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DISPOSABLE ABSORBENT UNDERGARMENT

This invention relates to disposable absorbent undergarments and more particularly to disposable absorbent undergarments such as disposable diapers effectively preventing spread and leakage of fluidal excretion for infants, the aged or the sick.

Disposable diapers have already been well known in which the topsheet and/or the liquid-absorbent core are formed with an opening and/or recess or an annular projection to form a pocket adapted to hold solid excretion such as excrement (e.g., Japanese Laid-Open Utility Model Application Nos. Hei3-29123, Hei4-15921, Hei5-86320, Hei6-5614, Hei6-7725, Hei6-11722, Hei6-21624, Hei6-21626, Hei6-31722, Hei6-31723).

Of these well known arrangements, the arrangement in which the pocket for solid excretion is defined by the opening or the recess formed in the liquid-absorbent core is disadvantageous in that the opening or the recess sometimes can not receive the solid excretion due to insufficient permeability of the topsheet for such solid excretion. The arrangement in which the opening or the recess is formed by the liquid-absorbent core and the topsheet is also

disadvantageous in that so-called loose passage or diarrheal excrement once received by the opening or the recess may back flow and spread to the upper surface of the topsheet. Finally, the arrangement in which the pocket is formed by the annular projection may deteriorate a desired feeling to wear.

In view of the problem of the conventional diaper as has been described above, it is a principal object of the invention to improve the disposable absorbent undergarment so that the fluidal excrement can smoothly settle down from the skin-contacting surface and reliably held without any apprehension of spreading along the skin-contacting surface, smearing and wetting the wearer's skin.

The object set forth above is achieved, according to the invention, by a disposable absorbent undergarment comprising a laminated panel having front and rear waist regions, a crotch region longitudinally extending therebetween, and skin-contactable and skin-noncontactable surfaces, the laminated panel comprising a liquid-permeable topsheet extending along the skin-contacting surface, a liquid-impermeable backsheet extending along the skin-noncontactable surface and a liquid-absorbent core disposed therebetween, and the crotch region being provided with

holding means for excrement, the disposable undergarment being characterized in that the holding means comprises a layer of continuous filaments extending above and longitudinally of the liquid-absorbent core and exhibiting a compressive elastic recovery and a void content among the individual filaments under its wetted condition higher than compressive elastic recoveries of the topsheet and the liquid-absorbent core and a void content among materials thereof under their wetted conditions wherein the individual filaments are not fixed one to another at least along their longitudinal length of 10 mm so as to be freely movable transversely of the layer of continuous filaments at least along the length of 10 mm.

The invention covers further variations as will be described below.

The layer of continuous filaments has its lower surface covered with a sheet having a basis weight and a density lower than those of the topsheet and a liquid-permeability higher than that of the topsheet so as to maintain its layered state in which the layer of continuous filaments is fixed to an upper surface of the topsheet.

The layer of continuous filaments is rolled inward together with the sheet covering the lower surface of the

layer along its transversely opposite sides to form barriers against fluidal excrement.

The layer of continuous filaments is disposed between the topsheet and the liquid-absorbent core and a region of the topsheet overlying a central region of the layer is formed with an opening defined by a length of at least 50 mm and a width of at least 30 mm through which the layer is partially exposed.

The layer of continuous filaments is received in a recess having a length of at least 50 mm and a width of at least 30 mm formed in an upper surface of the liquid-absorbent core and a region of the topsheet covering the layer is formed with an opening defined by a length of at least 50 mm and a width of at least 30 mm.

The layer of continuous filaments is received in a recess having a length of at least 50 mm and a width of at least 30 mm formed in an upper surface of the liquid-absorbent core and at least a region of the topsheet covering the layer is formed with a plurality of perforations each defined by a diameter of 2 ~ 15 mm.

The topsheet is formed with a plurality of perforations each defined by a diameter of 2 ~ 15 mm.

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

Fig. 2 is a scale-enlarged perspective view cut along a line A - A in Fig. 1;

Fig. 3 is a perspective view showing an alternative embodiment of a layer of continuous filaments;

Fig. 4 is a scale-large sectional view taken along a line B - B in Fig. 3; and

Fig. 5 is a perspective view showing the alternative embodiment of the layer of continuous filaments together with an alternative embodiment of a topsheet.

