

ABSORBENT GARMENT HAVING ELONGATABLE

TOP- AND BACKSHEETS

This invention relates generally to absorbent garments having elongatable top- and backsheets and more particularly to such an absorbent garments such as disposable diapers for infants, training pants for infants, incontinence diapers for adults or the like.

It is well known in Japanese Laid-Open Patent Application (Kokai) Nos. Hei3-139350, Hei3-162854 and Japanese Laid-Open Utility Model Application (Kokai) No. Hei3-16923 to improve a fitting of a disposable absorbent article such as a diaper of shorts type or training pants to a wearer by using a nonwoven fabric of stretchable fibers as a topsheet (inner sheet) of the article and a laminated sheet of a stretchable plastic film and a nonwoven fabric of stretchable fibers as a backsheet (outer sheet) of the article. Japanese Laid-Open Patent Application (Kokai) No. Sho61-41304 discloses use of a nonwoven fabric made from stretchable fibers as a topsheet to improve a fitting of a disposable diaper to a wearer and formation of an opening in the topsheet extending in a crotch region of the diaper to facilitate excretion to be transferred into the diaper.

Use of stretchable materials both for the topsheet and the backsheet of the article often leads to an increase of manufacturing cost. More specifically, in manufacturing the article having the topsheet formed with the excretion receiving opening at least dimensioned to have a size corresponding to the middle zone of the crotch region, a stretchable continuous web previously formed with the openings at regular intervals as a material of the topsheet is inevitably affected under high tension as this web is transported along a production line of the article. As a result, the openings may be deformed and, in order to avoid such deformation, it is necessary to decrease a velocity at which the web is transported. Thus the openings make a high-speed mass production of the articles difficult.

The zone of the topsheet corresponding to the middle zone of the crotch region is intended to be in contact with much quantity of excretion and it is desirable that this zone of the topsheet has a high permeability for excretion, particularly urine and the zone of the topsheet surrounding the middle zone can prevent urine from spreading and/or exuding.

The above-cited Applications neither disclose nor teach nor suggest the measures to solve the problems.

In view of the problems as have been described above, it is a principal object of the invention to employ a relatively simple measure to solve the problems.

The object set forth above is achieved, according to the invention, by an absorbent garment having elongatable top- and backsheets comprising:

a laminate panel having longitudinal and transverse axes intersecting orthogonally to each other, front and rear waist regions and a crotch region;

the laminate panel including a non-stretchable topsheet being liquid-permeable in the crotch region, a stretchable liquid-impermeable backsheet and a liquid-absorbent batt structure disposed therebetween; and

a length of the topsheet as measured in a direction of at least one of the longitudinal and transverse axes is dimensioned to be larger than a length of the backsheet as measured in the direction of said one axis and the topsheet is formed between opposite edges as viewed in the direction of the one axis with at least one of pleats over a length substantially corresponding to the differential length of the topsheet and the backsheet so that said at least one of pleats extend substantially in parallel to the other axis orthogonal to said one axis.

More specifically, said at least one of pleats extending in direction of the longitudinal axis is formed in each of paired end flaps defined by portions of the topsheet and the backsheet and said at least one of pleats extending along the longitudinal axis is formed in paired side flaps defined by portions of the topsheet and the backsheet extending outward beyond opposite edges of the batt structure as viewed in the direction of the transverse axis. The topsheet is made of a hydrophobic sheet and formed at least in the middle of the crotch region with an opening covered with a hydrophilic sheet which is, in turn, bonded to the topsheet so that a zone defined by the opening has a liquid-permeability.

Fig. 1 is a perspective view showing a disposable diaper of pull-on or shorts type as an embodiment of the invention;

Fig. 2 is an unfolded plan view showing a laminate panel forming the diaper as partially broken away;

Fig. 3 is a scale-enlarged sectional view of the laminate panel taken along its longitudinal axis passing through the middle of the laminate panel;

Fig. 4 is a scale-enlarged sectional view of the

laminate panel taken along its transverse axis passing through a crotch region;

Fig. 5 is a view similar to Fig. 3 but showing the laminate panel with its pleats having been unfolded; and

Fig. 6 is a scale-enlarged sectional view of the laminate panel taken along a line transversely passing through a front or rear waist region.

