

DISPOSABLE DIAPER OF PANTS TYPE

This invention relates generally to a pull-on disposable diaper type and more particularly to such a pull-on disposable diaper having letters described on transversely opposite side edges thereof.

A pull-on disposable diaper is well known. It is also well known as the usually adopted measure to provide, in such a diaper, the peripheral edges of the waist-opening as well as of the leg-openings with elastic members adapted to be circumferentially stretched and contracted and thereby to improve a fitting of such diaper when it worn. In addition, it is also well known to provide the front waist region and the rear waist region with elastic members adapted to be circumferentially stretched and contracted. When such diaper is still not put on the wearer's body, a plurality of pleats (gathers) are formed on the outer surface of the diaper due to contraction of the elastic members. Once the diaper has been put on the wearer's body, most of these pleats disappear. Some of these well known diapers have letters or the like described on the front waist region or the rear waist region so as to be visually recognized externally of the diaper for the purposes of decoration or information.

While said letters or the like described on said diaper having the pleats on the front or rear waist region can be easily recognized after the diaper has been put on the wearer's body and said pleats have disappeared, visual recognition of said letters or the like is difficult before it is put on the wearer's body. With a consequence, the letters or the like indicating various information such as size, type and trade mark of the diaper which are desired to be visually recognized by consumers or suppliers when the diaper is still not put on the wearer's body can not achieve an intended effect so far as these letters or the like are described on the waist regions having a plurality of pleats.

In view of the problem as has been described above, it is a principal object of the invention to allow the letters or the like described on the diaper to be clearly visible even when the diaper is still not put on the wearer's body.

The object set forth above is achieved, according to the invention, by a pull-on disposable diaper comprising a liquid-permeable topsheet, a liquid-impermeable backsheet and a liquid-absorbent core disposed therebetween and having a front waist region, a rear waist region and a crotch region extending therebetween, wherein transversely opposite side

edges of said front and rear waist regions are put flat together and joined to each other, said disposable diaper being characterized by that join spots at which said topsheet and said backsheet are joined to each other along said transversely opposite side edges of said diaper have their thickness smaller than that of non-joined areas surrounding said join spots so as to define recesses describing letters such as Roman characters, numerals, Japanese characters or Chinese characters adapted to be visually recognized externally of said diaper.

Fig. 1 is a perspective view showing an embodiment of a pull-on disposable diaper according to the invention as partially broken away;

Fig. 2 is a fragmentary front view partially showing a backsheet;

Fig. 3 is a sectional view taken along a line III-III in Fig. 2; and

Fig. 4 is a sectional view taken along a line IV-IV in Fig. 1.

Details of the inventive diaper will be more fully understood from the description given hereunder in reference

with the accompanying drawings. The term "joined" herein used should be understood to mean that two or more parts are unitized in a substantially inseparable fashion. The term "bonded" herein used should be understood to include not only the situation in which two or more parts are unitized by adhesive or glue in a separable fashion but also the situation in which two or more parts are unitized in a substantially inseparable fashion.

Fig. 1 is a perspective view showing a pull-on disposable diaper 1 of as partially broken away. The diaper 1 is shown to have been contracted transversely of the diaper 1. The diaper 1 comprises a liquid-permeable topsheet 2, a liquid-impermeable backsheet 3 and a liquid-absorbent core 4 disposed between these two sheets 2, 3. The topsheet 2 and the backsheet 3 are put one upon another and bonded to each other by means of hot melt adhesive (not shown) over their portions extending outward beyond a peripheral edge of the absorbent core 4.

The diaper 1 has a front waist region 6, a rear waist region 7 and a crotch region 8 extending between the front and rear waist regions 6, 7. The front and rear waist regions 6, 7 are put flat together and joined to each other at a plurality of join spots 9 so as to form a waist-opening

11 and a pair of leg-openings 12. The waist-opening 11 and leg-openings 12 are provided circumferentially along their peripheral edges with elastic members 13, 14, respectively, which are disposed between the topsheet 2 and backsheet 3 and bonded with appropriate tensions to an inner surface of at least one of these two sheets 2, 3. These elastic members 13, 14 are shown in their contracted states.

The topsheet 2 comprises liquid-permeable porous thermoplastic film, nonwoven fabric made of thermoplastic synthetic fiber, laminate of these film and nonwoven fabric, or the like. The backsheet 3 comprises an elastically stretchable inner sheet 3A made of thermoplastic synthetic resin elastomer and a non-elastic outer sheet 3B made of nonwoven fabric of thermoplastic synthetic fiber. These two sheets 3A, 3B have, at least in the front waist region 6, a plurality of join spots 21 at which the two sheets 3A, 3B are joined to each other and a plurality of pleats 22 extending substantially in the vertical direction with respect to the diaper 1. The absorbent core 4 is formed from fluff pulp or a mixture of fluff pulp and super-water-absorptive polymer.

