FOLDABLE DISPOSABLE DIAPER

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a disposable diaper, foldable at a compact size and therefore packable in a package; more specifically, the present invention relates to a compact disposable diaper, which is foldable at a thin thickness and is therefore very convenient for shipment and handy for consumers.

2. Description of the Prior Art

Disposable diaper is composed of a back sheet and a top sheet, along with an absorption core interposed between the two sheets. The back sheet facing outwardly when such diapers are worn comprises a resin sheet, liquid non-permeable but air permeable, while the top sheet facing toward the skin of a wearer is so directly in contact to skin that the top sheet comprises a non-woven fabric or a porous resin sheet, liquid permeable. Alternatively, the absorption core absorbs urine passing through the top sheet and comprises a crushed pulp or a mixture of crushed pulp and super absorbent polymers.

This diaper is prepared by pressing the absorption core to a uniform thickness and thereafter cutting the core into a given shape such as sandglass-like form to interpose the resulting core

between the top sheet and the back sheet prior to sealing. The back sheet and the top sheet are of a shape almost similar to the shape of the absorption core, but with a larger outline than the outline of the absorption core. By coating for example a hot-melt adhesive on the back sheet and the top sheet, the two sheets are bonded together at a portion where the absorption core does not exist.

This disposable diaper comprises a front waist region facing the abdominal area of a wearer, a crotch region to be applied to the crotch thereof, and a back waist region facing the dorsal area (back area) thereof. The back sheet and the top sheet protrude at both the right and left ends of each of the front waist region and the back waist region in the width direction of the diapers, where front flaps and back flaps are formed.

Retaining fasteners are fixed on the ends of the back flaps in the width direction, and retaining fasteners are also fixed on the front surface of the back sheet in the front waist region.

When this diaper is worn, the back flaps are pulled out from the dorsal area (back area) of a wearer to the abdominal area along the body outline of the wearer, to be overlaid in the front waist region. Then, the retaining fasteners in the front waist region and the retaining fasteners in the back waist region are attached together.

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After production at a plant, such diapers are folded at a small size to be packed in a package for shipping as a manufacturing product.

In such case, both the sides of each of the front waist region and the back waist region are folded over the side of the top sheet along the width direction of the diapers, and then, the front waist region and the back waist region are overlaid onto the crotch region in three layers.

For folding both the sides of the front waist region in the width direction, generally, the sides are folded at the part where the absorption core is present. Hence, the absorption core is overlaid at least in five layers when the diaper is folded in the three layers. Thus, the dimensional height of the folded diapers is so increased that the dimensional height of the whole package containing a plurality of such diapers overlaid together is also increased.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a foldable disposable diaper of a more compact size than those of conventional diapers because the diaper can be folded at a thin thickness.

It is the other object of the present invention to prepare

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a foldable disposable diaper which can be folded at a thin thickness with no loss of the absorption potency thereof.

The diaper of the present invention comprises a back sheet, a liquid permeable top sheet and an absorption core interposed between the two sheets, having a front waist region facing the abdominal area of a wearer, a crotch region to be applied to the crotch thereof, and a back waist region facing the dorsal area thereof, wherein the absorption core formed in at least one of the front waist region and the back waist region have a thin thickness part(s) thinner than the thickness of the absorption core in the crotch region and wherein the front waist region and/or the back waist region is folded at the thin thickness part(s).

When the front waist region and the back waist region are of a larger dimension than the dimension of the crotch region in the width direction provided that the direction of aligning the front waist region, the back waist region and the crotch region is defined as the longitudinal direction of a diaper while the direction vertical to the longitudinal direction of the diaper is defined as the width direction, for example, the absorption core is made thin at both the sides of the front waist region and the back waist region in the width direction, whereby such thin thickness parts are also formed in the front waist region and the back waist region. Then, both the sides of the front waist region

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and the back waist region in the width direction are folded inwardly at the thin thickness parts in the width direction, along a folding line parallel to the longitudinal direction of the diaper, and furthermore, the folded front waist region and back waist region are overlaid on the crotch region, along the folding line parallel to the width direction of the diaper.

In this case, preferably, the diaper is folded in such a manner that the folding line for folding the front waist region and the back waist region is positioned at the thin thickness parts; and that the dimensional width of the thin thickness part positioned on the far end side of the width direction of the diaper from the folding line is smaller than the dimensional width of the thin thickness parts positioned inwardly in the width direction of the diaper so as to face the thin thickness parts to each other along the folding line to overlay the thin thickness parts to each other.

Additionally, the thickness of the diaper at the thin thickness part of the absorption core is preferably 1/2-fold or less the thickness of the diaper at the remaining parts excluding the thin thickness part of the absorption core.