Details of an absorbent garment having elongatable top- and backsheets according to the invention will be more fully understood from the description of disposable shorts type diaper as a specific embodiment of the invention given hereunder in reference with the accompanying drawings.

Referring to Figs. 1 through 4, a garment comprises a flat laminate panel 6 having a longitudinal axis 1, a transverse axis 2 extending orthogonally to the longitudinal axis 1, a front waist region 3, a rear waist region 4 and a crotch region 5 extending between these two waist regions 3, 4. The laminate panel 6 comprises a non-stretchable topsheet 7, a backsheet 8 which is stretchable in length and width, i.e., in a direction of the longitudinal axis 1 as well as in a direction of the transverse axis 2, and a batt structure 9 disposed between the topsheet 7 and the backsheet. The

laminate panel 6 additionally has a pair of flexible end flaps 10 extending in parallel to the transverse axis 2 and a pair of flexible side flaps 11 extending in parallel to the longitudinal axis 1. The end flaps 10 are formed by portions of the topsheet 7 and the backsheet 8 extending outward beyond longitudinally opposite edges 12 of the batt structure 9, respectively, and the side flaps 11 are formed by portions of the topsheet 7 and the backsheet 8 extending outward beyond transversely opposite side edges 13 of the batt structure 9, respectively. The topsheet 7 and the backsheet 8 are formed along opposite sides as viewed in a direction of the transverse axis 2 with inwardly curved edges 14, respectively, to define a pair of leg-openings 20 as will be described later.

The topsheet 7 comprises a liquid-impermeable sheet 7a which is identical to the backsheet 8 in shape as well as in size and a liquid-permeable sheet 7b which is smaller than the liquid-impermeable sheet 7a and is longitudinally larger. The liquid-impermeable sheet 7a is centrally formed with an opening 15 having a longitudinally larger dimension. The opening 15 is covered with the liquid-permeable sheet 7b which is, in turn, bonded to a peripheral edge of the opening 15 by means of heat-sealing or adhesive agent. The liquid-

impermeable sheet 7a is made of a hydrophilic material and the liquid-permeable sheet 7b is made of a hydrophobic material. The liquid-impermeable sheet 7a may be a nonwoven fabric of hydrophobic fibers or of hydrophilic fibers treated by the well known repellent in the art. The liquid-permeable sheet 7b may be a nonwoven fabric of hydrophilic fibers or of hydrophobic fibers treated by well known surface active agent or wetting agent or mixed with such well known agent. Polyester or polypropylene is typical as the hydrophobic fibers and polyester made hydrophilic by the agent or rayon is typical as the hydrophilic fibers.

The backsheet 8 comprises a breathable film 8a of rubber or synthetic resin lying on an underside of the batt structure 9 and fibrous nonwoven fabric 8b bonded to an outer surface of the breathable film 8a by means of heat-sealing or adhesive agent. Both the breathable film 8a and the nonwoven fabric 8b are stretchable in length as well as in width. In order to maintain a determined stretchability of the backsheet 8, it is preferable to bond the nonwoven fabric 8b to the breathable film 8 intermittently in the directions of the longitudinal axis 1 and/or the transverse axis 2. The fibrous nonwoven fabric 8b is preferably made of hydrophobic fibers such as polyester or polypropylene.

The stretchable fibrous nonwoven fabric 8b is obtained, for example, by a process for making stretchable nonwoven fabric disclosed in Japanese Laid-Open Patent Application Nos. Hei4-281057 and Hei4-100958, more specifically, the process comprising the steps of treating a web of low melting point/high melting point composite fibers which is potential for crimping with water jet streams for fibers entangling and heat-treating the web so as to crimp the composite fibers or by a recess for making stretchable nonwoven fabric disclosed in Japanese Laid-Open Patent Application No. Hei4-65562, more specifically, the process comprising the steps of heat-sealing the web at spots arranged intermittently at predetermined intervals longitudinally as well as transversely of the web and heat treating the web so as to develop a crimping effect. The Patent Applications are incorporated here for reference with respect to the nonwoven fabric of stretchable fibers 8b.

The topsheet 7 and the backsheet 8 may be provided in the form of a melt blown, spun laced, needle punched, thermally bonded, spun bonded or chemical bonded nonwoven fabric.