Figs. 2 and 3 are respectively a plan view showing a portion of the backsheet 3 surrounded by an imaginary line 20 in Fig. 1 and a sectional view taken along a line III-III in

Fig. 2. The inner sheet 3A of the backsheet 3 is elastically stretchable transversely of the diaper 1 and shown in its contracted state. The outer sheet 3B has a plurality of pleats extending substantially in the vertical direction with respect to the diaper 1. These inner and outer sheets 3A, 3B are unitized at the join spots 21 by fusion and solidification of synthetic resin ingredient contained in at least one of these two sheets 3A, 3B. Th join spots 21 are provided on a plurality of imaginary lines which extend in a desired direction in parallel one to another and closely adjacent one to another. In the case shown by Fig. 2, the join spots 21 are provided on a plurality of imaginary lines 26 rising rightward and on a plurality of imaginary lines 27 falling rightward. Each pair of adjacent lines 26 and the pair of adjacent lines 27 crossing the pair of adjacent lines 26 define a substantially rectangular area 28 in which the outer sheet 3B remains lifted out of the inner sheet 3A so as to form the pleats 22. The pleats 22 present indeterminate shapes and the number thereof cannot be exactly counted. Concerning crests 29 of the respective pleats 22, each of the areas 28 may have one or more of such crests 29, as seen in Fig. 3. The backsheet 3 can be elastically stretched until the pleats 22 of the outer sheet 3B have been completely

flattened.

Such backsheet 3 may be obtained in the form of a laminated sheet having the join spots 21 distributed in a desired layout, through a series of steps as following: stretching original web for the elastically stretchable sheet 3A at a desired ratio in the direction intended to become the transverse direction of the diaper 1; placing thereupon original web for the non-stretchable sheet 3B; and then feeding these two original webs for the sheets 3A, 3B placed one upon another to a pair of heat-embossing rolls. The laminated sheet thus obtained corresponds to original web for the backsheet 3. With the diaper 1 in which the sheet 3A has been assembled with a tension, the pleats 22 extending in the direction crossing the direction of the contraction, as will be best seen from Fig. 1. It should be understood here that the distribution and/or pattern of these pleats 22 will be variable depending on the layout of the join spots 21.

Fig. 4 is a sectional view taken along a line IV-IV in Fig. 1. As shown in Fig. 1, the join spots 9 distributed along the transversely opposite side edges of the diaper 1 comprise a plurality of linear spots 9A extending in parallel to the waist line as well as in parallel one to another in vertically opposite areas of each side edge and spots 9B

describing Roman characters OYASUMI in vertically intermediate area of each side edge. Referring to Fig. 4, the respective join spots 9A, 9B are enclosed by non-joined areas 31. The spots 9A have a thickness of t_A , the spots 9B have a thickness of t_B and the non-joined areas 31 have a thickness of T . There are established a relationship among these thicknesses represented by $t_A, t_B < T$, preferably $t_A, t_B < T \times 2/3$, and more preferably $t_A, t_B < T \times 1/2$, wherein $t_A \geq 0$ and $t_B > 0$. The relationship of $t_A = 0$ means that the transversely opposite side edges of the diaper 1 are formed with small openings 32 around which the respective sheets constituting the front and rear waist regions 6, 7 are joined to each other (See the left hand of Fig. 4). Of the join spots 9A, 9B, at least the spots 9B form recesses 33 in front and/rear sides of the side edges so that these recesses 33 describe said Roman characters. These recesses 33 can describe not only the Roman characters but also the other various characters such as numerals, Japanese characters or Chinese characters. These characters are visually recognized from outside of the diaper 1 and can be advantageously used to indicate various information such as trade marks and genders for which the articles should be exclusively used, for example, BOY or GIRL.