The foldable disposable diaper of the present invention is disposable for use for infants, toddlers or aged people, wherein the thickness of the absorption core is thin in the front waist region and the back waist region to prepare thin thickness parts

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in the absorption core. The disposable diaper is wholly folded in two or three or a plurality, and a given number of such diapers are packed in a package for shipment as a manufacturing product. So as to make the manufacturing product in its entirety at a compact size, thin thickness parts are formed in the absorption core in the front waist region and the back waist region of the foldable disposable diaper of the present invention. When the diaper is folded, the front waist region and the back waist region are folded at the thin thickness parts so these regions are overlaid together at the thin thickness parts. Accordingly, the thickness of the folded and overlaid portion of the diaper can be made so thin that the resulting thickness in the folded diaper can be made thinner than the thickness of conventional diapers with no formation of such thin thickness part. Because the absorption core is still present at the thin thickness parts, the area of the absorption core in the whole diaper is never reduced. Because the thickness of the folded diaper can be made thin, additionally, the absorption core existing in the crotch region of the diaper and to be applied to the crotch of a wearer can be thicker than conventional diapers.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig.1(A) is a developed plane view of the foldable disposable

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diaper of the present invention, which is viewed from the side toward skin;

Fig.1(B) is a plane view of the diaper of Fig.1(A), which is folded inwardly along the line L-L;

Fig.1(C) is a perspective view depicting the diaper of Fig.1(B), which is folded inwardly along the line M-M;

Fig.2 (A) is a cross sectional view of the diaper of Fig.1(A) along the line IIA-IIA;

Fig.2 (B) is a cross sectional view of the diaper of Fig.1(B) along the line IIB-IIB;

Fig.2(C) is a cross sectional view of the diaper of Fig.1(C) along the line IIC-IIC;

and

Fig.3 is a front view of the diaper at a state when the diaper is actually worn.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention will now be described with reference to drawings.

As shown in Fig.1(A), diaper 11 is in a lamination structure where absorption core 14 is interposed between back sheet 12 and top sheet 13. The back sheet 12 is faced outwardly when the diaper 11 is worn, and comprises a resin sheet, liquid non-permeable but

air permeable, so as not to ooze water such as urine outside. Alternatively, the top sheet 13 facing the skin side of a wearer is directly in contact to the skin of the wearer, and the top sheet 13 therefore comprises a non-woven fabric or a porous resin sheet, liquid permeable, which can permeate spotted urine into the absorption core. Additionally, the absorption core 14 absorbs urine permeating through the top sheet 13, and comprises a highly absorbent crushed pulp, or a mixture of a crushed pulp and a super absorbent polymer.

As shown in Fig.1(A), the diaper 11 is formed in a sandglass-like form. The narrow middle region of the sandglass-like form is the crotch region 19, while the front and back parts thereof in wider forms are individually the front waist region 18 and the back waist region 20.

The absorption core 14 in the sandglass-like form is arranged from the crotch region 19 to the front waist region 18 and the back waist region 20. In the front waist region 18 and the back waist region 20, the absorption core 14 is prepared, in the regions surrounded with an alternate long and short dash line in both the left and right regions of the diaper, as thin thickness part 14b of a thickness thinner than the thickness of the absorption core in the remaining region. In the present example, the thickness of the absorption core 14 is uniform in the region excluding the

thin thickness part 14b, and so as to discriminate the region from the thin thickness part 14b, the region is designated as thick thickness part 14a. So as to enhance the absorption potency in the crotch region 19, however, the absorption core 14 positioned in the crotch region 19 may satisfactorily be thicker than the thick thickness part in the central part of the front waist region 18 and the back waist region 20.

As shown in the cross sectional view of Fig.2(A), the thickness of the diaper 11 at the thin thickness part 14b is 1/2 ×H1 or less, provided that the thickness of the diaper at the thick thickness part 14a is defined as H1.

The back sheet 12 and the top sheet 13 are in a sandglass-like form, nearly similar to the form of the absorption core 14, and these sheets are wholly larger individually than the absorption core 14. The absorption core 14 is put in the center between the back sheet 12 and the top sheet 13, to be interposed between the back sheet 12 and the top sheet 13. At parts where the absorption core 14 is not present between the back sheet 12 and the top sheet 13, namely at the margins in the width direction and the longitudinal direction, a hot-melt adhesive or the like is coated on the margins where the back sheet 12 and the top sheet 13 face to each other, to attach the back sheet 12 and the top sheet 13 together. In such manner, the absorption core 14 is sealed in

between the back sheet 12 and the top sheet 13. The back sheet 12 and the top sheet 13 protrude in the front waist region 18 and the back waist region 20 of the diaper 11 in the width direction of the diaper 11. The protruding parts form individually front flap 18a, 18a and back flap 20a, 20a.