So far as the topsheet 7 and the backsheet 8 are made of the foregoing materials, the end flaps 10 and the side

flaps 11 made of the same materials have a flexibility higher than that of the bat structure 9.

The batt structure 9 is made of materials usually employed for a batt structure in a disposable diaper and bonded between the topsheet 7 and the backsheet 8 by means of adhesive agent intermittently in the direction of the longitudinal axis 1 and/or in the direction of the transverse axis 2 in the well known manner. Though not illustrated, the batt structure 9 substantially comprises a mixture of fluff pulp obtained by a comminuted wood pulp sheet known in the art and superabsorbent hydrocolloid materials laminated in a panel, then entirely covered with a liquid-absorbent sheet such as tissue paper and compression-molded in an appropriate thickness. With such configuration, the batt structure 9 is semi-rigid and well retains its initial shape so far as the diaper is worn in a normal manner. The superabsorbent hydrocolloid materials includes graft polymer of starch, modified cellulose, water-soluble crosslinked polymer, self-crosslinked acrylic acid/alkali metal salt polymer and the other materials which have conventionally been well known in the art as the absorbent materials for sanitary napkins and disposable diapers.

Opposite ends of the topsheet 7 in the direction of the

longitudinal axis 1 are longitudinally folded each by a length of $L \times 2$ in a Z-shape in the regions of the end flaps 10 so as to form pleats 16 extending substantially in parallel to the transverse axis 2. The length to be folded is selected so that, as will be apparent from Fig. 5, the pleats 16 may be completely unfolded and the length of the topsheet 7 may substantially be conformed to the length of the backsheet 8 as the backsheet 8 is stretched to the maximum in the direction of the longitudinal axis 1. Therefore, the topsheet 7 can be stretched as the backsheet 8 is stretched in spite of the fact that the topsheet 7 is made of a non-stretchable material. Opposite side edges of the pleats 16 in the direction of the transverse axis 2 are bonded to the topsheet 7 itself by means of heat-sealing or adhesive agent. Accordingly, the pleats 16 are maintained in their folded condition before the article is actually put on the wearer. Obviously, the bonded portions of the pleats 16 can not be unfolded even after the article has been put on the wearer. However, the bonded portions lie only at opposite side edges of the pleats 16 and the topsheet 7 has a high flexibility. Accordingly, there is no apprehension that the bonded portions might prevent the pleats 16 from being smoothly unfolded.

Referring to Fig. 6, The pair of side flaps 11 in the front and rear waist regions 3, 4 are formed with pleats 17 extending substantially in parallel to the longitudinal axis 1. Arrangement and function of these pleats 17 are similar to those of the pleats 16 and therefore the description of their arrangement as well as function is eliminated.

Though not shown, it will be apparent to those skilled in the art from the foregoing description that both or any one of the pleats 16, 17 may be provided depending on the type of the article and the direction in which the backsheet 8 is stretchable. If both of the pleats 16, 17 are provided, they will orthogonally intersect and become somewhat bulky in their intersecting points. However, such bulkiness disappears as the article is put on the wearer's body and the pleats are unfolded. Furthermore, owing to the high flexibility of the topsheet 7 forming these pleats 16, 17, there is no apprehension that such orthogonal intersecting points might prevent the pleats 16, 17 from being smoothly unfolded.

Referring again to Figs. 1 and 2, the laminate panel 6 is folded along a line extending across the middle of the crotch region in the direction of the transverse axis 2 with the topsheet inside and opposite side edges of the front and

rear waist regions as viewed in the direction of the transverse axis 2 are bonded together intermittently in the direction of the longitudinal axis 1 by means of heat-sealing. Reference numeral 18 designates intermittently bonded spots. In this manner, the diaper of pull-on or shorts type having a waist-opening 19 and a pair of leg-openings 20 is formed. These openings 19, 20 are provided with elastic members 21, 22 adapted to be elastically contractile circumferentially of these openings 19, 20. The elastic members 21, 22 are disposed between the topsheet 7 and the backsheet 8 and bonded thereto under appropriate tensions by means of adhesive agent. Particularly the elastic member 22 associated with the respective leg-openings 20 comprises a first member 22a and a second member 22b each curved substantially in a U-shape having a pair of legs and an intermediate bridge. Specifically, the intermediate bridges of the first and second members 22a, 22b extend across substantially a middle zone of the crotch region 5 and the pair of legs of the first member 22a extends along approximately front half of the pair of leg-openings 20 while the pair of legs of the second member 22b extend along approximately rear half of the pair of leg-openings 20. Such arrangement and bonding means of the elastic member 22 are

disclosed in Japanese Laid-Open Patent Application No. Hei6-11275 incorporated herein for reference.