Details of a disposable absorbent undergarment according to the invention will be more fully understood from the description given hereunder in reference with the accompanying drawings which illustrate the disposable diaper for infants as a specific example of the inventive undergarment.

Referring to Figs. 1 and 2, a diaper comprises a laminated panel 1 having a longitudinally narrow and flat configuration. The laminated panel 1 longitudinally

comprises, in turn, front and rear waist regions 2, 3 and a crotch region 4 extending between these two waist regions 2, 3, on one hand, and comprises, as seen in a direction of thickness, a skin-contactable surface 5 and a skin-noncontactable surface 6, on the other hand. Thus, the laminated panel 1 is defined by the two surfaces 5, 6, transversely opposite side edges 7, 7 and longitudinally opposite ends 8, 8. The laminated panel 1 further comprises a transversely opposite pair of elastically contractible side flaps 9, 9, a longitudinally opposite pair of elastically contractible end flaps 10, 10, a pair of elastically contractible barrier flaps 11, 11 provided on the respective side flaps 9, 9, and a layer 12 of a number of filaments longitudinally extending on the crotch region 4.

The laminated panel 1 comprises a liquid-permeable topsheet 13 defining the skin-contactable surface 5, a liquid-impermeable backsheet 14 defining the skin-noncontactable surface 6 and a liquid-absorbent core 15 disposed between these two sheets 13, 14.

The layer 12 of continuous filaments is provided as means adapted to receive fluidal excretion, particularly fluidal excrement such as so-called loose passage discharged

by infants or diarrheal excrement discharged by the aged restrained on his or her bed or the sick without spreading at the level of the skin-contactable surface 5 and thereby to hold the fluidal excrement without leaking out beyond the transversely opposite side edges 7, 7 and/or the longitudinally opposite ends 8, 8.

The layer 12 of continuous filaments is placed upon a fibrous nonwoven fabric 16 which is lower in its basis weight as well as density than the topsheet 13 but higher in its liquid-permeability than the topsheet 13 and transversely opposite sides thereof are rolled inward so as to form barriers 17, 17. The nonwoven fabric 16 is intermittently bonded to the topsheet 13 by any suitable adhesive means. The individual filaments 12a lying between the opposite barriers 17, 17 are heat-embossed at predetermined intervals longitudinally thereof to prevent the individual filaments 12a from unintentionally floating and transferred onto the wearer's skin. The individual filaments 12a are heat-sealed together at respective emboss spots 18. Each pair of adjacent emboss spots 18 may be longitudinally spaced from each other by a length L of at least 10 mm to assure that fluidal excrement can settle down on the layer 12 of continuous filaments and reliably held thereon. If the

length L exceeds 10 mm, fluidal excrement would settle down with its dead load among the individual filaments 12a of the layer 12 of continuous filaments which are then forced to be displaced transversely of the layer 12 and facilitate fluidal excrement to settle down. The length L is preferably 25 ~ 50 mm and a length L in excess of 50 mm would result in excessive displacement of the filaments 12a. Consequently, a holding ability of the layer 12 for fluidal excrement would be correspondingly decreased. The layer 12 of continuous filaments is obtained by opening a tow which each comprises a number of continuous filaments and by forming them into a web. The layer 12 will effectively achieve its intended purpose when the layer 12 comprises the crimped filaments having a void content of wt 60 ~ 85 % among them and the layer 12 as a whole has a compressive elastic recovery of at least wt 30 %, preferably wt 50 % or higher. Such compressive elastic recovery and void content are substantially higher than the compressive elastic recoveries of the topsheet 13 and the liquid-absorbent core 15 as well as the void contents among these materials under their wetted conditions. Particularly to obtain a desired compressive elastic recovery, the individual filament 12a is a hydrophobic filament of 1 ~ 15 deniers such as polyester

filament. However, the layer 12 of continuous filaments may contain hydrophilic filaments less than wt 30 % such as rayon. While not shown, the barriers 17 may extend to the longitudinally opposite ends of the layer 12 of continuous filaments.

Referring to Figs. 3 and 4, the layer 12 of continuous filaments is disposed between the topsheet 13 and the liquid-absorbent core 15 and the topsheet 13 placed upon the layer 12 of continuous filaments is centrally formed with an opening 19 defined by a length of 50 mm and a width of 30 mm so that the layer 12 of continuous filaments may swell and exposed through the opening 19.

