

DESCRIPTION**PANT-TYPE DISPOSABLE DIAPER AND MANUFACTURING METHOD
THEREFOR****5 Technical Field**

[0001]

The present invention is related to a disposable diaper to be worn at a crotch of a wearer for absorbing and retaining liquids such as urine, and a manufacturing method therefor. Specifically, the present invention is related to the disposable diaper formed
10 into a pant-type by joining both left and right side portions of a front body and of a back body with each other at a side seal portion, and related to a manufacturing method therefor.

Background Art

[0002]

15 Conventionally, a pant-type disposable diaper worn, for example, by infants and elderly persons is known. The typical pant-type disposable diaper includes an absorbent body having a liquid absorbing function, and a cover sheet for retaining the absorbent body at a crotch of the wearer. The cover sheet is formed such that both left and right end portions of a front body and of a back body are joined in advance, thereby
20 forming the disposable diaper as a pant-type diaper. With this form, a wearer can wear the pant-type disposable diaper by inserting both legs from an opening around the waist. At a side seal portion, both end portions of the front body and of the back body are joined with appropriate joining strength. Therefore, the wearer can easily remove the pant-type disposable diaper by tearing this side seal portion.

25 [0003]

The side seal portion has this structure is typically formed in such a manner that thermoplastic sheet members that configure the cover sheet of the diaper are joined with each other by thermal fusion using heat sealing or ultrasonic sealing. The heat sealing, for example, is a technique that introduces a plurality of stacked thermoplastic sheets
5 between a pair of rolls including an embossing roll having a block with engraved joining patterns on one side and an anvil roll that is flat, and then heats and pressurizes the thermoplastic sheets by using the embossing roll and the anvil roll so as to melt and join the sheets. The ultrasonic sealing is a technique whereby a plurality of stacked thermoplastic sheets between a block with engraved joining patterns, and an ultrasonic
10 horn for transmitting an ultrasonic vibration, and then, the ultrasonic vibration is given to the sheets while the sheets are pressurized. With this technique, the sheets are melted and joined with frictional heat.

[0004]

As described above, the technique using heat sealing and ultrasonic sealing to
15 form a pair of side seal portions on both left and right side portions of a disposable diaper is disclosed, for example, in Patent Literature 1 and Patent Literature 2.

Citation List

Patent Literatures

20 [0005]

Patent Literature 1: JP 2004-523374 A

Patent Literature 2: JP 2002-102283 A

Summary of Invention

25 **Technical Problem**

[0006]

In these techniques, however, the cover sheet to configure the front body and the back body of the disposable diaper is bound only at joint portions extending in an up/down direction, and is not bound at portions other than this joint portion. With this structure, the cover sheet of the front body and the cover sheet of the back body are not bound at portions other than the joint portions in a left/right direction. This causes, at these non-bound portions, the cover sheet of the front body and the cover sheet of the back body to spread like flapping frills and lead to deterioration in appearance.

[0007]

Meanwhile, in many cases, an elastic stretchable member to add stretchability is fixed to the cover sheet of the diaper. For example, the elastic stretchable member is sandwiched between layers of a plurality of sheet members at portions around hip and around abdomen and fixed by hot-melt adhesive, or the like. Exemplary methods for applying the hot-melt adhesive include applying on a surface of the sheet member forming the cover sheet, and applying directly on the elastic stretchable member. In other cases, the hot-melt adhesive is used for bonding the cover sheets of the front body and of the back body with each other, in addition to fixing the elastic stretchable member. As described above, for forming the side seal portion at both the left and right side portions of a disposable diaper, a joining technique such as heat sealing and ultrasonic sealing is used. The heat sealing and the ultrasonic sealing join thermoplastic sheets with each other by thermal fusion. However, if hot-melt adhesive exists at the joint portion of the thermoplastic sheet, heat is used for melting the hot-melt adhesive. As a result, it is not possible to sufficiently heat the thermoplastic sheet, which is a target of joining. This might cause problems: the joining strength is not stabilized; adhesiveness occurs at the joint portion because of melted hot-melt

adhesive; or the joint portion is solidified and hardened while its embossed pattern is disturbed. Therefore, in relation to joining at the side seal portion, it is considered desirable not to apply hot-melt adhesive at this joint portion. Accordingly, for a portion at which the side seal portion is to be formed, on a disposable diaper, it would be desirable that the hot-melt adhesive is not applied and the elastic stretchable member is not fixed. For example, except for the portions to be formed into the side seal portion, applying intermittently hot-melt adhesive for fixing the elastic stretchable member enables eliminating the existence of the hot-melt adhesive or the elastic stretchable member at least at this side seal portion. However, intermittent application of the hot-melt adhesive may create a region in which there is no hot-melt adhesive, at both the left and right side portions (side seal portion) of the disposable diaper. Accordingly, on both sides of a finished disposable diaper, specifically in a region outer than the joint portion (main joint region) in the left/right direction provided for the purpose of binding the cover sheet of the front body and the cover sheet of the back body, there exists a region (non-bound portion) in which the front body and the back body are not bound to each other. This causes the cover sheet of the front body and the cover sheet of the back body to spread like flapping frills at the non-bound portions on both left/right ends of the disposable diaper, leading to deterioration in appearance.

[0008]

On the other hand, as described above, in order to prevent the cover sheet of the front body and the cover sheet of the back body from spreading at both the left and right side portions, it is possible to provide these joint portions at positions close to the edges on both left and right sides. The pant-type diaper, however, is created, as described below, by stacking a plurality of continuous sheet materials, and joining the sheet materials at the joint portion formed with a pair of rows, and by cutting the sheet

materials between the pair of rows of the joint portion, so as to obtain separate pant-type
diapers. Because of this, if a space between the joint portions is too narrow, there
might be a case where it is impossible to cut between the joint portions when the sheet
is cut, and might cut the joint portion. This would increase variation in the joining
5 strength of the joint portion. Also, since a large number of cross-sections of the joint
portion would be exposed at the cut section, it might impair good skin feel. Therefore,
conventionally, it has been considered undesirable to provide a joint portion (main joint
region) formed for the purpose of binding the cover sheet of the front body and the
cover sheet of the back body, at the position close to the both left and right side edges of
10 the diaper.

[0009]

As described above, in conventional techniques, it has been considered difficult to
achieve both good appearance of the side seal portion of the pant-type disposable diaper,
and good skin feel at the side seal portion. Currently, therefore, there is a demand for a
15 technique that is related to the side seal portion of the pant-type disposable diaper, and
that prevents, at both the left and right side portions, the cover sheet of the front body
and the cover sheet of the back body from spreading and deterioration of appearance
caused by this spreading, as well as preventing loss of good skin feel at both the left and
right side portions of the diaper.

20

Solution to Problem

[0010]

Therefore, the present inventor has conducted intensive examinations for finding a
technique of solving the above-described problems of conventional inventions, and has
25 found the following. The technique includes binding both the left and right side

portions on the front body and the back body of the disposable diaper in the main joint region, while forming a secondary joint region that has weaker joining strength than in the main joint region at portions outer than the main joint region in a left/right direction. With this technique, it is possible to prevent the cover sheet of the front body and the cover sheet of the back body from spreading and thereby improving appearance of the pant-type disposable diaper and preventing loss of good skin feel at both the left and right side portions. The present inventor then has found that it is possible to solve the problems of conventional techniques by following the above-described findings, and has completed the present invention.

Specifically, the present invention includes the following configurations.

[0011]

A first aspect of the present invention relates to a pant-type disposable diaper.

The pant-type disposable diaper according to the present invention is divided into a front body 1 that comes in contact with an abdominal portion of a wearer, a back body 2 that comes in contact with a back portion of the wearer, and a crotch portion 3 that is located between the front body 1 and the back body 2. In addition, the pant-type disposable diaper has a pair of side seal portions 4. The pair of side seal portions 4 is joined with thermal fusion using heat sealing or ultrasonic sealing in a state where both left and right side portions of the front body 1 and of the back body 2 are overlapped with each other correspondingly.

Here, the pair of side seal portions 4 includes a main joint region 40 extending in an up/down direction and a secondary joint region 50 that is located at an outer side than the main joint region 40 in a left/right direction, and that extends in the up/down direction.

The secondary joint region 50 is a region that is formed with one or a plurality of

embossed rows in which a plurality of secondary embossed portions 51 is arranged being spaced from each other in the up/down direction.

[0012]

As in the above-described configuration, the pant-type disposable diaper according to the present invention includes the secondary joint region 50 at left and right portions outer than the main joint region 40. The main joint region 40 is formed to bind both the left and right side portions of the front body and the back body. The secondary joint region 50 is provided to prevent the front body and the back body from being released. By providing the secondary joint region 50, in this manner, it is possible to solve a problem that the cover sheet of the front body and the cover sheet of the back body spread like flapping frills and cause deterioration in appearance at both the left and right side portions of the diaper. Moreover, the secondary joint region 50 has weaker joining strength compared with the joining strength of the main joint region 40. The secondary joint region 50 is formed not for the purpose of binding the both side portions of the front body and the back body of the diaper. Therefore, it is sufficient that the secondary joint region 50 can prevent the cover sheets from being released on both sides of the diaper. Therefore, it is possible to significantly reduce the joining strength of the secondary joint region 50, compared with the joining strength of the main joint region 40. With this configuration, providing the secondary joint region 50 does not impair good skin feel of the diaper. As a result, it is possible improve wearing touch of the diaper.

[0013]

In the present invention, the joining strength of the secondary joint region 50 is desirably 50% or less with respect to the joining strength of the main joint region 40.

25 [0014]

As in the above-described configuration, by setting the joining strength of secondary joint region 50 to half or lower than the joining strength of the main joint region 40, it is possible to retain good and soft skin feel in the entire secondary joint region 50. Moreover, by setting the joining strength of the secondary joint region 50 low, it is possible to prevent difficulty in tearing both the left and right side portions, joined with the side seal portion 4, of the diaper, when the wearer removes the disposable diaper.

[0015]

In the pant-type disposable diaper according to the present invention, it is desirable to have a configuration in which adhesive is not applied to the main joint region 40 nor to the secondary joint region 50, and both the left and right side portions of the front body 1 and the back body 2 are joined only by thermal fusion using heat sealing or ultrasonic sealing. For example, in the main joint region 40 and the secondary joint region 50, it is desirable that the seat member configuring both the left and right side portions of the front body 1 and the back body 2 are not joined with adhesive. In addition, it is desirable that no adhesive is used in attaching an elastic stretchable member to sheet members forming both the left and right side portions of the front body 1 and the back body 2.