At the end parts of the crotch region 19 in the width direction of the diaper 11 are arranged elastic members 17 elongating in the longitudinal direction of the diaper. At an elongated state between the back sheet 12 and the top sheet 13, the elastic members 17 comprising for example flat elastic braid adhere to the back sheet 12 and the top sheet 13 by means of a hot-melt adhesive. The elastic members can form gathering. When the diaper 11 is worn, the gathering facing the thigh part of a wearer elastically presses the thigh part.

Herein, the back waist region 20 of the diaper 11 is formed wider than the front waist region 18, and protrusion 20b is formed on each end of the back waist region 20 in the width direction. Retaining fastener 16 is fixed on the protrusion 20b, and the protrusion 20b is generally at a folded state on the inner side of the diaper 11, excluding when the diaper 11 is worn. When the diaper 11 is worn, the back waist region 20 is applied to the back of a wearer while the crotch region 19 is applied to the crotch thereof. Then, the diaper is folded and flapped in front to apply

the front waist region 18 abdominally, at such a state as shown in Fig.3. Subsequently, the back flaps 20a, 20a are drawn forward along the body outline of a wearer toward the abdominal area, and thereafter, each retaining fastener 16 of each protrusion 20b is fastened on the retaining fastener 15 fixed on the back sheet 12 in the front waist region 18. The diaper 11 is worn in such fashion.

Alternatively, instead of the retaining fastener 15, film is fixed on the surface of the back sheet 12 in the front waist region 18; instead of the retaining fastener 16, an adhesive tape is fixed in the back waist region 20. In this case, the adhesive tape in the back waist region 20 adheres to the film in the front waist region 18, to attach the front waist region 18 and the back waist region 20 together.

After the production of the disposable diaper 11, the front flaps 18a, 18a on both the right and left sides in the front waist region 18 as well as the back flaps 20a, 20a on both the sides in the back waist region 20 are folded along the line L-L parallel to the longitudinal direction, toward the direction shown by arrow β, so that the diaper 11 is folded as shown in Fig.1(B). Furthermore, the front waist region 18 and the back waist region 20 are folded along the line M-M parallel to the width direction of the diaper toward the direction shown by arrow γ to be overlaid

on the crotch region 19, so that the diaper is folded at such a state as shown in Fig.1(C). The diaper folded at the state shown in Fig.1(C) is packed in a package and the like.

So as to make the thickness of the folded diaper 11 as thin as possible, the line L-L should be present in a region where the absorption core 14 is not present in the crotch region 19. Furthermore, the line L-L should be present at the end side in the width direction of the diaper from a parallel line to the longitudinal line of the diaper, the parallel line dividing the thin thickness part 14b of the absorption core in halves on right and left sides and the thin thickness part 14b having been formed individually in the front waist region 18 and the back waist region 20. More specifically, when the diaper is divided along the line L-L as shown in Fig.1(A) and Fig.2(A), the dimensional width (i) of the thin thickness part on the end side in the width direction of the diaper 11 is the same as or smaller than the dimensional width (ii) of the thin thickness part on the central side. Accordingly, the diaper 11 should necessarily be folded along the line L-L as shown in Fig.2(B), so that the thin thickness parts 14b, 14b in the front flaps 18a, 18a formed on the right and left ends of the front waist region 18 might be overlaid together. Similarly, the back flaps 20a, 20a should necessarily be folded so that the thin thickness parts thereof might be overlaid

together.

Because the thickness of the diaper 11 at the thin thickness part 14b is 1/2-fold or less the thickness of the diaper at the thick thickness part 14a, the thickness H2 of the thin thickness parts 14b, 14b overlaid together is almost H1 or less.

When the diaper 11 is folded at a state as shown in Fig.1(C), the front waist region 18 and the back waist region 20, both folded along the line L-L as shown in Fig.1(B), are overlaid on the crotch region 19 as shown in the cross sectional view of Fig.2(C). The thickness H2 of the front waist region 18 and the back waist region 20, both overlaid on the crotch region 19, is almost the same as the thickness H1 of the thin thickness part 14a of the diaper, as described above, and therefore, the total thickness H3 of the diaper 11 at a folded state as shown in Fig.1(C) is the thickness as the sum of the thickness H1 of the crotch region 19 and the thickness H2 of the front waist region 18 and the back waist region 20, which is nearly the same thickness as $3 \times H1$.

