corresponding to the valley parts V of the cut ends of each of the long segments 13a and 13b to form the side panel 3.

Accordingly, the fixed part A, the stretchable part E, the removeably attachable part B, and the gripping part T can be formed simultaneously with the simple process of attaching the junction material 14 to the base material 13 and cutting, which makes it possible to manufacture the side panel 3 efficiently. In addition, since the side panel 3 is cut out in a staggered shape with respect to the center line L1 of the base material 13, it is possible to utilize the part between side panels 3 cut out in an adjacent state along the longitudinal direction of the base material 13 as another side panel 3 and to make use of the base material 13 without waste.

A preferred embodiment of the present invention was described above as an explanation, but, this is not to be construed to be a limitation on the present invention. A variety of modifications can be implemented without deviating from the spirit of the invention.

As illustrated in FIG. 14, a plurality of slits 15 may be formed on the male side surface fastener 9 for example. Also, as illustrated in FIG. 15, openings 15A may be formed instead of the slits 15. The form of the openings 15A is not limited, and examples thereof include circular, rectangular, and honeycomb shapes. In the example illustrated in FIG. 15, the openings 15A are rhombus shaped. The slits 15 or the openings 15A may be those that penetrate through the male side surface fastener 9 or those that do not penetrate through the male side surface fastener 9. By forming the slits 15 or the openings 15A, flexibility of the side panel 3 is enhanced.

Positions of the slits 15 or the openings 15A are not limited. In the examples illustrated in FIGS. 14 and 15, the slits 15 and the openings 15A are formed along a plurality of rows L6 that is orthogonal to the projection direction of the side panel 3. The part between

adjacent slits 15 or adjacent openings 15A along the row L6 forms a joining part 16 where surface of the male side surface fastener is left as is (e.g. have a shape where a plurality of formed hooks is left as is). The slits 15 or the openings 15A may be formed along a plurality of rows that is parallel to the projection direction of the side panel 3. As illustrated in FIG. 16, the slits 15 or the openings 15A may be formed along a plurality of rows L7 that follows the tip edge 8d of the elastic member 8 and the edges 9a and 9b of the male side surface fastener 9. Although, in FIGS. 14 to 16, the joining parts 16 provided in the adjacent rows L6 or rows L7 are each arranged alternately (in a staggered manner) along the rows L6 or rows L7, the arrangement is not limited to these. Alternatively, the joining parts 16 may be arranged so that the plurality of joining parts 16 provided in the adjacent rows L6 or rows L7 is aligned in a straight line in a specific direction (e.g. in the direction orthogonal to the plurality of rows L6 or rows L7). The plurality of rows L6 and L7 may be aligned so as to have one row of hooks between the rows L6 or L7, or may be aligned so as to have two or more rows of hooks between the rows L6 or L7. Furthermore, the slits 15 or the openings 15A may be arranged irregularly, i.e. in an arrangement that cannot be described like above.

The tip edge R1 of the stretchable part E and the base edge R3 of the removeably attachable part B may have a rectangular shape. A side panel 3A in which the tip edge R1 and the base edge R3 have a rectangular shape can be manufactured, for example, by forming the junction material 14 in the manufacturing method of the side panel 3 into a junction material 14A which meanders in the form of a rectangular wave, as illustrated in FIG. 9.

The tip edge R1 of the stretchable part E and the base edge R3 of the removeably attachable part B may also have a tapered shape. A side panel 3B in which the tip edge R1 and the base edge R3 have a tapered shape can be manufactured, for example, by forming the junction material 14 in the manufacturing method of the side panel 3 into a junction material 14B which meanders in the form of a triangular wave, as illustrated in FIG. 10.

The removeably attachable part B may be composed of a plurality of the male side surface fasteners 9 interspersed along the tip edge 8d of the elastic member 8. A side panel 3C in which the plurality of male side surface fasteners 9 is interspersed along the tip edge 8d can be manufactured, for example, by forming the junction material 14 in the manufacturing method of the side panel 3 into a plurality of junction materials 14C which is interspersed along the first meander line L2, as illustrated in FIG. 11.

The tip edge 8d of the elastic member 8 may also have a rectangular shape. A side panel 3D in which the tip edge 8d has a rectangular shape can be manufactured, for example, by forming the second meander line L3 in the manufacturing method of the side panel 3 into a second meander line L4 which meanders in the form of a rectangular wave, as illustrated in FIG. 12.

The tip edge 8d of the elastic member 8 may also have a tapered shape. A side panel 3E in which the tip edge 8d has a tapered shape can be manufactured, for example, by forming the second meander line L3 in the manufacturing method of the side panel 3 into a second meander line L5 which meanders in the form of a triangular wave, as illustrated in FIG. 13.

The side panel 3 may also be fixed to the abdominal end part 2a. In this case, the female side surface fastener 7 is provided on the back end part 2b.

In addition, although the fixed part A is formed in a straight line and the removeably attachable part B is curved in the embodiments described above, the removeably attachable part
5 B may be formed in a straight line and the fixed part A may be curved. Further, both the removeably attachable part B and the fixed part A may be curved.

What is Claimed is:

1. A diaper side panel which is a side panel for connecting an abdominal end part and a back end part of a sheet-like main body part on a left and right waist of a wearer so as to be
5 freely attached and removed, the side panel being used in a diaper which covers the crotch of the wearer with the main body part from an abdominal side to a back side; the side panel comprising:

a stretchable part composed of a stretchable material, having a band-shape along one direction, and being freely stretchable in the one direction;

10 a fixed part which is provided on one end side in the one direction of the stretchable part and is fixed to either the abdominal end part or the back end part of the main body part; and

a removeably attachable part which is provided on another end side in the one direction of the stretchable part and is joined to the other of the abdominal end part or the back end part of the main body part so as to be freely attached and removed;

15 a distance from the fixed part to the removeably attachable part at a central position in a direction orthogonal to the one direction being larger than a distance between the fixed part and the removeably attachable part at both flank positions sandwiching the central position in a direction orthogonal to the one direction.

20 2. The diaper side panel according to claim 1, wherein the removeably attachable part is a male member or a female member of a surface fastener.