[0016]

As described above, in a case where there is any adhesive such as a hot-melt adhesive at a portion in which the main joint region 40 and the secondary joint region 50 are scheduled to be formed, attempting to form the main joint region 40 and the secondary joint region 50 by thermal fusion using heat sealing or ultrasonic sealing might cause a result that the heat generated by the heat sealing or ultrasonic sealing is used for melting the hot-melt adhesive. Accordingly, it becomes difficult to

sufficiently heat the thermoplastic sheet, which is a target of joining. This might cause problems including: joining strength is not stabilized; adhesiveness occurs at the joint portion because of melted hot-melt adhesive; and the joint portion is solidified and hardened while its embossed pattern is disturbed. Therefore, in relation to joining at the side seal portion, it is considered desirable not to apply the hot-melt adhesive to this joint portion. On the other hand, however, if no hot-melt adhesive is applied to the side seal portion, this causes, at both the left and right side portions of the diaper, the cover sheet of the front body and the cover sheet of the back body to spread like flapping frills, leading to deterioration in appearance. In a desirable embodiment according to the present invention, in order to solve these problems at the same time, a configuration is employed in which no hot-melt adhesive is applied to the portion on which the side seal portion is scheduled to be formed. Moreover, at these portions to which no hot-melt adhesive is applied, not only the main joint region 40 but also the secondary joint region 50 is provided. With this configuration, it is possible to prevent the cover sheet of the front body and the cover sheet of the back body from spreading and to join the both side portions of the disposable diaper with each other, with good appearance and stability.

[0017]

In the pant-type disposable diaper according to the present invention, it is desirable that at least two of the plurality of the secondary embossed portions 51 formed on the secondary joint region 50 reach an edge 4a on both left and right sides of the front body 1 and the back body 2.

[0018]

Achieving the above-described configuration in which the plurality of secondary embossed portions 51 reaches an edge 4a on both the left and right sides of the front

body 1 and the back body 2, it is possible, with higher reliability, to prevent the cover sheet of the front body and the cover sheet of the back body from spreading.

[0019]

In the pant-type disposable diaper according to the present invention, it is
5 desirable that the main joint region 40 is formed with a plurality of embossed rows in which a plurality of main embossed portions 41 is arranged being spaced from each other in an up/down direction. In a similar manner, it is desirable that the secondary joint region 50 is formed with a plurality of embossed rows in which the plurality of secondary embossed portions 51 is arranged being spaced with each other in the
10 up/down direction. In this case, the joining strength of the secondary joint region 50 is desirably 30% or less with respect to the joining strength of the main joint region 40.

[0020]

With the above-described configuration in which both the main joint region 40 and the secondary joint region 50 are formed with the plurality of embossed rows being
15 spaced from each other in the left/right direction, and the joining strength of the secondary joint region 50 is significantly weaker than the joining strength of the main joint region 40, it is possible to effectively prevent the cover sheet of the front body and the cover sheet of the back body from spreading and prevent loss of good skin feel of the diaper.

20 Moreover, the main joint region 40 is a joint portion provided to give both side portions joining strength required in wearing. The secondary joint region 50 is a joint portion provided to hold an outside in the left/right direction of the main joint region 40 from spreading. Therefore, as described above, it is desirable to have a significant difference in joining strength of the main joint region 40 and joining strength of the
25 secondary joint region 50. That is, if there is no significant difference between the

joining strength of the main joint region 40 and the joining strength of the secondary joint region 50, the user is required to use a great force to tear the side seal portion 4.

This configuration would be stressful to the user. In addition, when momentum generated by tearing the diaper would impact the wearer, it might cause an

5 uncomfortable feeling to the wear.

[0021]

Moreover, in the pant-type disposable diaper according to the present invention, it is desirable that the main joint region 40 is provided all across the length in the up/down direction on both the left and right side portions of the pant-type disposable diaper. In

10 comparison, it is desirable that the length of the secondary joint region 50 in the up/down direction is shorter than the length of the main joint region 40 in the up/down direction. Furthermore, it is desirable to arrange the secondary joint region 50 at an offset position that does not correspond to the end portion of the diaper in the up/down direction. The length in the up/down direction in this case refers to a distance between
15 each of outer edges of the embossed patterns provided at outermost portions.

By arranging the position of the secondary joint region 50 like this, it is possible to avoid the joint portion from being exposed to an upper end and a lower end of the diaper and thus avoid giving the wearer uncomfortable feeling caused by the hard joint portion touching the skin. Meanwhile, it is required to give the main joint region 40 a
20 level of strength that can prevent the portions around the abdomen or around the legs from being torn when the diaper is attached and during the use of it. Accordingly, it is desirable to provide the main joint region 40 to fully cover the entire length of the diaper in the up/down direction.

[0022]

25 A second aspect of the present invention relates to a manufacturing method of the

pant-type disposable diaper. The pant-type disposable diaper includes a front body 1 that comes in contact with an abdominal portion of a wearer, a back body 2 that comes in contact with a back portion of the wearer, and a crotch portion 3 that is located between the front body 1 and the back body 2.

5 The manufacturing method according to the present invention includes:
a step of obtaining a diaper continuous body in which a plurality of disposable
diapers is joined in a left/right direction;

a step of folding back the diaper continuous body at the crotch portion 3 and
overlapping the front body 1 and the back body 2;

10 a joining step of forming a side seal portion 4 on which both the left and right side
portions of the front body 1 and both the left and right side portions of the back body 2
are joined with each other with thermal fusion using heat sealing or ultrasonic sealing;
and

a cutting step of cutting the diaper continuous body in the up/down direction at a
15 position corresponding to edge 4a on both the left and right side portions of the front
body 1 and the back body 2 to obtain a separate pant-type disposable diaper.

Herein, a side seal portion 4 to be formed in the joining step includes a main joint
region 40 extending in the up/down direction and a secondary joint region 50 located at
an outer side in the left/right direction than the main joint region 40 and that extends in
20 the up/down direction.

The secondary joint region 50 is a region that is formed by providing one or a
plurality of embossed rows in which a plurality of secondary embossed portions 51 is
arranged being spaced with each other in the up/down direction. The joining strength
of the secondary joint region 50 is configured to be weaker than the joining strength of
25 the main joint region 40.

In the subsequent cutting step, the diaper continuous body is cut in the up/down direction at a marginal position of two secondary joint regions 50.

[0023]

Following the above-describe steps, it is possible to efficiently and continuously produce the pant-type disposable diaper according to the first aspect of the present invention.

Advantageous Effects of Invention

[0024]

According to the present invention, it is possible to provide a pant-type disposable diaper that has a good-looking side seal portion formed on both left and right side portions of the diaper and has a good touch at the side seal portion.

Brief Description of Drawings

[0025]

Fig. 1 is an external perspective view of an exemplary disposable diaper according to the present invention.

Fig. 2 is a development plan illustrating an exemplary disposable diaper according to the present invention.

Fig. 3 illustrates an exemplary joining pattern at a side seal portion.

Figs. 4(a), 4(b), and 4(c) are diagrams illustrating joining patterns at the side seal portion. Fig. 4(a) is a cross-sectional view of the disposable diaper illustrated in Fig. 2, taken along the line Y1-Y1. Fig. 4(b) is a cross-sectional view of the disposable diaper illustrated in Fig. 2, taken along the line Y2-Y2. Fig. 4(c) is an enlarged plan view of the side seal portion.

Fig. 5 is an enlarge view of a joining pattern of a main joint region included in the side seal portion.

Fig. 6 is an enlarged view comparing the main joint region and a secondary joint region included in the side seal portion.

5 Fig. 7 is a flowchart illustrating an exemplary method of manufacturing the disposable diaper.

Fig. 8(a) and 8(b) each illustrates another exemplary joining pattern at the side seal portion.

10 Fig. 9(a) and 8(b) each illustrates another exemplary joining pattern at the side seal portion.

Description of Embodiments

[0026]

Hereinafter, embodiments of the present invention will be described with
15 reference to the drawings. The present invention is not limited to the below-described embodiments but includes embodiments that are appropriately modified based on the below-described embodiments in a range obvious to a person skilled in the art.

Note that in this description for application, an “up/down direction” refers to, on a pant-type disposable diaper on which both end portions of a front body and of a back
20 body are joined, an up/down direction (direction indicated with the arrow Y in Fig. 1 or the like) when a waist opening portion is defined as an upper end and a crotch portion is defined as a lower end. In addition, a “left/right direction” refers to a circumferential direction (a direction shown by an arrow X in Fig. 1, etc.) of the disposable diaper in a state where both the end portions of the front body and of the back body are joined.

25 Also note that in the present description for application, “A to B” refers to “A or

more and B or less".

[0027]

(1. Entire Configuration of Disposable Diaper)

The present invention is widely applicable to a known pant-type disposable diaper.

5 The pant-type disposable diaper is defined as a disposable diaper on which both end portions of the front body and of the back body are joined in advance. For example, the pant-type disposable diaper may be a type configured to include an absorbent body being crosslinked between the front body exterior body and the back body exterior body, each of which being separately formed. Alternatively, the pant-type disposable diaper
10 may be a type configured to include the absorbent body fixed around the crotch portion on an exterior body integrally formed into portions ranging from the front body and the back body. Hereinafter, the present invention will be described, among these types of pant-type disposable diapers, using, as an example, the pant-type disposable diaper of the type configured to include an absorbent body being crosslinked between the front
15 body exterior body and the back body exterior body, each of which being separately formed.

[0028]

Fig. 1 is a perspective view of a disposable diaper 100 viewed from the front body-side. Fig. 2 is a development plan of an exemplary disposable diaper 100 and
20 illustrates a state of the disposable diaper 100 viewed from a skin-contacting surface-side. As illustrated in the development plan in Fig. 2, the disposable diaper 100, when being applied to a wearer, is divided into a front body 1 that comes in contact with an abdominal portion of the wearer, a back body 2 that comes in contact with a back portion of the wearer, and a crotch portion 3 that is applied to a crotch of the
25 wearer. In the present embodiment, the disposable diaper 100 is configured to include

a front body exterior body 1a at the front body 1 and include a back body exterior body 2a at the back body 2. In addition, at the crotch portion 3 between the front body exterior body 1a and the back body exterior body 2a, an absorbent body 3a is crosslinked. Accordingly, in the present embodiment, the absorbent body 3a is fixed to the front body exterior body 1a at one end in a longitudinal direction, and fixed to the back body exterior body 2a at another end of in the longitudinal direction.