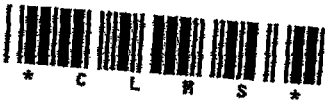
With the article according to the invention, the topsheet can be stretched as the stretchable backsheet is stretched in spite of the fact that the topsheet is made of a non-stretchable material since the topsheet is provided with the pleats and therefore a predetermined fitting of the article to the wearer is well assured.

Use of any stretchable material is not required to form the topsheet and this contributes to reduction of manufacturing cost which would be necessary if any stretchable material is used. In addition, non-stretchability of the topsheet is advantageous in that, even when the topsheet is formed with an opening adapted to facilitate excretion to be transferred to the batt structure, lowering of the article's productivity due to a stretchability of the topsheet can be reliably avoided.

The topsheet is hydrophilic in its central zone defined by the opening and corresponding to a substantially middle zone of the crotch region and hydrophobic in the remaining zone. As a result, excretion, particularly urine is rapidly transferred through the central zone to the batt structure and absorptively held therein, on one hand, and no spread of

urine outward beyond this central zone occurs. Urine once transferred to the lower surface of the topsheet does not exude to the upper surface of the topsheet at least in the zone other than the central zone. Consequently, an uncomfortable feeling given to the wearer due to the article wetted with urine is effectively alleviated and thereby the wearer never suffers from skin eruption and/or stuffiness.

The backsheet comprising a stretchable film and nonwoven fabric has a sufficiently high tensile strength to absorb a vigorous movement of the wearer without any damage of the article and to maintain a desired covering function for the batt structure. Additionally, the nonwoven fabric defining the outermost surface of the article presents a cloth-like appearance and good touch.



WHAT IS CLAIMED IS:

1. An absorbent garment having elongatable top- and backsheets comprising:

a laminate panel having longitudinal and transverse axes intersecting orthogonally to each other, front and rear waist regions and a crotch region;

the laminate panel including a non-stretchable topsheet being liquid-permeable in the crotch region, a stretchable liquid-impermeable backsheet and a liquid-absorbent batt structure disposed therebetween; and

a length of the topsheet as measured in a direction of at least one of the longitudinal and transverse axes is dimensioned to be larger than a length of the backsheet as measured in the direction of said one axis and the topsheet is formed between opposite edges as viewed in the direction of said one axis with at least one of pleats over a length substantially corresponding to the differential length of the topsheet and the backsheet so that said at least one of pleats extend substantially in parallel to the other axis orthogonal to said one axis.

2. The absorbent garment according to Claim 1, wherein



said at least one of pleats is formed in at least an end flap defined by a portion of the topsheet and the backsheet extending outward from an edge of the batt structure as viewed in the direction of the longitudinal axis so that said at least one of pleats extending along the transverse axis.

3. The absorbent garment according to Claim 1, wherein said at least one of pleats is formed in at least a side flap defined by a portion of the topsheet and the backsheet extending outward from an edge of the batt structure as viewed in the direction of the transverse axis so that said at least one of pleats extend along the longitudinal axis.

4. The absorbent garment according to Claim 1, wherein the topsheet is made of a hydrophobic sheet and formed at least in a middle of the crotch region with an opening covered with a hydrophilic sheet which is, in turn, bonded to the topsheet so that a zone defined by the opening may be liquid-permeable.

5. The absorbent garment according to Claim 4, wherein the hydrophilic sheet is bonded to an inner surface of the topsheet.



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6. The absorbent garment according to Claim 1, wherein the backsheet comprises a breathable but liquid-impermeable and stretchable film of rubber or synthetic resin and a stretchable nonwoven fabric bonded to an outer surface of the film.

7. The absorbent garment according to Claim 1, wherein opposite edges of the front and rear waist regions as viewed in the direction of the transverse axis are bonded together to form a pull-on diaper having a waist-opening and a pair of leg-openings.