3. The diaper side panel according to claim 1 or 2, further comprising a gripping part provided farther toward a tip side than the removeably attachable part.

25 4. A diaper comprising the diaper side panel described in any one of claims 1 to 3.

5. A manufacturing method for the diaper side panel described in any one of claims 1 to 4, wherein:

30 a junction material serving as a removeably attachable part is provided on a tape-shaped base material serving as a stretchable part along a first meander line which cyclically meanders with respect to a center line of the base material;

the base material is divided in a width direction along a second meander line which meanders roughly in sync with the period of the meandering of the junction material and at an
35 amplitude allowing the line to pass farther to an outside than an inner edge of a curved part of the junction material; and each of the divided sections is divided in a longitudinal direction at positions corresponding to valley parts of the second meander line.

6. A web used for the diaper side panel described in claim 1, the web comprising:
a tape-shaped base material serving as a stretchable part; and
a junction material serving as a removeably attachable part that is disposed along a first meander line which cyclically meanders with respect to a center line of the base material.

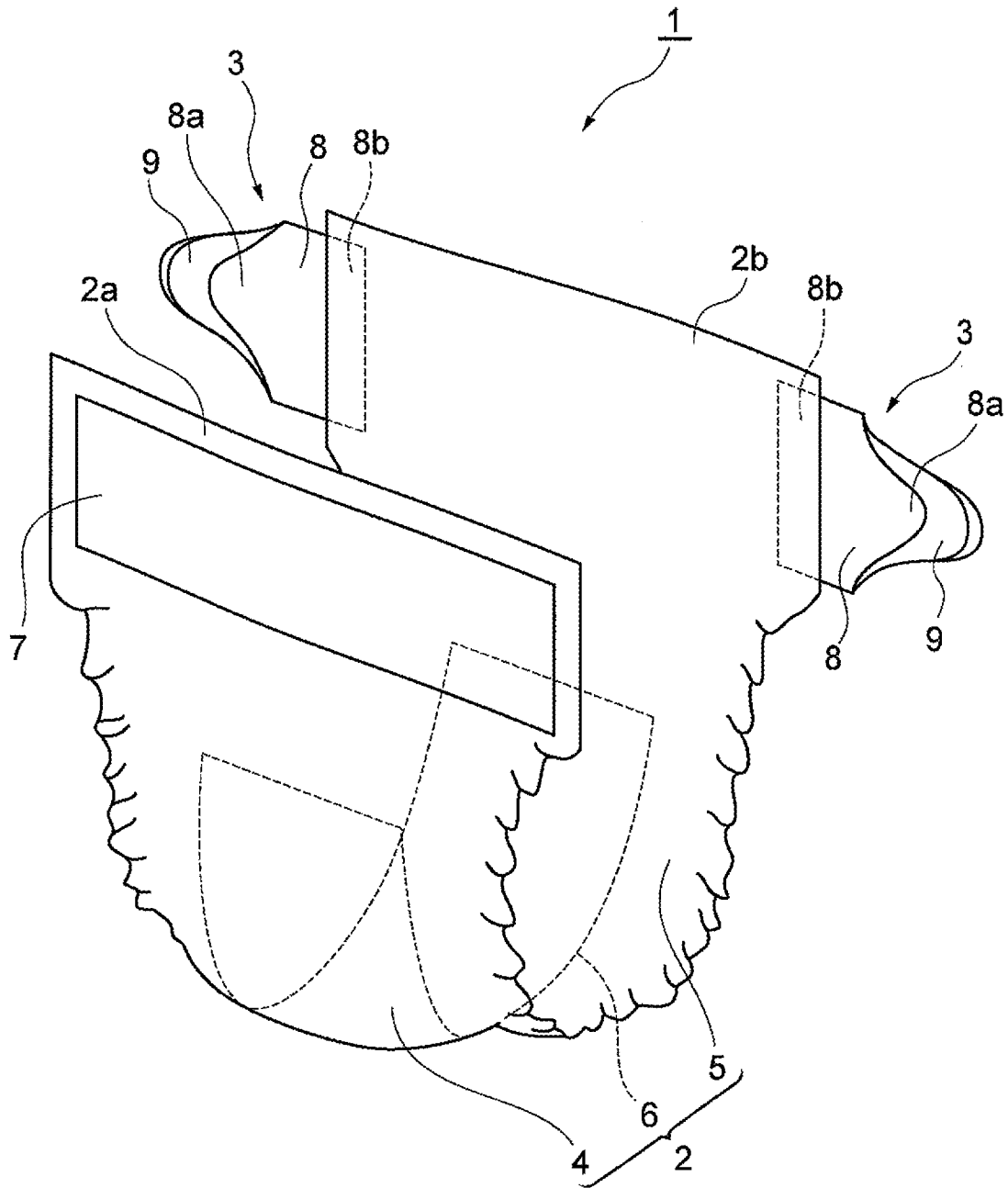


Fig. 1

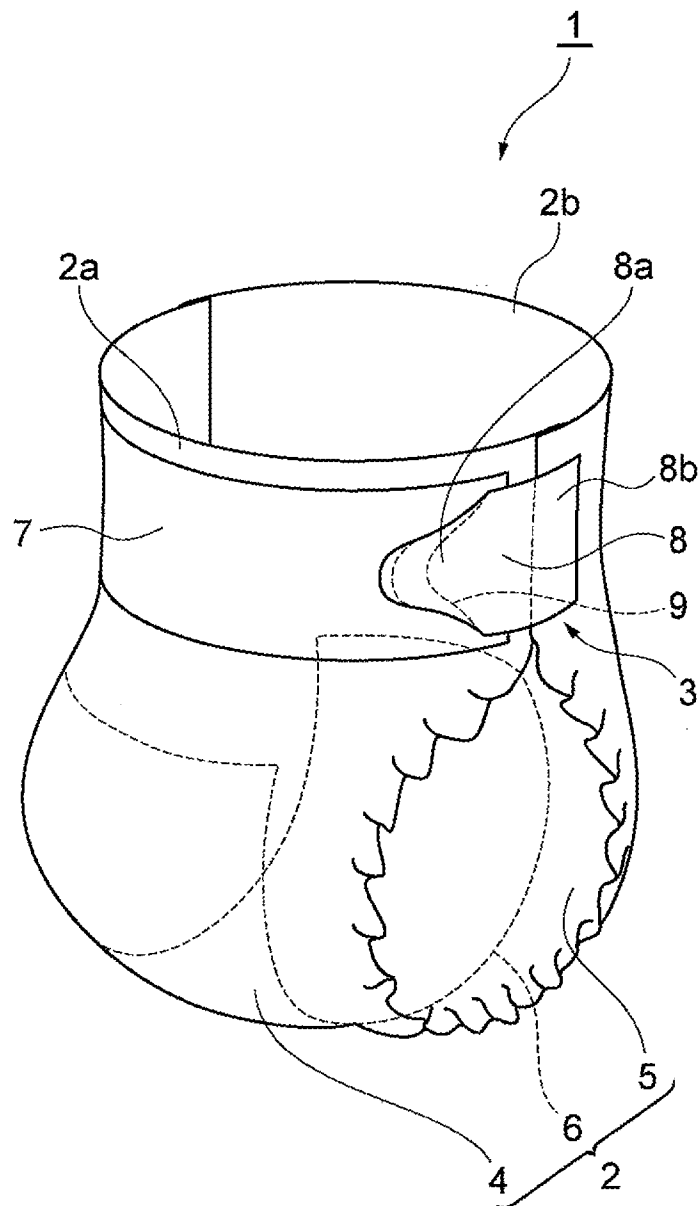


Fig. 2

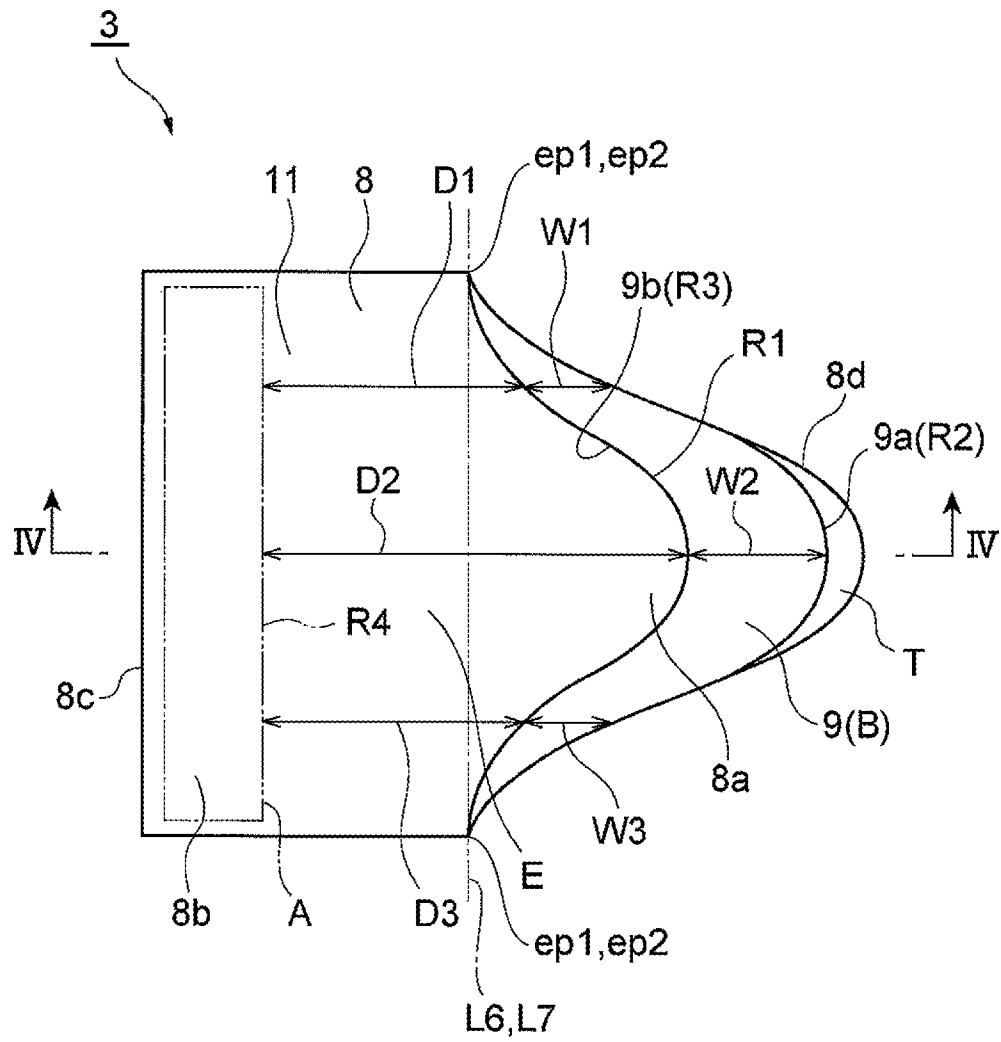


Fig. 3

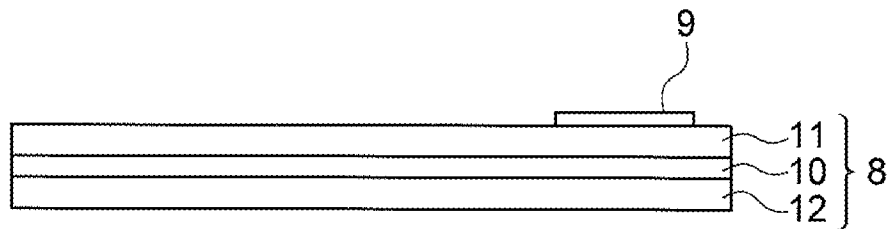