[0029]

While being in a developed state illustrated in Fig. 2, both left and right end portions of the front body exterior body 1a and of the back body exterior body 2a are overlapped and joined with each other in this overlapped state. At this joint portion, a pair of left and right side seal portions 4 is formed. By joining both end portions of the front body exterior body 1a and both end portions of the back body exterior body 2a correspondingly with each other at the pair of side seal portions 4, the diaper in the developed state illustrated in Fig. 2 is set up into a state illustrated in Fig. 1. As illustrated in Fig. 1, an upper edge of the front body exterior body 1a and an upper edge of the back body exterior body 2a are formed into a waist opening 5. In addition, by joining both end portions of the front body exterior body 1a and of the back body exterior body 2a with each other at the side seal portion 4, leg openings 6 positioned around the legs of a wearer are formed when being worn. This form allows the wearer to wear the disposable diaper 100 by inserting one's both legs into the waist opening 5 and sticking each of the legs out of each of the leg openings 6.

[0030]

In addition, as illustrated in Figs. 1 and 2, the pair of side seal portions 4 includes a main joint region 40 and a secondary joint region 50. The main joint region 40 is provided to bond both left and right side end portions of the front body exterior body 1a

and of the back body exterior body 2a with each other. Accordingly, the main joint region 40 extends in an up/down direction, and join the front body exterior body 1a and the back body exterior body 2a with each other. On the other hand, the secondary joint region 50 is formed at a position outer than the main joint region 40 in a left/right direction. The secondary joint region 50 is fundamentally provided to prevent both left and right edges of the front body exterior body 1a and of the back body exterior body 2a from spreading like flapping frills. Accordingly, the secondary joint region 50 extends in the up/down direction and mildly joins the front body exterior body 1a and the back body exterior body 2a with each other. That is, joining strength of the secondary joint region 50 has been set to a level that is at least weaker than joining strength of the main joint region 40.

[0031]

(2. Front Body Exterior Body and Back Body Exterior Body)

Next, a configuration of each portion of the disposable diaper 100 will be described.

As illustrated in Figs. 1 and 2, the front body exterior body 1a and the back body exterior body 2a are members to hold, when the disposable diaper 100 is being worn, the absorbent body 3a positioned between the front body exterior body 1a and the back body exterior body 2a. The front body exterior body 1a is a member that comes in contact with the abdominal portion of the wearer when being worn, and the back body exterior body 2a is a member that comes in contact with the back portion of the wearer when being worn.

[0032]

In addition, the front body exterior body 1a and the back body exterior body 2a are joined with each other at both end portions in the left/right direction. At this joint

portion, the pair of side seal portion 4 is formed. Fig. 3 illustrates an enlarged joining pattern at the side seal portion 4. As illustrated in Fig. 3, the side seal portion 4, at both left and right side portions at the front body exterior body 1a and the back body exterior body 2a, includes the main joint region 40 and the secondary joint region 50.

5 The main joint region 40 extends in the up/down direction from an upper edge to a lower edge. The secondary joint region 50 joins both the left and right side portions of the front body exterior body 1a and of the back body exterior body 2a with each other at a position outer than the main joint region 40 in the left/right direction. In the present embodiment, each of the main joint region 40 and the secondary joint region 50 is

10 formed by a plurality of embossed portions (a main embossed portion 41 and a secondary embossed portion 51) being arranged in clusters. Herein, the embossed portion (the main embossed portion 41 and the secondary embossed portion 51) refers to each of joining points. The main joint region 40, among the plurality of main embossed portions 41, is a band-shaped region that extends in the up/down direction,

15 having a width ranging from an inner edge of the innermost main embossed portion to an outer edge of the outermost main embossed portion. Similarly, the secondary joint region 50, among the plurality of secondary embossed portions 51, is a band-shaped region that extends in the up/down direction, having a width ranging from an inner edge of the innermost secondary embossed portion to an outer edge of the outermost

20 secondary embossed portion. As illustrated in Fig. 3, each of the main joint region 40 and the secondary joint region 50 is formed respectively by the plurality of main embossed portions 41 and the plurality of the secondary embossed portions 51 being arranged in a regular pattern. Details of the main joint region 40 and the secondary joint region 50 will be described below.

25 [0033]

Fig. 4(a) is a cross-sectional view of the disposable diaper illustrated in Fig. 2. Here, the view is taken from the development plan in Fig. 2 by cutting the disposable diaper in the longitudinal direction, taken along the Y1-Y1 line in Fig. 2. Fig. 4(b) is a cross-sectional view of the disposable diaper illustrated in Fig. 2. Here, the view is taken from the development plan in Fig. 2 by cutting the disposable diaper taken along the Y2-Y2 line in Fig. 2. Various kinds of sheet materials are very thin in nature; however, in Figs. 4(a) and 4(b), diagrams are created with conceptual thickness, in order to clarify description.

[0034]

Each of the front body exterior body 1a and the back body exterior body 2a has an outer sheet 10 on a non-skin-contacting surface and an inner sheet 12 on a skin-contacting surface. Examples of the outer sheet 10 and the inner sheet 12 include soft fiber nonwoven fabric and a plastic sheet. The fiber nonwoven fabric or and the plastic sheet are joined with each other using, for example, hot-melt adhesive.

However, it is desirable that portions at which the main joint region 40 and the secondary joint region 50 are to be formed include no hot-melt adhesive used for joining the outer sheet 10 and the inner sheet 12. In a case where there is hot-melt adhesive at a portion in which the main joint region 40 and the secondary joint region 50 are scheduled to be formed, an attempt to form the main joint region 40 and the secondary joint region 50 by thermal fusion using heat sealing or ultrasonic sealing might lead to a result that the heat generated by the heat sealing or ultrasonic sealing is consumed for melting the hot-melt adhesive. This would make it difficult to sufficiently heat the thermoplastic sheet, which is a target of joining. This would cause problems including unstable joining strength, adhesiveness occurring at the joint portion because of melted hot-melt adhesive, and solidified and hardened hot-melt adhesive.

Given these risks, it is desirable not to apply hot-melt adhesive at the joint portion at which the side seal portion 4 is to be formed.

[0035]

In addition, along an edge portion around the hip of the front body exterior body 1a and the back body exterior body 2a, a plurality of waist stretchable members 20 is arranged in a stretched state. Some of the plurality of waist stretchable members 20 are joined, in a stretched state, with the front body exterior body 1a and the back body exterior body 2a, and the joined portion, when contracted, is formed into a waist gather. Moreover, at a lower-side (crotch portion-side) of the plurality of waist stretchable members 20, a tammy stretchable member 21 is arranged. The tammy stretchable member 21 is fixed, between the outer sheet 10 and the inner sheet 12, in a stretched state. With contraction of the tammy stretchable member 21, a tammy gather is formed around the abdominal portion of the disposable diaper.

[0036]

As illustrated in Figs. 4(a) and 4(b), each of the front body exterior body 1a and the back body exterior body 2a has the outer sheet 10 on its outermost layer of the non-skin-contacting layer-side. On the front body exterior body 1a and the back body exterior body 2a, the outer sheet 10 is folded back at a fold line 11a of an upper edge toward the skin-contacting surface-side, so as to form a fold portion 11. The fold line 11a formed by folding back the outer sheet 10 corresponds to an upper ends of the front body exterior body 1a and of the back body exterior body 2a, and is planned to be an opening edge of the waist opening 5 when the disposable diaper is assembled. The fold portion 11 on the outer sheet 10 extends, in the up/down direction, for example, within a length that does not reach a position at which the tammy stretchable member 21 is disposed.

[0037]

On the front body exterior body 1a and the back body exterior body 2a, as illustrated in Figs. 4(a) and 4(b), the outer sheet 10 is configured such that the plurality of waist stretchable members 20 and the plurality of tammy stretchable members 21 are arranged in a stretched state, on the outer sheet 10 in a direction along with the fold line 11a. It is sufficient to provide two or more waist stretchable members 20; the number of the members 20 may be, for example, two to fifteen, four to twelve, or six to nine. Moreover, the plurality of tammy stretchable members 21 is attached to the outer sheet 10 below the waist stretchable member 20. The number of tammy stretchable members 21 may be, for example, 10 to 30, 15 to 25, or 18 to 20. The plurality of waist stretchable members 20 and the plurality of tammy stretchable members 21 are disposed, as illustrated in Figs. 4(a) and 4(b), substantially in parallel with a predetermined space between each other, in a longitudinal direction of the disposable diaper. As illustrated in the development plan in Fig. 2, it is desirable to have a configuration in which the plurality of waist stretchable members 20 and the plurality of tammy stretchable members 21 extend, in stretched states, to the side seal portions 4 positioned at both left/right ends of the front body exterior body 1a and of the back body exterior body 2a. The plurality of waist stretchable members 20 and the plurality of tammy stretchable members 21 may be fixed by applying or spraying, for example, high-flow adhesive such as a hot-melt adhesive. Note that it is desirable that no plurality of waist stretchable members 20 nor the plurality of tammy stretchable member 21 exist at portions to be joined with the side seal portion 4. If the waist stretchable member 20 or the tammy stretchable member 21 exists at the side seal portion 4, when, at the side seal portion 4, both the left and right side portions of the front body exterior body 1a and of the back body exterior body 2a are to be joined, the

heat generated by heat sealing or ultrasonic sealing is consumed for melting various kinds of elastic stretchable members, leading to unstable joining at both the left and right side portions of the front body exterior body 1a and of the back body exterior body 2a.

5 [0038]

As illustrated in Figs. 4(a) and 4(b), it is desirable that a cushion forming sheet 13 is disposed between the fold portion 11 formed by folding back the outer sheet 10 and the plurality of waist stretchable members 20. The cushion forming sheet 13 is a sheet material provided to improve cushioning property and flexibility of the waist gather.

10 The cushion forming sheet 13 is desirably formed of, for example, nonwoven fabric. The nonwoven fabric to be used to form the cushion forming sheet 13 may be either hydrophilic nonwoven fabric or water-repellent nonwoven fabric. It is desirable that the cushion forming sheet 13 is configured such that its skin-contacting surface is intermittently joined with an inner facing surface (non-skin-contacting surface) of the
15 fold portion 11 in a direction along the fold line 11a. Being “intermittently joined” means a joint portion and a non-joint portion are continuously arranged at a predetermined distance. By using a configuration in which the cushion forming sheet 13 and the fold portion 11 are intermittently joined with each other in the direction along the fold line 11a, a space is formed between the cushion forming sheet 13 and the
20 fold portion 11 when the waist stretchable member 20 or the tammy stretchable member 21 contracts. With this space, it is possible to improve cushioning property and flexibility of the waist gather. The cushion forming sheet 13 extends in the up/down direction of the diaper. An upper end of the cushion forming sheet 13 extends to reach the fold line 11a of the outer sheet 10, and a lower end of the cushion forming sheet 13
25 partly overlaps with the skin-contacting surface of the inner sheet 12. Note that the

cushion forming sheet 13 does not have a length to reach a lower end of the inner sheet 12.