In accordance with the present invention, therefore, the thickness of the folded diaper can be suppressed to about 3-fold the thickness of the diaper at the developed state. The thickness of conventional diapers at their folded state is 5-fold or more the thickness of the diapers at their developed state. When the thickness of the thick thickness part 14a of the diaper 11 is the

same thickness of conventional diapers, therefore, the diaper of the present invention can be folded at a thickness 3/5-fold the thickness of the conventional diapers. When the inventive diaper is packed in a package for shipment as a product, accordingly, the bulkiness of the product can be made less, so that the product can be compact. Hence, a large number of such products can be shipped at one time, compared with conventional diapers, and therefore, the product is also handy for consumers.

Because the thickness of the absorption core in the crotch region 19 is not thin, the absorption potency of the diaper is never reduced. Even when the thickness of the absorption core in the crotch region 19 is thicker than the thickness of conventional diapers, on contact, the diaper can be made thin compared with conventional diapers.

The present invention has been described insofar in one example as the open-type disposable diaper. However, the present invention is not limited to the example. In accordance with the present invention, a brief-type diaper product can be made compact, by forming such thin thickness parts in the front waist region and the back waist region, whereby the thickness of the folded diaper can be made thin.

In accordance with the present invention, as has been described hereinabove, the thin thickness parts are formed in the

front waist region and the back waist region of a disposable diaper to make the thickness of the folded diaper thin with no reduction of the thickness of the absorption core in the crotch region or with no loss of the absorption potency of the diaper. Thus, the diaper can be made thinner.

When the diaper of the present invention is folded and packed in a package for shipment as a product, the product can be made more compact. Compared with conventional diapers, a greater number of such products can be shipped at one time, which can contribute to the reduction of shipment cost. Because the product is not bulky, additionally, the product is handy for purchasers and consumers.

When the diaper is to be folded inwardly along a line parallel to the longitudinal direction of the diaper, furthermore, the line should be formed on each of the marginal sides in the width direction of the diaper, from the line parallel to the longitudinal line of the diaper, the parallel line dividing the thin thickness parts individually formed in the front waist region and the back waist region in halves on right and left sides, so that the area of the thin thickness parts in the inner region of the diaper, on which the end parts of the front waist region and the back waist region are overlaid, can be made larger than the area of the thin thickness parts in the front waist region and

the back waist region to be folded inwardly. Hence, the thick parts of the diaper are never overlaid together to make the thickness of the folded diaper thinner.

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What is claimed is;

1. A foldable disposable diaper comprising a back sheet, a liquid permeable top sheet and an absorption core interposed between the two sheets, having a front waist region facing the abdominal area of a wearer, a crotch region to be applied to the crotch thereof, and a back waist region facing the dorsal area thereof,

wherein the absorption core formed in at least one of the front waist region and the back waist region have thin thickness part(s) thinner than the thickness of the absorption core in the crotch region; and

wherein the front waist region and/or the back waist region is folded at the thin thickness part(s).

2. A foldable disposable diaper according to claim 1, wherein the dimensions of the front waist region and the back waist region in the width direction of the diaper are larger than the dimension of the crotch region in the width direction, provided that the direction of aligning the front waist region, the crotch region and the back waist region is defined as the longitudinal direction of the diaper while the direction vertical to the longitudinal direction of the diaper is defined as the width direction; and wherein the thickness of both the ends of the absorption core

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present in the front waist region and the back waist region is reduced to form the thin thickness parts therein, where both the ends of the front waist region and the back waist region in the width direction are folded along a folding line parallel to the longitudinal direction of the diaper.

3. A foldable disposable diaper according to claim 2, wherein the absorption core positioned in the central part between the front waist region and the back waist region in the width direction is the same as the thickness of the absorption core in the crotch region.

4. A foldable disposable diaper according to claim 2, wherein the folding line parallel to the longitudinal direction is positioned at a part not to overlay the folding line onto the absorption core in the crotch region.

5. A foldable disposable diaper according to claim 2, wherein the front waist region and back waist region are folded along two lines each parallel to the width direction of the diaper so that the front waist region and the back waist region with both their ends having already been folded might be folded in the width direction to be overlaid over the crotch region.

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6. A foldable disposable diaper according to claim 2, wherein among the two thin thickness parts produced by division along the folding line at the thin thickness parts in each of the front waist region and the back waist region, the dimension of the thin thickness part(s) positioned inwardly in the width direction of the diaper is larger than the dimension of the thin thickness part(s) positioned outwardly in the width direction of the diaper.

7. A foldable disposable diaper according to claim 1, wherein the thickness of the diaper at the thin thickness part(s) of the absorption core is 1/2-fold or less the thickness of the diaper excluding the thin thickness part(s).

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