Fig. 4

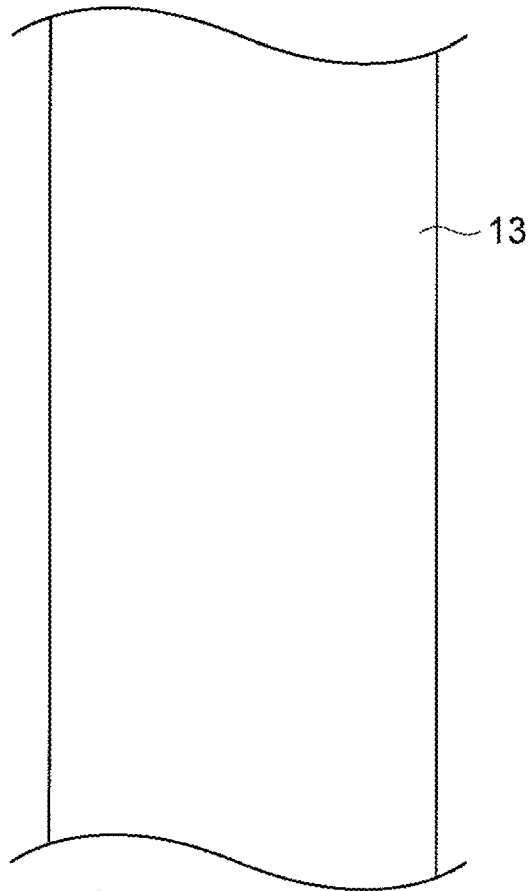


Fig. 5

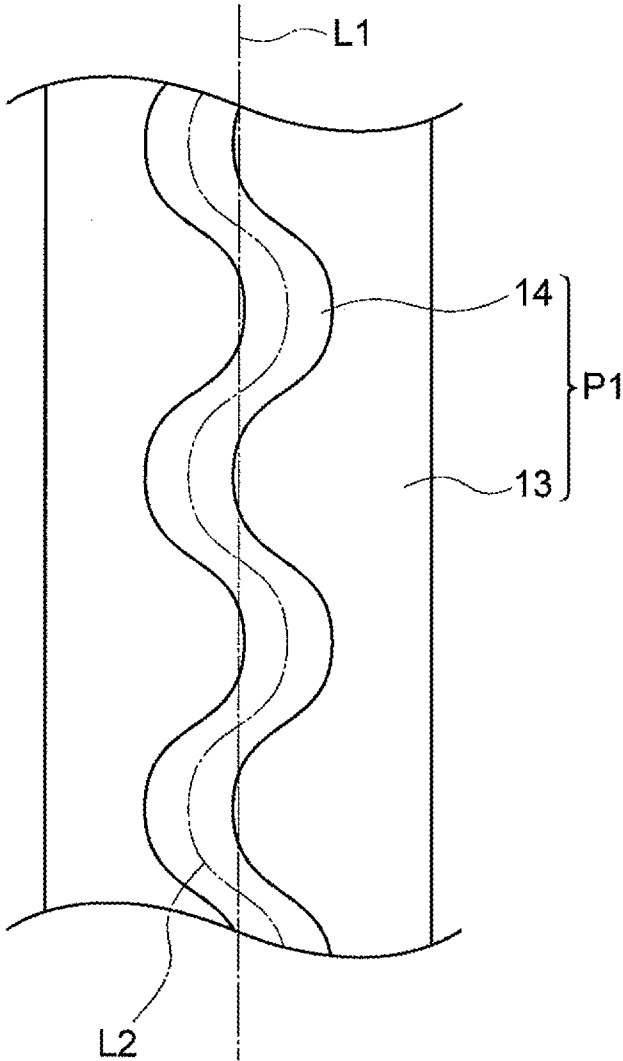


Fig. 6

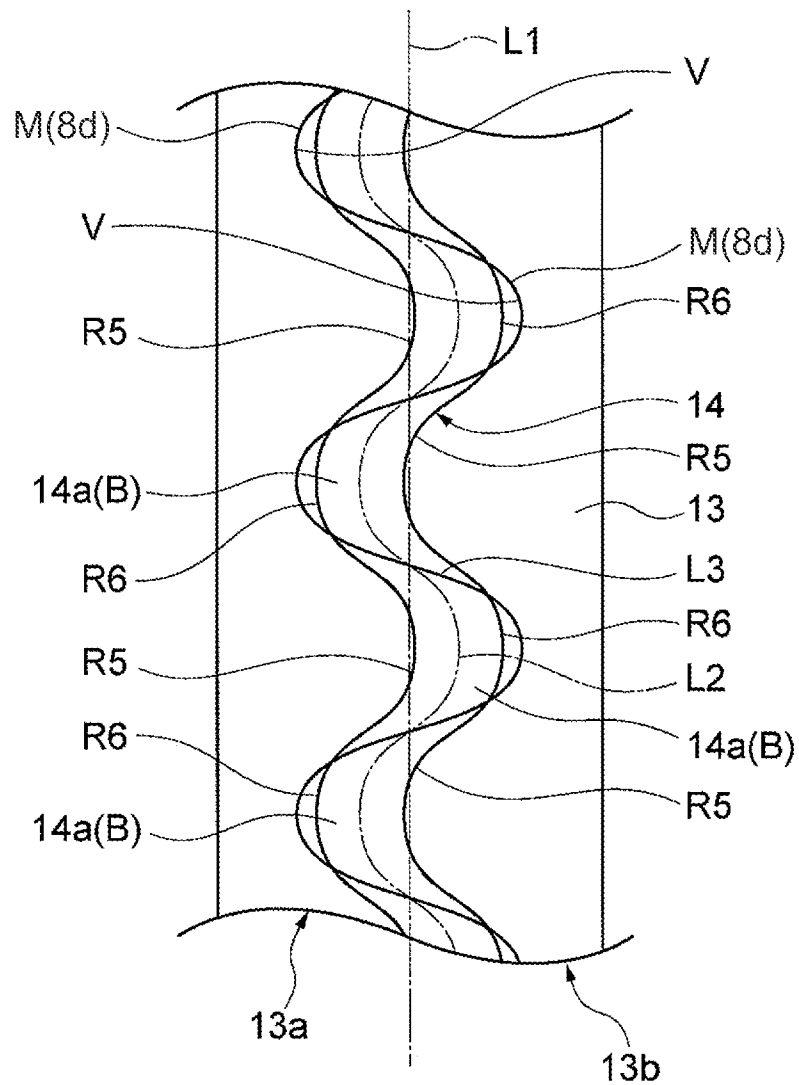


Fig. 7

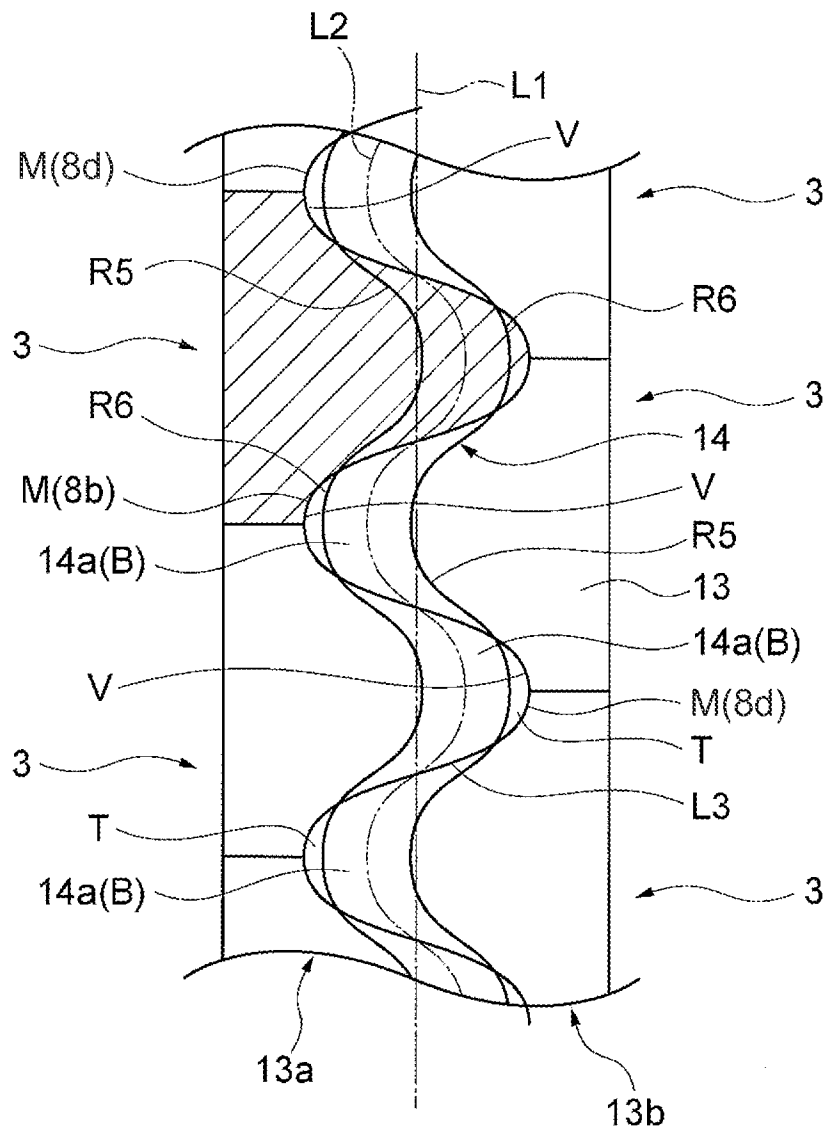


Fig. 8

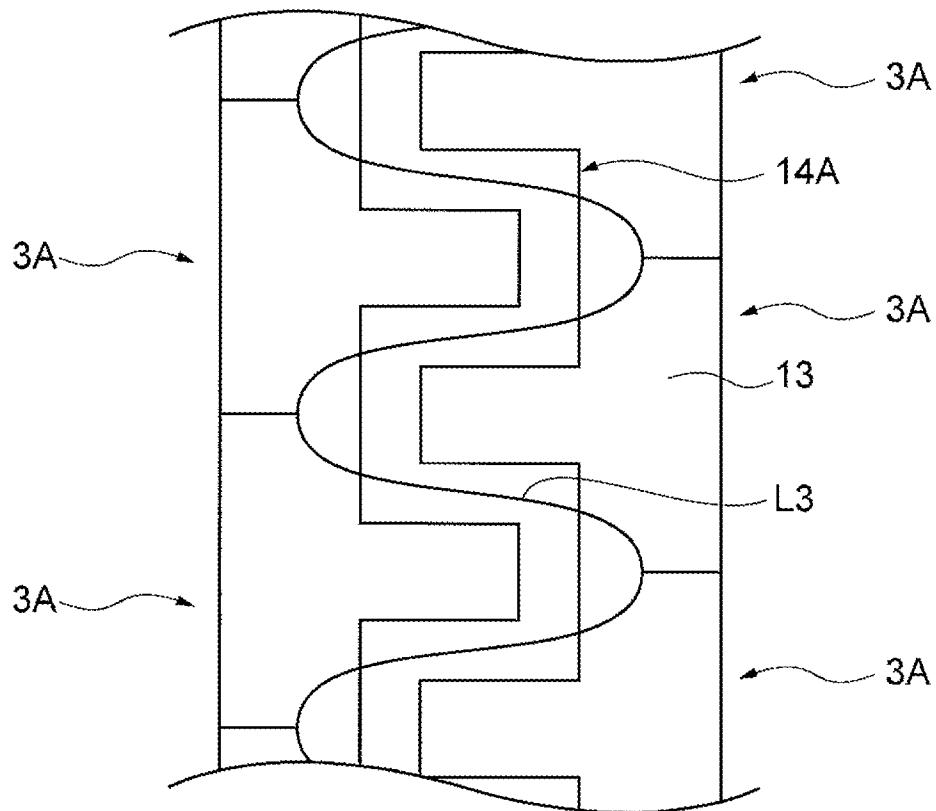


Fig. 9

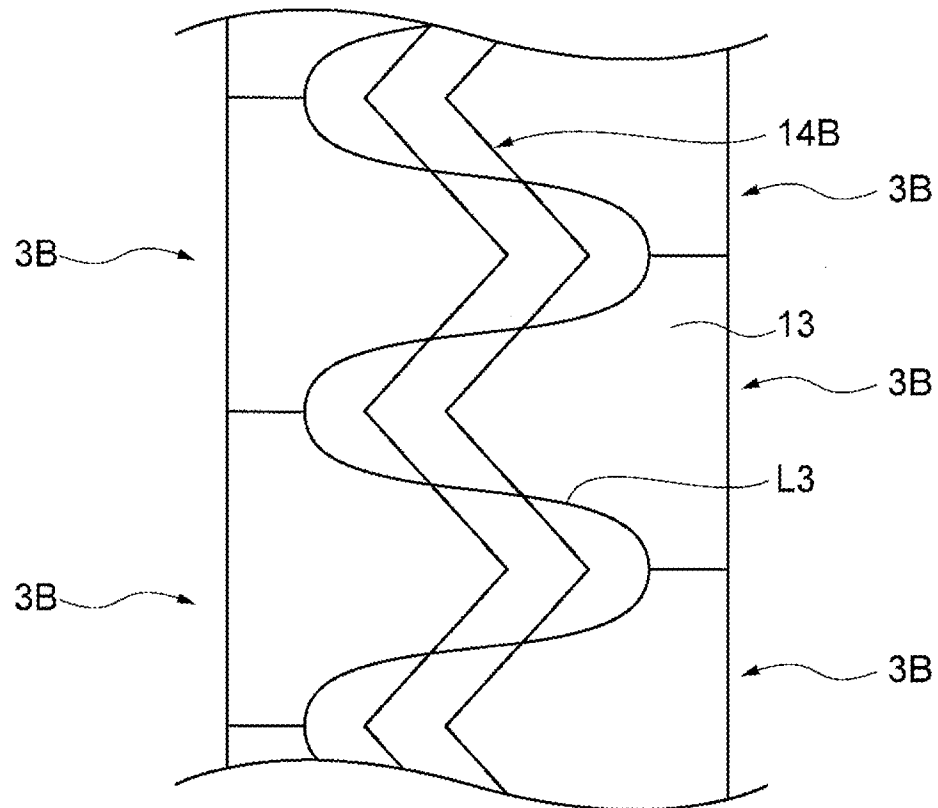
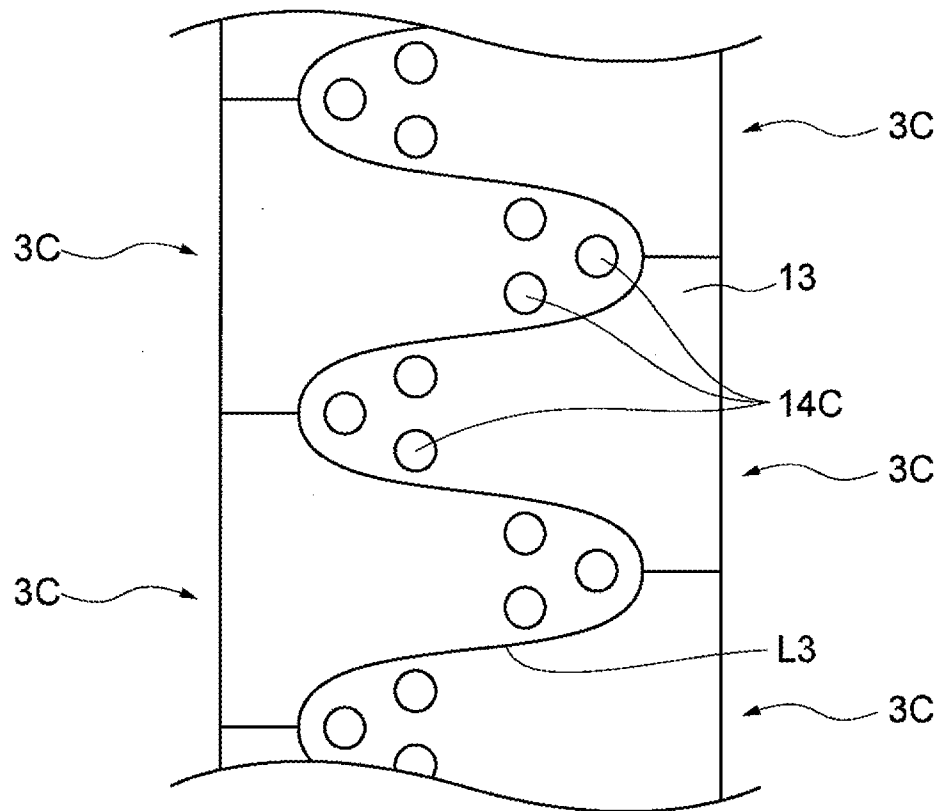
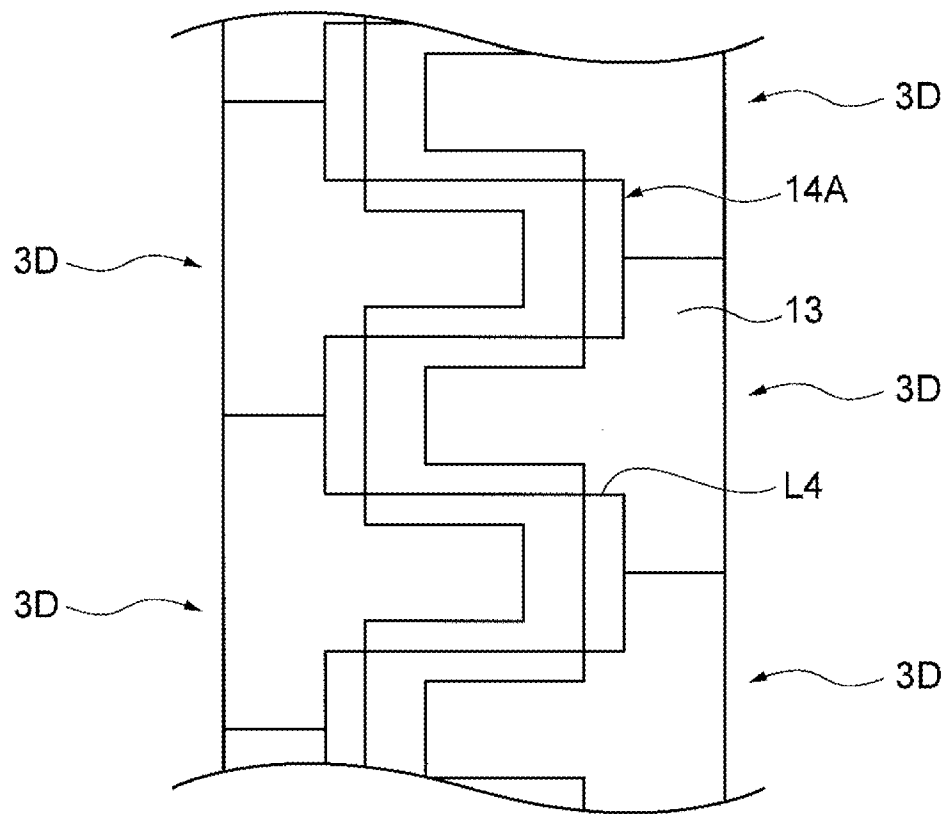