The disposable diaper having this type of cushion forming sheet 13 is disclosed in JP 2011-254996 A.

5 [0039]

As illustrated in Figs. 4(a) and 4(b), the inner sheet 12 is disposed on the skin-contacting surface of the outer sheet 10. The inner sheet 12, between itself and the outer sheet 10, sandwiches and fixes a part of the plurality of waist stretchable members 20 and the plurality of tammy stretchable members 21. The inner sheet 12
10 has a length to reach a lower edge of the outer sheet 10, although it does not reach an upper edge of the outer sheet 10. The inner sheet 12 may overlap, partially on its upper side, with the cushion forming sheet 13. Moreover, the inner sheet 12 may be configured such that its upper part partially overlaps with the cushion forming sheet 13 and the fold portion 11 of the outer sheet 10.

15 [0040]

In this manner, the front body exterior body 1a and the back body exterior body 2a are configured with the plurality of sheet materials overlapping with each other. According to the present embodiment, for example, a first stacked layer 71, which is a top portion of the front body exterior body 1a, as well as a top portion of the back body
20 exterior body 2a, has a three-tier configuration including the outer sheet 10, the cushion forming sheet 13, and the fold portion 11 of the outer sheet 10, in an order from the non-skin-contacting surface-side. In addition, a second stacked layer 72 located below the first stacked layer 71 has a four-tier configuration including the outer sheet 10, the inner sheet 12, the cushion forming sheet 13, and the fold portion 11 of the outer sheet
25 10, in an order from the non-skin-contacting surface-side. In addition, a third stacked

layer 73 located below the second stacked layer 72 has a three-tier configuration including the outer sheet 10, the inner sheet 12, and the cushion forming sheet 13, in the order from the non-skin-contacting surface-side. In addition, a fourth stacked layer 74 located at a lowermost position of the front body exterior body 1a and of the back body exterior body 2a, has a two-tier configuration including the outer sheet 10 and the inner sheet 12, in the order from the non-skin-contacting surface-side. In this manner, the front body exterior body 1a and the back body exterior body 2a may have different numbers of sheet materials overlapping at the side seal portion 4 depending on the portion.

10 [0041]

As described above, the front body exterior body 1a and the back body exterior body 2a, each of which being configured with the plurality of overlapping sheet materials, are joined with each other at the pair of side seal portions 4 located at both left and right end portions. That is, both the left and right side portions of the front body exterior body 1a and of the back body exterior body 2a are joined with each other in a state overlapping with each other, forming the pair of side seal portions 4 at both side portions of the front body exterior body 1a and of the back body exterior body 2a. It is desirable that the front body exterior body 1a and the back body exterior body 2a are joined with each other by using, for example, heat sealing and ultrasonic sealing.

20 [0042]

(2-1. Main Joint Region)

Herein, the main joint region 40 included in the side seal portion 4 will be described in detail.

Fig. 4(c) is a plan view of an enlarged portions of the front body exterior body 1a and of the back body exterior body 2a that have been joined at the side seal portion 4.

The cross-sectional view in Fig. 4(a), the cross-sectional view in Fig. 4(b), and the plan view in Fig. 4(c) are all illustrated so as to have the same dimensions in the up/down direction. In particular, Fig. 4(c) illustrates an embodiment of the joining pattern of the main joint region 40 at the side seal portion 4. The joining pattern of the main joint region 40 is not limited to the pattern is illustrated in Fig. 4(c).

[0043]

As illustrated in Fig. 4(c), the main joint region 40 linearly extending in the up/down direction of the diaper is divided into two regions: an upper joint region 40a located at an upper portion, and a lower joint region 40b located at a lower portion. In Fig. 4(c), the upper joint region 40a and the lower joint region 40b are divided by a dotted line extending in a lateral direction. The upper joint region 40a and the lower joint region 40b do not necessarily divide the main joint region 40 evenly. For example, as illustrated in Fig. 4(c), the upper joint region 40a may be configured with longer than the lower joint region 40b, and may be vice versa. As illustrated in Figs. 4(a), 4(b), and 4(c), the upper joint region 40a and the lower joint region 40b have the different number of stacked layers of sheet materials to be joined at each of the regions. That is, the upper joint region 40a has more number of stacked layers of sheet materials to be joined than the case of the lower joint region 40b. In an embodiment illustrated in Fig. 4(a) to 4(c), for example, the upper joint region 40a is configured such that the front body exterior body 1a and the back body exterior body 2a are joined with each other at the first stacked layer 71, the second stacked layer 72, and the third stacked layer 73. Accordingly, the upper joint region 40a is configured such that six or eight sheet materials are stacked and joined including the number of sheet materials for forming the front body exterior body 1a and the back body exterior body 2a. On the other hand, in an embodiment illustrated in Fig. 4(a) to 4(c), the lower joint region 40b

is configured such that the front body exterior body 1a and the back body exterior body 2a are joined with each other at the fourth stacked layer 74. Accordingly, the lower joint region 40b is configured such that four sheet materials are stacked and joined with each other including the number of sheet materials for forming the front body exterior
5 body 1a and the back body exterior body 2a.

[0044]

Note that in the main joint region 40, the number of sheet materials joined in the upper joint region 40a and the lower joint region 40b is not limited to the above-described embodiment. That is, the upper joint region 40a may be only required
10 to join, above the lower joint region 40b, the number of sheet materials equal to or more than the sheet materials of the lower joint region 40b. It is desirable that the lower joint region 40b is configured to join, below the upper joint region 40a, the number of sheet materials equal to or less than the sheet materials of the upper joint region 40a.

[0045]

As illustrated in Fig. 4(c), the upper joint region 40a is a region in which a plurality of upper embossed portions 41a is formed. The lower joint region 40b is a region in which a plurality of lower embossed portions 41b is formed. In the upper joint region 40a, the plurality of upper embossed portions 41a is formed in a plurality of rows, in the up/down direction of the diaper. In an example illustrated in Fig. 4(c), the
20 upper embossed portion 41a is formed in three rows. Among the plurality of upper embossed portions 41a, the distance from the leftmost row to the rightmost row is defined as a width of the upper joint region 40a. Similarly, in the lower joint region 40b, the plurality of lower embossed portions 41b is formed in a plurality of rows, in the up/down direction of the diaper. In an example illustrated in Fig. 4(c), the lower
25 embossed portion 41b is formed in three rows. Among the plurality of lower

embossed portion 41b, the distance from the leftmost row to the rightmost row is defined as a width of the lower joint region 40b. Rows of the upper embossed portion 41a and the lower embossed portion 41b that form the upper joint region 40a and the lower joint region 40b, respectively, are desirably provided in a plurality of numbers; the number of rows may be four to ten, for example. The number of rows of the upper embossed portions 41a may differ from the number of rows of the lower embossed portions 41b.

[0046]

Herein, as illustrated in Fig. 4(c), a width Bl of the lower joint region 40b is configured to be larger, expanding in the left/right direction of the diaper, than a width Bu of the upper joint region 40a ($Bl > Bu$). For example, it is desirable to configure such that a proportion of the width Bl of the lower joint region 40b to the width Bu of the upper joint region 40a is 105 to 150%, 110 to 145%, 115 to 140%, or 120 to 135%. In particular, it is desirable to configure such that the lower joint region 40b is expanding in the both left and right directions and has the larger width with respect to the upper joint region 40a. More specifically, it is desirable to configure such that, in a case where the width Bu of the upper joint region 40a is, for example, 2 to 20 mm, 4 to 15 mm, or 5 to 10 mm, the width Bl of the lower joint region 40b would be 3 to 30 mm, 5 to 20 mm, or 6 to 15 mm. In this manner, by forming the width Bl of the lower joint region 40b to be larger than the width Bu of the upper joint region 40a, it is possible to improve joining strength of the lower joint region 40b, which has less number of sheets to be joined. Accordingly, it is possible to improve a balance with the joining strength of the upper joint region 40a, which has more number of sheets to be joined. With this configuration, hardness of the upper joint region 40a and the hardness of the lower joint region 40b are equalized. As a result, an entire touch of the side seal portion 4

(particularly of the main joint region 40) improves. Furthermore, since the lower joint region 40b has less number of sheets to be joined, the joint portion might be detached when the diaper is worn. For this problem, however, expanding the width of the lower joint region 40b would improve adhesion strength and thus, would prevent detachment when the diaper is worn. Moreover, expanding the width of the lower joint region 40b can improve the adhesion strength without expanding an area of the lower embossed portion 41b. Therefore, the side seal portion 4 is more easily torn at disposal of the diaper.

[0047]

The joining pattern of the main joint region 40 will be described in more detail.

Fig. 5 is further enlargement of a portion enclosed in the dashed line frame illustrated in Fig. 4(c). Fig. 5 illustrates a positional relationship of the plurality of upper embossed portions 41a and the plurality of lower embossed portions 41b. As illustrated in Figs. 4 (a) to 4(c), each of the upper embossed portions 41a and the lower embossed portions 41b is formed in three rows. Middle rows of each of these embossed portions are positioned on a same line. Meanwhile, the leftmost and rightmost rows of the lower embossed portions 41b are formed at expanded positions in the left/right direction with respect to the leftmost and rightmost rows of the upper embossed portions 41a. As a result, the width B1 of the lower joint region 40b is larger than the width of the upper joint region 40a.

[0048]

As illustrated in Fig. 5, it is desirable to form each of the upper embossed portions 41a and each of the lower embossed portions 41b into a short-line shape extending in the left/right direction of the diaper. The upper embossed portion 41a with the “short-line shape” is at least configured such that a length Lu of the upper embossed

portion 41a in the left/right direction is longer than a width W_u of the upper embossed portion 41a in the up/down direction, and a value of the length L_u is half or less than a value of the width B_u of the upper joint region 40a. Similarly, the lower embossed portion 41b with the “short-line shape” is at least configured such that a length L_l of the lower embossed portion 41b in the left/right direction is longer than a width W_l of the lower embossed portion 41b in the up/down direction, and a value of the length L_l is half or less than a value of the width B_l of the lower joint region 40b. In this manner, by forming each of the upper embossed portions 41a and the lower embossed portions 41b into a short-line shape, the side seal portion 4 (particularly, the main joint region 40) is more easily torn at disposal of the diaper. In other words, since the upper embossed portions 41a and the lower embossed portions 41b are stretchable in the left/right direction of a diaper, it is possible to direct a force applied to the diaper when it is torn, toward the outside of the diaper. Accordingly, by forming each of the upper embossed portions 41a and the lower embossed portions 41b into a short-line shape, the side seal portion 4 is easily torn with a sequence of quick actions when the wearer applied a force to torn the diaper.