Such join spots 9A, 9B can be formed by placing the topsheet 2 and the backsheet 3 one upon another and locally heating these two sheets 2, 3 under a pressure. At the spots having been subjected to heat and pressure, resinous ingredient contained in the two sheets 2, 3 is fused and then solidified so as to form film-like thin spots 9A, 9B at which the two sheets 2, 3 are unitized. In the areas subjected to neither heat nor pressure, on the other hand, the sheets 2, 3 maintain their initial configuration and define relatively thick non-joined areas 31. Consequently, the recesses 33 are obtained. The plurality of join spots 9A extending in parallel to the waist line as well as closely in parallel to one another in the vertically opposite areas of each side edge are effective to prevent the front and rear waist regions 6, 7 from being separated back and forth along the side edge particularly in the proximity of the waist-opening 11 as well as the leg-openings 12 as the diaper 1 is put on the wearer's body. So far as the front and rear waist regions 6, 7 are so reliably fixed to each other along the side edges as shown in Fig. 1, the join spots 9B to be distributed in the vertically intermediate area may be less crowded than the join spots 9A. Thus, a freedom of selecting the letters used in this intermediate area, more

particularly, of selecting shape, size, spacing etc. of the letters can be correspondingly increased and at the same time a peeling strength in the vertically intermediate area can be made relatively low. Such feature is convenient for the wearer's mother because the front and rear waist regions can be easily separated back and forth when the diaper 1 smeared with body fluids is taken off by her.

In order to ensure that the letters described by the recesses 33 can be clearly discriminated from the non-joined areas 31 around these letters and easily read, a difference between the thickness t_b of each join spot 9B and the thickness T of each non-joined area 31 should be as large as possible. However, it is practically impossible to adjust the thickness t_b of the film-like join spot 9B. To increase the differential thickness, relatively bulky nonwoven fabric may be used for the topsheet 2 or the backsheet 3 and thereby an apparent thickness T of the non-joined areas 31 may be increased. It should be understood that the thickness T of the areas 31 as well as the thickness of the nonwoven fabric are measured under a pressure of 7 gf/cm² according to JIS L 1096 and the thickness t_b of the spots 9B is measure by means of a micrometer. It is also possible to facilitate the letters to be read by increasing a differential light

transmissivity or reflectivity between the join spot 9B and the non-joined area 31. For example, the join spot 9B may be formed by film having a smooth surface and relatively high light transmissivity while the non-joined area 31 may be formed simply by placing the topsheet 2 upon the backsheet 3 so as to have a light transmissivity lower than that of the spot 9B. In this manner, the spot 9B has a transparency or translucency higher than that of the area 31 and facilitates the letters to be read. The desired effect is also achieved by forming the spot 9B by film having a light reflectivity substantially higher than that of the non-joined area 31.

While a specific embodiment of the invention has been described hereinabove in reference with the accompanying drawings, in which the sheet-like elastic member (i.e., the inner sheet) 3A is incorporated with a tension in one of the front and rear waist regions 6, 7 so that the backsheet 3 forms a plurality of pleats 22 when the diaper 1 is still not put on the wearer's body, the invention is not limited to such embodiment. For example, it is possible without departing from the scope of the invention to replace the sheet-like elastic member 3A by a strip of elastic member or even to eliminate such elastic member 3A so that substantially no pleat is formed in both the front and rear

waist regions 6, 7. Even when the backsheet 3 forms a plurality of pleats 22, practically no pleat is formed in the side edges of the diaper 1, since the inner sheet 3A freely contracts or the join spots 9A, 9B function to limit such contraction. This is the reason why the letters described on the side edges are clearly visible no matter whether the diaper is put on the wearer or not.

It is also possible to describe the letters by printing - obviously using ink which is safe and harmless for babies - instead of describing them by the join spots 9B. Nevertheless, it is desired to avoid a possibility that such ink might come in contact with the baby's mouth even if ink used to print the letters is safe and harmless. In conclusion, it is preferred to describe the letters by the join spots 9B.

With the pull-on disposable diaper according to the invention, the letters described on the side edges of the diaper can be clearly visible no matter whether the diaper is put on the wearer or not, since the side edges on which the letters are described are substantially or completely free from the formation of pleats.



WHAT IS CLAIMED IS:

1. A pull-on disposable diaper comprising a liquid-permeable topsheet, a liquid-impermeable backsheet and a liquid-absorbent core disposed therebetween and having a front waist region, a rear waist region and a crotch region extending therebetween, wherein transversely opposite side edges of said front and rear waist regions are put flat together and joined to each other, said disposable diaper being characterized by that:

join spots at which said topsheet and said backsheet are fixed to each other along said transversely opposite side edges of said diaper have their thickness smaller than that of non-joined areas surrounding said spots so as to define recesses describing letters such as Roman characters, numerals, Japanese characters or Chinese characters adapted to be visually recognized externally of said diaper.

2. The diaper according to Claim 1, wherein said join spots present light transmissivity and/or light reflectivity sufficiently higher than those of said non-joined areas to facilitate said join spots to be visually recognized.