Fig. 10

*Fig. 11*

*Fig. 12*

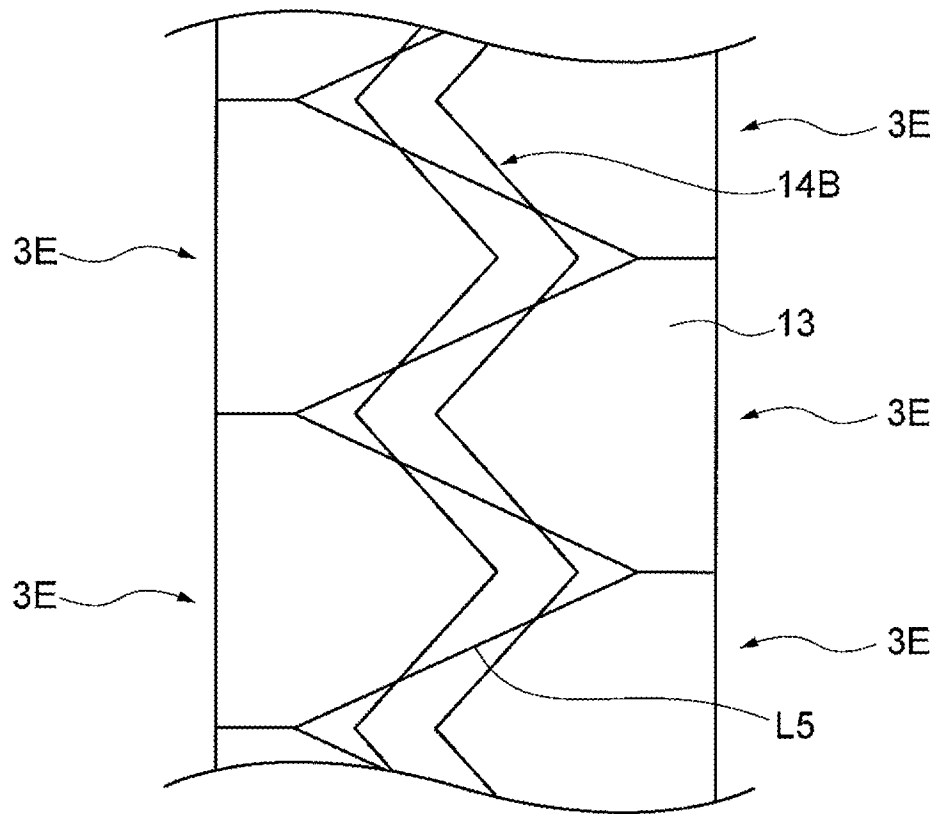
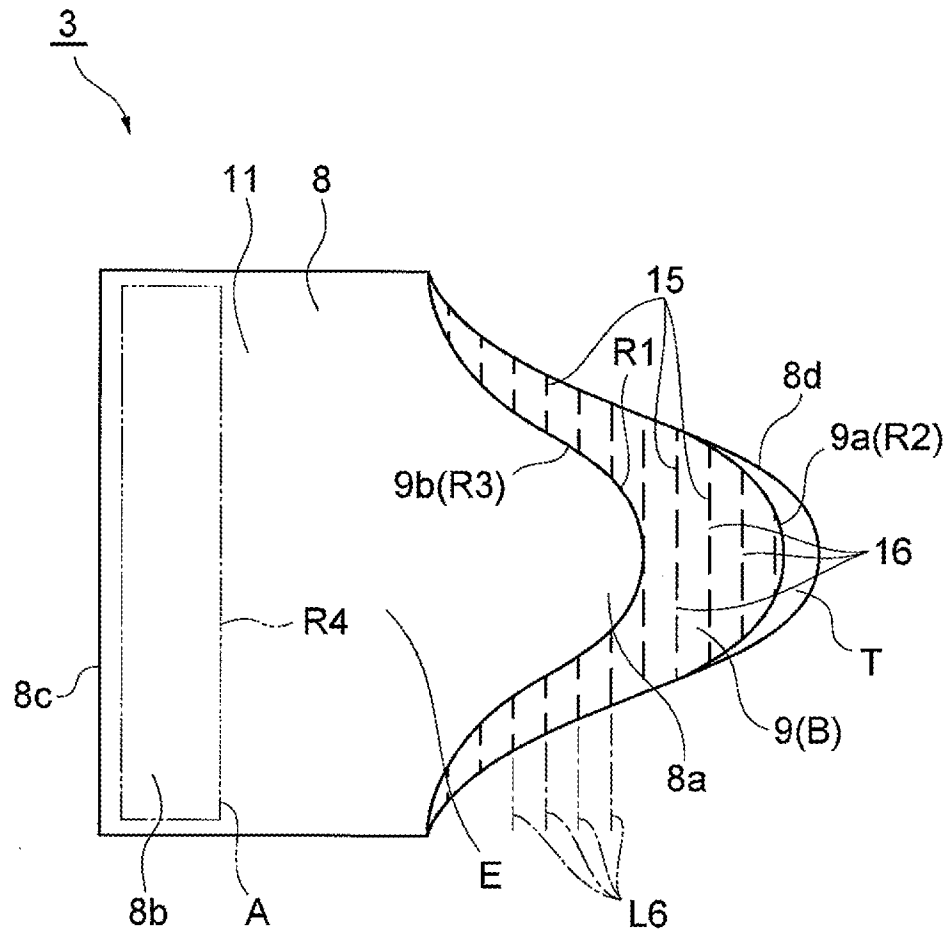