[0049]

It is desirable that joining areas of each of the upper embossed portion 41a and of each of the lower embossed portion 41b are equal. More particularly, it is desirable, that the length L_u of the upper embossed portion 41a and the length L_l of the lower embossed portion 41b are equal, and the width W_u of the upper embossed portion 41a and the width W_l of the lower embossed portion 41b are equal. For example, in an embodiment illustrated in Fig. 5, it is desirable that both of the length L_u of the upper embossed portion 41a and the length L_l of the lower embossed portion 41b are 0.5 to 10 mm, 1 to 5 mm, or 1.5 to 3 mm. In addition, it is desirable that both of the width W_u

of the upper embossed portion 41a and the width Wl of the lower embossed portion 41b are 0.2 to 5 mm or 0.4 to 3 mm. In the present embodiment, as described above, by expanding the width Bl of the lower joint region 40b, it is possible to ensure the joining strength of the lower joint region 40b. Therefore, in a case where the joining area of each of the lower embossed portions 41b forming the lower joint region 40b is equal to the joining area of each of the upper embossed portions 41a forming the upper joint region 40a, it is possible to ensure the joining strength of the lower joint region 40b. With configuration in which the area of each of the lower embossed portions 41b and the area of each of the upper embossed portions 41a are equal, it is possible, at disposal of the diaper, to tear the upper joint region 40a and the lower joint region 40b more easily by a sequence of actions.

[0050]

In Fig. 5, a sign S_u represents, in the upper joint region 40a, a distance between adjacent rows of the upper embossed portions 41a in the left/right direction. As illustrated in Fig. 5, it is desirable that all of distances S_u between the adjacent rows of the upper embossed portions 41a in the left/right direction are equal. It is particularly desirable that the distance S_u between the adjacent rows of the upper embossed portions 41a in the left/right direction is equal to the length L_u of the upper embossed portion 41a ($S_u = L_u$).

A sign S_l represents, in the lower joint region 40b, a distance between adjacent rows of the lower embossed portions 41b in the left/right direction. As illustrated in Fig. 5, it is desirable that all of distances S_l between the adjacent rows of the lower embossed portions 41b in the left/right direction are equal.

Moreover, when comparing the distance S_u between the rows of the upper embossed portions 41a and the distance S_l between the rows of the lower embossed

portions 41b, it is desirable that the value of the distance S1 is larger than the value of the distance Su ($S1 > Su$). For example, it is desirable that a proportion of the value of the distance S1 between the rows of the lower embossed portions 41b to the value of the distance Su between the rows of the upper embossed portions 41a may be 110 to 200%, 120 to 180%, or 130 to 160%, and desirably, 140 to 150%. In this manner, in the present invention, by forming the distance S1 between the rows of the lower embossed portions 41b wider than the distance Su of the rows of the upper embossed portions 41a, it is consequently possible to form the width B1 of the lower joint region 40b to be larger than the width Bu of the upper joint region 40a.

10 [0051]

As illustrated in Fig. 5, the configuration in which the width B1 of the lower joint region 40b is larger than the width Bu of the upper joint region 40a, would lead to a formation of a protrusion O in the lower joint region 40b. The protrusion O is formed in the plurality of lower joint regions 40b positioned at the outermost rows in the left/right direction and is configured to protrude outwardly more than the width of the upper joint region 40a in the left/right direction. In Fig. 5, the protrusion O is illustrated with hatched lines. The protrusion O is desirably formed each of the lower joint regions 40b positioned at the outermost rows in the left/right direction. For example, it is desirable that a length of the protrusion O in the left/right direction is 0.1 to 1 mm, 0.3 to 0.8 mm, or 0.5 to 0.6 mm.

20 [0052]

In Fig. 5, a sign Pu represents a distance between the plurality of upper embossed portions 41a in a certain row in the up/down direction. As illustrated in Fig. 5, it is desirable that all of distances Pu of the upper embossed portions 41a in the up/down direction are equal.

25

A sign Pl represents a distance between the plurality of lower embossed portions 41b in a certain row in the up/down direction. As illustrated in Fig. 5, it is desirable that all of distances Pl between the lower embossed portions 41b in the up/down direction are equal.

Moreover, when comparing the distance Pu between the upper embossed portions 41a in the up/down direction and the distance Pl between the lower embossed portions 41b in the up/down direction, it is desirable that the value of the distance Pl is smaller than the value of the distance Pu ($Pu > Pl$). For example, it is desirable that a proportion of the value of the distance Pl between the lower embossed portions 41b in the up/down direction to the value of the distance Pu between the upper embossed portions 41a may be 50 to 95%, 55 to 90%, or 60 to 85% and desirably, 65 to 80%. In this manner, by forming the distance Pl between the lower embossed portions 41b to be shorter than the distance Pu between the upper embossed portions 41a, it is possible to improve joining strength of the lower joint region 40b, which has less number of sheets to be joined. Accordingly, it is possible to improve a balance with the joining strength of the upper joint region 40a, which has more number of sheets to be joined. With this configuration, hardness of the upper joint region 40a and the hardness of the lower joint region 40b are equalized and leads to improvement in touch of the whole side seal portion 4.

[0053]

As illustrated in Fig. 5, it is desirable that rows of the upper embossed portions 41a adjacent to each other in the upper joint region 40a are arranged in shifted positions to each other in the up/down direction of the diaper. In Fig. 5, a sign Du represents a distance of shift existing between the rows of the upper embossed portions 41a, located at both left and right ends, and the row of the upper embossed portions 41a, located at

the center. For example, it is desirable that the distance of shift D_u of the upper embossed portion 41a is approximately half of the distance P_u , in the up/down direction, between the plurality of upper embossed portions 41a in a certain row.

Similarly, it is desirable that rows of the lower embossed portions 41b adjacent to each other in the lower joint region 40b are arranged in a shifted positions to each other in the up/down direction of the diaper. In Fig. 5, a sign D_l represents a distance of shift existing between the rows of the lower embossed portions 41b located at both left and right ends and the row of the lower embossed portions 41b located at the center. For example, it is desirable that the distance of shift D_l of the lower embossed portions 41b is approximately half of the distance P_l , in the up/down direction, between the plurality of lower embossed portions 41b in a certain row.

[0054]

The above has described the joining pattern in the main joint region 40, with an exemplary pattern in which the plurality of main embossed portions 41 are arranged so as to be spaced from each other in the up/down direction, to be formed into a plurality of rows being arranged to form a pattern being spaced from each other in the left/right direction. The joining pattern of the main joint region 40 is not limited to the above embodiment. For example, the joining pattern in the main joint region 40 may have a linear shape extending in the up/down direction. The main embossed portion 41 to form the main joint region 40 may have an oblong shape that is long in the up/down direction and is parallel to a side edge of the diaper. The main embossed portion 41 may have an inclination of about 1 to 45 degrees or 2 to 30 degrees with respect to the side edge of the diaper. The main embossed portion 41 having the inclination as above makes it possible to increase a linear pressure. Accordingly, it is useful when it is desirable to maintain or stabilize the joining strength.

[0055]

(2-2. Secondary Joint Region)

Subsequently, the secondary joint region 50 included in the side seal portion 4 will be described in detail.

5 Fig. 6 is an enlargement of a portion enclosed in the dashed line frame illustrated in Fig. 3. In other words, the enlarged diagram illustrated in Fig. 6 illustrates an upper portion of the main joint region 40 and an upper portion of the secondary joint region 50.

[0056]

10 As illustrated in Fig 6, the side seal portion 4 includes the main joint region 40 and the secondary joint region 50. In the present embodiment, the main joint region 40, as described above, is a band-shaped region extending in the up/down direction, in which the plurality of main embossed portions 41 is arranged being spaced from each other in the up/down direction and in the left/right direction. As illustrated in Fig. 6, a
15 blank space S exists between an outer edge of the main joint region 40 and an edge 4a on both left and right sides of the front body exterior body and of the back body exterior body. Providing the blank space S between the main joint region 40 and the edge 4a, as described above, can prevent the main joint region 40, which is rough to skin, from being exposed to the edge 4a and directly touching the user's skin. The pant-type
20 diaper is typically produced by stacking a plurality of continuous sheet materials, and joining the sheet materials in the main joint region 40 formed with a pair of rows, and by cutting the sheet materials between the two rows of the main joint region 40, so as to obtain separate pant-type diapers. Because of this structure, if a space between the main joint regions 40 is too narrow, there might be a case where it is difficult to cut
25 between the main joint regions 40 in cutting the sheet, and might cut the main joint

region 40. This would increase variation in the joining strength of the main joint region 40. To avoid this, it is configured to provide the blank space S as described above, between the main joint region 40 and the edge 4a. With this configuration, it is possible more reliably cut the continuous sheet material between the main joint regions 40 formed in the pair of rows. From these viewpoints, it is desirable to set a length of the blank space S, in the left/right direction, to at least approximately 3 to 20 mm, or 5 to 10 mm. However, there is a problem that existence of the blank space S between the main joint region 40 and the edge 4a might cause both left and right end portions of the front body exterior body and of the back body exterior body to spread like flapping frills and deterioration in overall appearance of the diaper. In the present invention, it is configured to form the secondary joint region 50 at the blank space S existing between the main joint region 40 and the edge 4a. By mildly joining the portions of the blank spaces S so as not to impair good skin feel, it is possible to prevent the both left and right end portions of the front body exterior body and of the back body exterior body from spreading.

[0057]

Joining in the secondary joint region 50 is not intended to bond the both left and right end portions of the front body exterior body and of the back body exterior body so as not to detach, but intended to mildly join and hold both left and right end portions of the front body exterior body and of the back body exterior body with strength enough to avoid spreading. Therefore, the joining strength of the secondary joint region 50 is set to a lower level than the joining strength of the main joint region 40. For example, when the joining strength of the main joint region 40 is defined as 100%, it is desirable that the joining strength of the secondary joint region 50 is 50% or less; or more desirably, 30% or less; particularly desirably, 15% or less. For example, the joining

strength of the secondary joint region 50 may be set to 1 to 50%, 1 to 30%, or 1 to 15%, with respect to the joining strength of the main joint region 40.