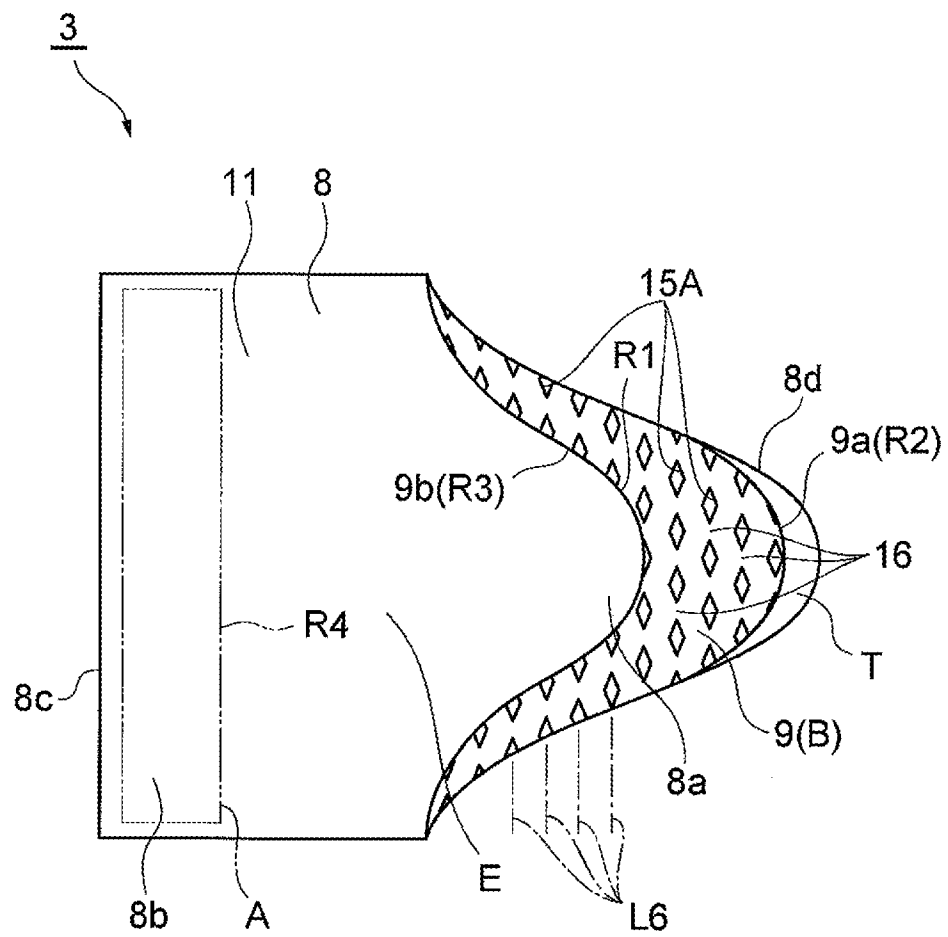
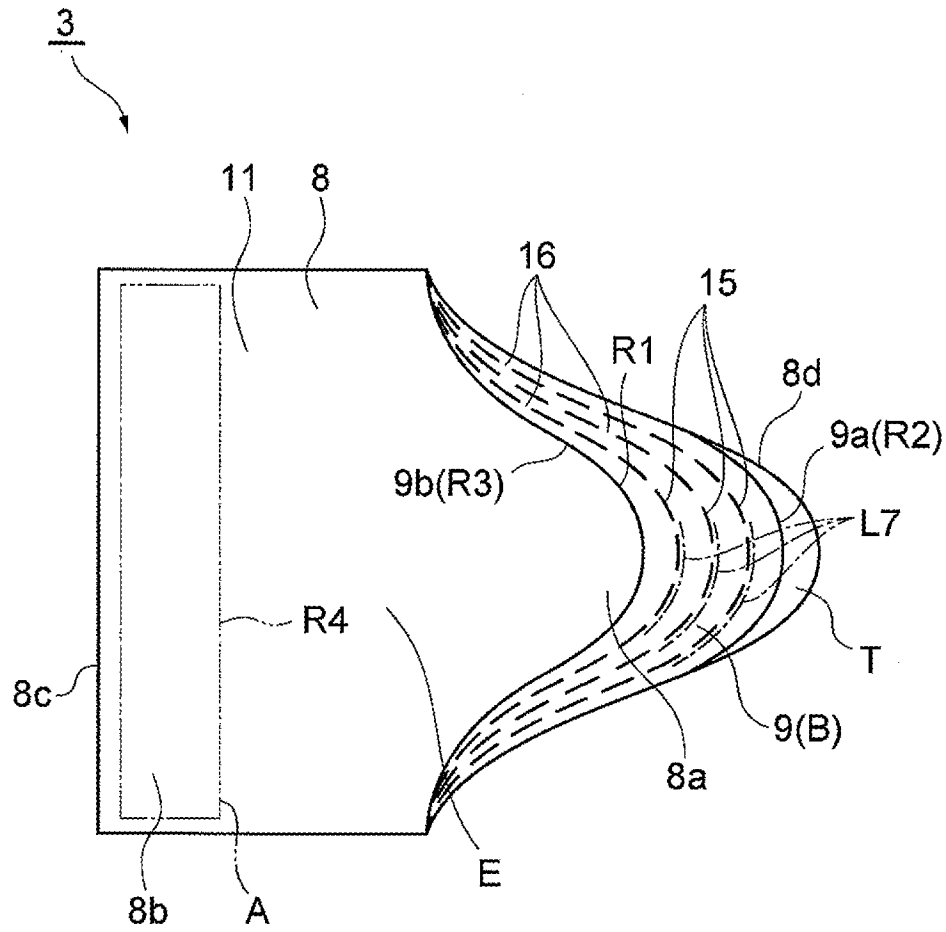


Fig. 13

*Fig. 14*

*Fig. 15*

*Fig. 16*