[0058]

The pant-type disposable diaper is designed to be torn at one or both of the left/right side portions to be expanded, when it is removed. In order to reproduce this action, the “joining strength” is defined as follows. By using a tensile strength testing device, the main joint region 40 and the secondary joint region 50 are spread in a direction of 180 degrees and pulled from inside the diaper. At this time, a peak value of the strength is defined as the joining strength.

Accordingly, in the present description of application, the “joining strength” represents a tensile strength measured with a method described below.

First, portions including the main joint region 40 and the secondary joint region 50, which are measurement targets for joining strength, are cut out to a predetermined shape (25 mm in left/right direction × 30 mm in up/down direction) to be used for a test piece for the main joint region and a test piece for the secondary joint region, respectively. Subsequently, the test piece for the main joint region is placed on a tensile strength testing device (trade name STROGRAPH V1-B, made by Toyo Seiki Seisaku-sho, Ltd.). The test piece for the main joint region is placed such that the test piece for the main joint region is expanded to left and right with the main joint region 40 located in the middle, and then, the expanded ends are sandwiched and fixed by a chuck from above and below. At this time, a distance between the left and right chucks is determined as 20 mm. In this state, the tensile test device is operated, and the tensile strength of the test piece for the main joint region is measured by pulling the test piece for the main joint region in the left/right direction. At this time, a tensile speed is determined as 200 mm/minute. The measurement finishes at timing when the

test piece for the main joint region is torn. From a measurement chart obtained, a maximum tensile strength is confirmed. The maximum tensile strength is determined as the “joining strength” described in the present description. The secondary joint region 50 can be measured by first peeling off the joint portion in the main joint region 40 up to, for example, a S2 region illustrated in Fig. 6, then using the similar procedure as for measurement of the joining strength of the main joint region 40, the “joining strength” can be measured.

[0059]

Specifically with values, it is desirable that the joining strength of the main joint region 40 is 5.0 N/25 mm or more. Specifically, it is desirable that the joining strength of the main joint region 40 is, for example, in a range from 5.0 N/25 mm to 30.0 N/25 mm. If the joining strength of the main joint region 40 is less than 5.0 N/25 mm, the joining strength becomes too low; when the diaper is pulled up by being held on side edges when the diaper is worn, the main joint region 40 might be detached and the entire diaper might be torn apart. On the other hand, if the joining strength of the main joint region 40 exceeds 30.0 N/25 mm, the joint portion might touch the skin and cause pain. Moreover, in order to remove the pant-type diaper from the wearer easily, it is necessary to tear a side edge portion of the diaper. However, if the joining strength of the main joint region 40 exceeds 30.0 N/25 mm, it might be difficult to tear the side edge portion as above.

[0060]

On the other hand, it is desirable that the joining strength of the secondary joint region 50 is set to 50% or less, 30% or less, or 15% or less, with respect to the above-described joining strength of the main joint region 40. Specifically, it is desirable that the joining strength of the secondary joint region 50 is, for example, from

0.75 N/25 mm to 15.0 N/25 mm. If the joining strength of the secondary joint region 50 is less than 0.75 N/25 mm, the joining strength becomes too low, and the secondary joint region 50 is easily detached depending on the wearer's action, and there might be substantially no meaning of providing the secondary joint region 50 in this case. On the contrary, the joining strength of the secondary joint region 50 exceeds 15.0 N/25 mm, the combined joining width of the main joint region 40 and the secondary joint region 50 becomes too large. This would require extra force to be torn and makes it inconvenient. In addition, the joining strength of the secondary joint region 50 exceeds 15.0 N/25 mm, the secondary joint region 50 would be rough to skin, and might cause pain when the diaper touches the wearer's skin.

[0061]

Methods for setting the joining strength of the secondary joint region 50 at a lower level than the joining strength of the main joint region 40, as described above, include various techniques.

The techniques for setting the joining strength of the secondary joint region 50 weak include: (A) reducing the joining area in the secondary joint region 50 so as to be smaller than the joining area in the main joint region 40; (B) reducing a sum of the length of the plurality of secondary embossed portions 51 being arranged in the secondary joint region 50 in the up/down direction so as to be shorter than a sum in the main joint region 40; (C) reducing a depth of each of the secondary embossed portions 51 in the secondary joint region 50 so as to be smaller than the depth each of main embossed portions 41 in the main joint region 40. Hereinafter, an exemplary technique to weaken the joining strength of the secondary joint region 50, although the secondary joint region 50 according to the present invention is not limited to this.

[0062]

In relation to the above-described (A), in order to set the joining strength of the secondary joint region 50 to a weak level, there may be a technique to configure the joining area in the secondary joint region 50 to be smaller than the joining area in the main joint region 40. In other words, even if the area of each of the secondary embossed portions 51 provided in the secondary joint region 50 is the same as the area of each of the main embossed portions 41 provided in the main joint region 40, by increasing the distance in the up/down and left/right directions between the embossed patterns in the secondary joint region 50 so as to be longer than the distance between the embossed patterns in the main joint region 40, it is possible to weaken the joining strength of the secondary joint region 50.

[0063]

In Fig. 6, for example, a sign P_s represents a distance between the plurality of secondary embossed portions 51 in the up/down direction in a certain row. As illustrated in Fig. 6, it is desirable that the distance P_s in the up/down direction between the secondary embossed portions 51 is longer than the distance P_u in the up/down direction between the main embossed portions 41 (the upper embossed portions 41a). For example, it is desirable that a proportion of the distance P_s between the secondary embossed portions 51 in the up/down direction to a distance P_u between the main embossed portions 41 in the up/down direction is 200 to 1000% or 300 to 600%. In Fig. 6, a sign D_s represents a distance of shift, in the up/down direction, existing between the secondary embossed portions 51 positioned in a certain row and the secondary embossed portion 51 positioned in an adjacent row. In this manner, in a case where the rows of the secondary embossed portions 51 are offset, it is desirable that a distance of shift D_s is longer than the distance P_u in the up/down direction between the main embossed portions 41. For example, it is desirable that a proportion

of the distance D_s to the distance P_u is 150 to 500% or 200 to 300%.

[0064]

In Fig. 6, a sign G_s represents a distance between the rows of the secondary embossed portions 51 in the up/down direction. As illustrated in Fig. 6, it is desirable that the distance G_s between the rows of the secondary embossed portions 51 in the up/down direction is longer than the distance G_s between the rows of the main embossed portions 41 in the left/right direction. For example, it is desirable that a proportion of the distance G_s between the rows of the secondary embossed portions 51 in the left/right direction to the distance G_s between the rows of the main embossed portions 41 in the left/right direction is 120 to 500%, or 150 to 300%. In this manner, by increasing the distance between the embossed patterns in the secondary joint region 50 in the up/down and left/right directions so as to be longer than the distance between the embossed patterns in the main joint region 40, it is possible to reduce the joining area in the secondary joint region 50 so as to be smaller than the joining area in the main joint region 40.

[0065]

More specifically, it is desirable that a joining area ratio of the secondary joint region 50 is smaller than a joining area ratio of the main joint region 40. Herein, the joining area ratio of the secondary joint region 50 refers to a proportion of an entire area of the plurality of secondary embossed portions 51 to an area of the entire secondary joint region 50. Similarly, the joining area ratio of the main joint region 40 refers to a proportion of an entire area of the plurality of main embossed portions 41 to an area of the entire main joint region 40. A total area of the main joint region 40 and the secondary joint region 50 can be obtained as an area of a band-shaped region extending in the up/down direction, using a length from an inner edge of the innermost embossed

portion among individual embossed portions, to an outer edge of the outermost embossed portion among individual embossed portions, as a width. Moreover, a total area of the plurality of main embossed portions 41 and the plurality of secondary embossed portions 51 can be obtained by multiplying the number of embossed portions that belong to either the main joint region 40 or the secondary joint region 50 to an area of each of the embossed portions. It is desirable, that the proportion of the joining area ratio of the secondary joint region 50 obtained as above to the joining area ratio of the main joint region 40 is 1 to 50%, or more desirably, 1 to 30%; particularly desirably, 1 to 15%. Meanwhile, it is desirable that a proportion of the area of one secondary embossed portion 51 to the area of one main embossed portion 41 would be approximately 50 to 200%, or more desirably, 70 to 150%.

[0066]

As illustrated in Fig. 6, it is desirable that a width B_s of the secondary joint region 50 is smaller than a width B_u of the main joint region 40 (upper joint region 40a). It is desirable that a proportion of the width B_s of the secondary joint region 50 to the width B_u of the main joint region 40 (upper joint region 40a) is 40 to 95%, or 50 to 70%.

[0067]

In relation to the above-described (B), in order to set the joining strength of the secondary joint region 50 to a low level, the configuration may be such that the sum of the length in the up/down direction of the plurality of secondary embossed portions 51 being arranged in the secondary joint region 50 in the up/down direction is smaller than a sum of the main joint region 40. That is, in the present description of application, the “joining strength”, as described above, is defined as a peak value of the tensile strength when the main joint region 40 and the secondary joint region 50 are spread and pulled

from the inner side of diaper, while opening at 180 degrees. Therefore, the more the sum of the length of the plurality of embossed portions arranged in the up/down direction, the higher the joining strength; the less the sum, the lower the joining strength. In this case, “the sum of the length of the plurality of embossed portions arranged in the up/down direction” means the sum of the lengths of sides, in the up/down direction, of the plurality of embossed portions located on a virtual line that extends in the up/down direction and that is parallel to a side edge of the disposable diaper. In a case where the side of each of the embossed portions in the up/down direction is not parallel to an estimated line, it means a length of a portion generated by crossing the estimated line in the up/down direction by each of the embossed portions. For example, it is desirable that a proportion of the sum of lengths, in the up/down direction, of the plurality of secondary embossed portions 51 being arranged in the secondary joint region 50 in the up/down direction to the sum of the lengths, in the up/down direction, of the plurality of main embossed portions 41 being arranged in the main joint region 40 in the up/down direction is 1 to 50%, 1 to 30%, or 1 to 15%.

[0068]

In relation to the above-described (C), in order to set the joining strength of the secondary joint region 50 to a low level, the configuration may be such that the depth of each of the secondary embossed portions 51 in the secondary joint region 50 is smaller than the depth of each of the main embossed portions 41 in the main joint region 40.

In a case where the side seal portion 4 is formed using heat sealing or ultrasonic sealing, the height of a pattern block used for the heat sealing or the ultrasonic sealing in actual situation is processed by using processing called cylindrical polishing so as to form a surface with a same height by forming a curve like a cylinder surface. Accordingly, the embossed patterns arranged on the pattern block have a same height at one moment.

Therefore, it is possible, after being processed to a state in which the embossed patterns have the same height, to perform processing such that the pattern block for forming each of the secondary embossed portions 51 in the secondary joint region 50 is further polished and the height of the pattern block may be reduced. For example, it is

5 desirable that the height of the pattern block for forming the secondary embossed portion 51 is lower than the pattern block for forming the main embossed portion 41 by 3 μm or more. For example, it is desirable that the height of the pattern block for forming the secondary embossed portion 51 is lower than the pattern block for forming the main embossed portion 41 by 3 to 100 μm or 5 to 50 μm , approximately. The

10 height of the pattern block for forming the secondary embossed portion 51 may be configured to gradually increase toward the pattern block for forming the main embossed portion 41. With this configuration, it is possible to configure such that the depth of each of the secondary embossed portions 51 in the joint region 50 to be formed at the side seal portion 4 becomes smaller than the depth of each of the main embossed

15 portions 41 in the main joint region 40. When the depth of each of the secondary embossed portions 51 becomes smaller, the joining strength of the secondary joint region 50 is weakened, as a result. If it is possible to set the joining strength of the secondary joint region 50 to a level within a suitable range by adjusting the depth of the secondary embossed portion 51, it is allowable to configure such that the embossed

20 pattern of the main joint region 40 is the same as the embossed pattern of the secondary joint region 50.

[0069]

In the above description, the embossed pattern in the secondary joint region 50 is compared with the embossed pattern in the main joint region 40. In some cases,

25 however, the embossed pattern in the secondary joint region 50 and the embossed

pattern in the main joint region 40 have different joining strength depending on the region. For example, the embossed pattern in the secondary joint region 50 and the embossed pattern in the main joint region 40, in some cases, might have difference in joining area ratios, distance between embossed portions in the up/down direction and in

5 left/right direction, depending on the portion. In this manner, in a case where the secondary joint region 50 and the main joint region 40 have a plurality of types of joining area ratios, distances between embossed portions in the up/down direction and in left/right direction, or the like, it is appropriate, when performing comparison between the secondary joint region 50 and the main joint region 40, to extract

10 predetermined portions adjacent to each other in the left/right direction, for comparison.

For example, as described in a measurement method of “joining strength”, it is appropriate, when performing comparison between the secondary joint region 50 and the main joint region 40, to extract predetermined portions (25 mm in left/right direction × 30 mm in up/down direction) adjacent to each other in the left/right direction,

15 for comparison.

[0070]

Furthermore, it is desirable that the embossed pattern of the secondary joint region 50, as illustrated in Fig. 6, is configured such that the plurality of secondary embossed portions 51 is arranged being spaced from each other in the up/down direction to form a

20 plurality of rows, and the plurality of rows of the secondary embossed portions 51 are formed being spaced from each other in a state where the plurality of rows is being offset from each other. In addition, it is appropriate that the length of the secondary embossed portion 51 in the left/right direction is 2 to 5 mm, and the length of the

secondary embossed portion 51 in the up/down direction is 0.3 to 5 mm. Moreover,

25 the appropriate distance between the secondary embossed portions 51 in the up/down

direction may be in a range of 5 to 50 mm.

[0071]

It is desirable that the secondary joint region 50 is formed within 5 mm from the edge 4a of both the left and right side portions of the diaper. In other words, any of the secondary embossed portions 51 formed within the secondary joint region 50 is desirably arranged within 5 mm from the edge 4a of the diaper. In Fig. 6, for example, the distance between the outermost edge of the secondary joint region 50 and the edge 4a of both sides of the diaper is indicated with a sign S1. A distance S1 is desirably within 5 mm. In this manner, by forming the secondary joint region 50 at a position that is within 5 mm from the edge 4a of the diaper, even if both left and right edges of the front body exterior body and of the back body exterior body are turned over, it is possible to suppress a width of turn-over within 5 mm at a maximum, thus, to achieve effects. Note that, as described below, it is allowable to configure such that the secondary joint region 50 reaches the edge 4a of the diaper and the distance S1 is 0 mm. The secondary joint region 50 has a weaker joining strength compared with the joining strength of the main joint region 40. Therefore, even if a cross-section of the secondary embossed portion 51 is exposed at the edge 4a of the diaper, it is possible to prevent loss of good skin feel on the edge 4a.

[0072]

In addition, as illustrated in Fig. 6, it is desirable that a region with no joining portion (non-joining region) exists between the main joint region 40 and the secondary joint region 50. In Fig. 6, a width of the non-joining region existing between the main joint region 40 and the secondary joint region 50 is represented by a sign S2. For example, a width S2 of the non-joining region is desirably 0.5 to 4 mm, or 1 to 3 mm; particularly desirably 1.5 mm or more.. With this configuration, when disposing the

disposable diaper, it is possible to detach the secondary joint region 50 more easily when detaching the side seal portion 4. Specifically, in a typical case, when the side seal portion 4 is detached, detachment begins at an inner side of the diaper and proceeds toward an outer side. Accordingly, the main joint region 40 is detached at first, and then, the secondary joint region 50 is detached. Since the non-joining region exists between the main joint region 40 and the secondary joint region 50, a force used by a user for tearing the side seal portion 4 is likely to be urged at this non-joining region, after completing tearing the main joint region 40. With this urged force, the secondary joint region 50 is reached and the secondary joint region 50 is torn. With this structure, the user can feel it easy to tear the side seal portion 4. In the present invention, the side seal portion 4 includes the main joint region 40 and the secondary joint region 50. Accordingly, compared with a conventional side seal portion without any secondary joint region 50, the entire width of the side seal portion 4 is large. In this regard, by configuring to form the non-joining region, as described above, between the main joint region 40 and the secondary joint region 50, and by giving the user the feeling that the side seal portion 4 can be easily torn, it is possible to reduce difficulty in tearing the side seal portion 4 due to formation of the secondary joint region 50.

[0073]

(2-3. Steps of Forming Side Seal Portion)

Subsequently, with reference to Fig. 7, steps of forming the side seal portion, executing in a method for manufacturing the pant-type disposable diaper, will be described. The steps of forming the side seal portion is typically executed at a final stage of the method for manufacturing the pant-type disposable diaper. Fig. 7 conceptually illustrates a flow at the final stage of the method for manufacturing the pant-type disposable diaper.

[0074]

As illustrated in Fig. 7, by following a typical manufacturing method, it is possible to obtain a diaper continuous body 100' that contains a plurality of disposable diapers being connected in series in the left/right direction (step S1). The diaper

5 continuous body 100' is configured such that a plurality of front body exterior bodies is connected in the left/right direction at a portion in which the side seal portion 4 is scheduled to be formed, so as to be formed into a continuous body 1a', and such that a plurality of back body exterior bodies is connected in the left/right direction at a portion in which the side seal portion 4 is scheduled to be formed, so as to be formed into a

10 continuous body 2a'. In the diaper continuous body 100', an absorbent body 3a is arranged to be orthogonal to the continuous body 1a' of the front body exterior body and to the continuous body 2a' of the back body exterior body. At the portion on which the side seal portion 4 is scheduled to be formed, among portions of the diaper continuous body 100', it is desirable that no hot-melt adhesive is applied; the hot-melt adhesive is

15 used for fixing the waist stretchable member 20 and the tammy stretchable member 21 to the exterior body. With this configuration, the hot-melt adhesive is applied partially and intermittently in the left/right direction (conveyance flow direction) of the diaper continuous body 100', and adjustment is performed such that the intermittent portion 110 corresponds to the portion at which the side seal portion 4 is scheduled to be formed.

20 With this arrangement, neither elastic stretchable member nor the hot-melt adhesive to fix the elastic stretchable member exists at the portion where the side seal portion 4 is scheduled to be formed.

[0075]

Subsequently, the diaper continuous body 100' is folded in the up/down direction

25 in a crotch area in which the absorbent body 3a is disposed (step S2). With this

structure, the continuous body 1a' of the front body exterior body and the continuous body 2a' of the back body exterior body are overlapped with each other. At this time, a position of the intermittent portion 110 formed on the continuous body 1a'-side of the front body exterior body corresponds to a position of the intermittent portion 110 formed on the back body exterior body 2a'-side.

[0076]

Subsequently, the side seal portion 4 is formed for the diaper continuous body 100' in which the front body and the back body are overlapped with each other (step S3). The side seal portion 4 is formed at positions corresponding to both the left and right side portions of the front body and of the back body of the diaper when the diaper continuous body is formed into the separate pant-type disposable diaper 100. As illustrated in Fig. 7, the side seal portion 4 is formed at one time so as to include two adjacent rows including a row formed on a right side of a pant-type disposable diaper, and another row formed on a left side of an adjacent pant-type disposable diaper.

Forming two rows of side seal portions 4 at one time means that two rows of embossed patterns are engraved on a pattern block of an embossing roll for performing heat sealing or ultrasonic sealing. Accordingly, just by applying the diaper continuous body 100' between this type of embossing roll and an anvil roll, and by causing the embossing roll and the anvil roll to rotate for one rotation, two adjacent rows of side seal portions 4 are formed. Herein, as illustrated in an enlarged diagram of the side seal portion 4 in Fig. 7, each of the side seal portions 4, as described above, includes the main joint region 40 and the secondary joint region 50. A distance from this secondary joint region 50 A to a preset cutting line (one-dotted chain line) is shorter than a distance from the main joint region 40 to the preset cutting line. As illustrated in the enlarged diagram in Fig. 7, the two rows of side seal portions 4 are formed such that the

individual secondary joint regions 50 are adjacent to each other. That is, the preset cutting line (one-dotted chain line) on the diaper continuous body 100' is configured to be positioned between the two secondary joint regions 50.

[0077]

5 Thereafter, the diaper continuous body 100' on which the side seal portion 4 is formed is cut in the up/down direction along the preset cutting line (one-dotted chain line) positioned between the two rows of side seal portions 4 (step S4). That is, the diaper continuous body 100' is configured to be cut at a margin of the two secondary joint regions 50. With this procedure, a separate pant-type disposable diaper 100 is cut
10 out from the diaper continuous body 100'. Thus, it is possible after the above-described steps, to manufacture the pant-type disposable diaper 100 of the present invention.

[0078]

(2-4. Other Embossed Patterns on Side Seal Portion)

15 Next, a pattern that differs from the embossed pattern illustrated in Fig. 3, or the like, with reference to Figs. 8(a), 8(b), 9(a), and 9(b). In the embossed patterns illustrated in Figs. 8(a), 8(b), 9(a), and 9(b) differ from the pattern in Fig. 3, or the like, in that, among the plurality of secondary embossed portions 51 formed in the secondary joint region 50, at least two secondary embossed portions 51 reach the edge 4a on both
20 left and right sides of the front body 1 and of the back body 2. By employing the configuration, as the patterns illustrated in Figs. 8(a), 8(b), 9(a) and 9(b), in which the plurality of the secondary embossed portion 51 reaches the edge 4a on both left and right sides of the front body 1 and of the back body 2, it is possible to prevent more reliably the edge 4a on both left and right sides from spreading.

25 [0079]

Specifically, according to the embossed pattern in Fig. 8(a), the plurality of secondary embossed portions 51 having substantially an elliptical shape is arranged being spaced from each other along the preset cutting line (one-dotted chain line) on the diaper continuous body, in the up/down direction. Accordingly, by cutting the diaper continuous body along the preset cutting line, the plurality of the secondary embossed portion 51 on the preset cutting line is divided into two portions. With this procedure, in the secondary joint region 50 of each of the side seal portion 4, the divided secondary embossed portions 51 reach the edge 4a on both left and right sides of the diaper.

[0080]

In the embossed pattern illustrated in Fig. 8(b), the secondary joint region 50 is formed with a plurality of secondary embossed portions 51 with short-line shapes. In addition, the secondary joint region 50 is arranged in a relatively concentrated manner in the vicinity of the preset cutting line (one-dotted chain line). Moreover, also on the preset cutting line, the plurality of secondary embossed portions 51 with short-line shapes is arranged in rows being spaced from each other in the up/down direction. In the embossed pattern illustrated in Fig. 8(b), the row including the secondary embossed portions 51 arranged on the preset cutting line has been shifted positionally, in the up/down direction, from the both of adjacent rows of the secondary embossed portions 51.

[0081]

An embossed pattern in Fig. 9(a) is an exemplary modification of the embossed pattern in Fig. 8(b). In the embossed pattern illustrated in Fig. 9(a), all the rows of the secondary embossed portions 51 arranged on the preset cutting line and all of both adjacent rows of the secondary embossed portions 51 are arranged to be shifted positionally from each other, in the up/down direction.

[0082]

According to an embossed pattern illustrated in Fig. 9(b), a plurality of secondary embossed portions 51 with long-line shapes is arranged in one row in the up/down direction along the preset cutting line (one-dotted chain line), in such a manner as to cross over the preset cutting line. The secondary embossed portion 51 with a long-line shape has a length in the left/right direction is configured to be 3 to 15 mm, desirably, 5 to 10 mm. The secondary embossed portion 51 with a long-line shape is divided into portions that belong to two secondary joint regions 50 when the diaper continuous body is cut along the preset cutting line. According to the embossed pattern illustrated in Fig. 9(b), it is possible to more reliably prevent turn-over from occurring on the edge of both sides of the disposable diaper.

[0083]

The above has described the embossed pattern at the side seal portion 4, with reference to desirable exemplary embodiment. In the present invention, however, the embossed pattern at the side seal portion 4 is not limited to the above-described embodiment. The pattern can be modified, appropriately based on the above-described embodiment, in a range obvious to those skilled in the art.

[0084]

(3. Absorbent Body)

Finally, a structure of the absorbent body 3a configured to be held by the above-described front body exterior body 1a and the back body exterior body 2a will be described.

The absorbent body 3a is held between the front body exterior body 1a and the back body exterior body 2a, with a crosslinked state. The absorbent body 3a is located at a crotch portion of a wearer when the disposable diaper 100 is being worn and

absorbs and retains liquids including urine excreted by the wearer. The absorbent body 3a is arranged across the front body 1 and the back body 2, around the crotch portion 3 of the disposable diaper.

As illustrated in Fig. 2 the absorbent body 3a is basically formed with an absorbent body 31, a top sheet 32, a back sheet 33, and a pair of three-dimensional gathers 34.

[0085]

The absorbent body 31 is a member for absorbing liquids including urine and retaining the absorbed liquids. The absorbent body 31 is arranged between the liquid-permeable top sheet 32 and the liquid-impermeable back sheet 33. The absorbent body 31 is formed with an absorbent material and has a function of absorbing the liquid that has permeated through the top sheet 32. As the absorbent material for forming the absorbent body 31, known materials can be employed. Exemplary absorbent materials to be useful include flap pulp, superabsorbent polymers, or a hydrophilic sheet. For the absorbent material, one type of material selected from the group consisting of the flap pulp, superabsorbent polymers, or hydrophilic sheet may be used separately, or two or more types may be used in combination. The typical absorbent material is formed into a single-layered or multiple-layered mat-shape for use. The shape of the absorbent body 31 can be designed appropriately to suit the shape, size, and usage of the disposable diaper. For example, the absorbent body 31 may be shaped into an hourglass-shape as illustrated in Fig. 2. Alternatively, the absorbent body 31 may be shaped into a rectangular, oval, or gourd shape, as used in typical disposable diapers.

[0086]

The top sheet 32 is a member that comes in contact with the wearer's skin at the

crotch portion, and is used for allowing the liquids including urine to be permeated to the absorbent body 31. For this usage, the top sheet 32 is formed with a highly flexible liquid-permeable material. The top sheet 32 is disposed so as to cover a skin-contacting surface-side of the absorbent body 31. Examples of the impermeable material for forming the top sheet 32 include woven fabric, nonwoven fabric, or a porous film. Also, it is possible to perform hydrophilic treatment, for example, on fibers of thermoplastic resin such as polypropylene, polyethylene, polyester, and nylon to form a nonwoven fabric to use.

[0087]

The back sheet 33 is a member for preventing the liquid that has permeated through the top sheet 32 and has been absorbed in the absorbent body 31, from leaking to the outside. For this usage, the back sheet 33 is formed with a liquid-impermeable material. The back sheet 33, in order to prevent liquid-leakage from the bottom surface of the absorbent body 31, covers the absorbent body 31 from the non-skin-contacting surface-side. An example of impermeable material to form the back sheet 33 is a liquid-impermeable film made of polyethylene resin. It is particularly desirable to use a microporous polyethylene film having a plurality of microscopic pores of 0.1 to 4 μm in size.

[0088]

The pair of three-dimensional gathers 34 is a member that stands along both edge portions of the absorbent body 31 for preventing side leakage of the urine excreted by the wearer. On each of the three-dimensional gather 34, a three-dimensional gather stretchable member 35 is arranged on an end portion thereof. It is configured such that when the three-dimensional gather stretchable member 35 contracts, the three-dimensional gather 34 stands toward the skin-contacting direction of the wearer.

For this structure, the pair of three-dimensional gathers 34 becomes a leak-proof wall and prevents the urine that has not permeated through the top sheet 32, or the urine that cannot be absorbed by the absorbent body 31 from leaking out of leg openings of the disposable diaper, namely, prevents side-leakage of urine. As the three-dimensional gather 34, a known configuration being used in conventional disposable diapers may be employed. The three-dimensional gather 34 may be formed, for example, by sandwiching the three-dimensional gather stretchable member 35 that is in an stretched state between layers of water-repellent sheets so as to fix the sandwiched portion. As the water repellent sheet, for example, it is possible to use a nonwoven sheet obtained by production processes such as card-embossing or spun-bonding. It is particularly desirable to use a nonwoven fabric sheet such as SMS and SMMS having high waterproof property. The typical three-dimensional gather stretchable member 35 uses elastic thread rubber. For such a rubber material, it is possible to use a material including styrene-based rubber, olefin rubbers, urethane rubbers, ester-based rubber, polyurethane, polyethylene, polystyrene, styrene butadiene, silicone, and polyester.

Industrial Applicability

[0089]

The present invention relates to a pant-type disposable diaper for infants and elderly persons. The present invention, thus, is appropriately applicable to industries related to child care and family care.

Reference Signs List

[0090]

1 front body

- 1a front body exterior body
- 2 back body
- 2a back body exterior body
- 3 crotch portion
- 5 3a absorbent body
- 4 side seal portion
- 4a edge
- 40 main joint region
- 40a upper joint region
- 10 40b lower joint region
- 41 main embossed portion
- 41a upper embossed portion
- 41b lower embossed portion
- 50 secondary joint region
- 15 51 secondary embossed portion
- 100 disposable diaper
- 100' diaper continuous body
- 110 intermittent portion

CLAIMS

1. A manufacturing method for a pant-type disposable diaper comprising:
 - a front body (1) configured to come in contact with an abdominal portion of a wearer;
 - a back body (2) configured to come in contact with a back portion of the wearer;
 - and
 - a crotch portion (3) located at a position between the front body (1) and the back body (2),the manufacturing method comprising:
 - a step of obtaining a diaper continuous body in which a plurality of disposable diapers is joined in a left/right direction;
 - a step of folding back the diaper continuous body at the crotch portion (3) and overlapping the front body (1) and the back body (2);
 - a joining step of forming a side seal portion (4) at which both left and right side portions of the front body (1) and both left and right side portions of the back body (2) are joined with each other with thermal fusion using heat sealing or ultrasonic sealing;
 - and
 - a cutting step of cutting the diaper continuous body in an up/down direction at a position corresponding to an edge (4a) on both left and right sides of the front body (1) and on both left and right sides of the back body (2) to obtain a separate pant-type disposable diaper,wherein the side seal portion (4) configured to be formed in the joining step includes
 - a main joint region (40) extending in the up/down direction and
 - a secondary joint region (50) located at an outer side in the left/right direction than

the main joint region (40) and that extends in the up/down direction,

the secondary joint region (50) is a region that is formed by providing one or a plurality of embossed rows in which a plurality of secondary embossed portions (51) is arranged being spaced from each other in the up/down direction,

joining strength of the secondary joint region (50) is configured to be weaker than joining strength of the main joint region (40), and

in the cutting step,

the diaper continuous body is cut in the up/down direction at a marginal position of the secondary joint regions (50) provided in two rows.

2. A manufacturing method for a pant-type disposable diaper according to claim 1,

in the cutting step, the diaper continuous body is cut in the up/down direction while at least two of the plurality of secondary embossed portion (51) formed in the secondary joint region (50) are cut.