Referring now to Fig. 5, the layer 12 of continuous filaments is received by a recess 20 formed by compression molding and this recess 20 has a length of at least 50 mm and a width of at least 30 mm. Correspondingly, a region of the topsheet 13 covering the layer 12 of continuous filaments is formed with an opening 19 defined by a length of at least 50 mm and a width of at least 30 mm. It should be understood that the topsheet 13 having such opening 19 may be replaced by the topsheet 13 a plurality of perforations 21 as will be described later.

The layer 12 of continuous filaments and the opening 19

are obviously intended to extend around the wearer's anus during use of the diaper so that fluidal excrement may be directly discharged onto the layer 12 of continuous filaments.

The topsheet 13 is preferably made of a fibrous nonwoven fabric and has a plurality of perforations 21. In view of infant's delicate skin, a nonwoven fabric other than that obtained by chemical bonding, for example, a nonwoven fabric obtained by melt blowing, spun lacing, needle punching, thermally bonding or spun bonding, particularly a nonwoven fabric obtained from extremely fine fibers by melt blowing is preferred. While material fibers for such a nonwoven fabric may be hydrophobic and/or hydrophilic, the nonwoven fabric preferably contains hydrophobic fibers of at least 70 % by weight to avoid an uncomfortable feeling of wetness for the wearer. Each of the perforations 21 preferably has a diameter of 2 ~ 15 mm and these perforations 21 are preferably distributed with a perforation rate of wt 40 ~ 80 %. These perforations 21 are not limited to those which extend in a common plane but may be those which are provided with guiding passages each having a length of 0.3 ~ 3 mm extending downward from the lower sides of the respective perforations 21. Preferably, the topsheet 13

having the relatively large opening 19 is also provided with the small perforations 21, because such measure can compensate for a trouble occurring when fluidal excrement is discharged not onto the layer 12 encircled by the larger opening 19 but onto the region having the smaller perforations 21.

Referring again to Figs. 1 and 2, the respective side flaps 9, 9 function to prevent leakage of excretion from occurring around the wearer's legs. These side flaps 9, 9 comprise backsheet portions 14a, 14a extending outward beyond transversely opposite side edges of the liquid-absorbent core 15 and outer side portions 11a, 11a of the respective barrier flaps 11, 11 overlying the backsheet portions 14a, 14a which are bonded together, respectively, by any suitable adhesive means. A plurality of thread-like elastically contractible members extending in parallel one to another longitudinally of the laminated panel 1 are disposed between and bonded to said portions 14a, 14a and the portions 11a, 11a.

The respective barrier flaps 11, 11 function to confine fluidal excrement within a space defined between these barrier flaps 11, 11. Each of these barrier flaps 11, 11 has the outer side portion 11a and an inner side portion 11b extending from the outer side portion 11a toward the liquid-

absorbent core 15 and folded inward. The inner side portion 11b contains therein a plurality of thread-like elastically contractible members 23 extending in parallel one to another along the fold and bonded to the inner side portion 11b. The barrier flap 11 is then folded outward along a transversely middle line of the inner side portion 11b with the elastic members 23 being stretched and, in this state, longitudinally opposite ends 11c of the laminated panel 1 are bonded to the outer side portion 11a by suitable adhesive means. The inner side portion 11b is bonded at a location 24 to an extension 13a of the topsheet 13 by suitable adhesive means. With such an arrangement, the inner side portion 11b is biased under a contractile force of the elastic members 23 to be erected. It should be understood that the inner side portion 11b may have its inner surface fixed to the skin-contactable surface 5 of the laminated panel 1 the inner surface is opposed to, instead of being folded outward as has been described above.

The respective end flaps 10, 10 function to hold the diaper around the wearer's waist and to prevent leakage of excretion from occurring around the wearer's waist. These end flaps 10, 10 comprise backsheet portions 14b, 14b extending outward beyond longitudinally opposite ends of the liquid-absorbent core 15 and extensions 13b, 13b of the

topsheet 13 overlying the backsheet portions 14b, 14b which are bonded together by any suitable adhesive means with elastic members 25 disposed between these backsheet portions 14b, 14b and extensions 13b, 13b. Each of the elastic members 25 comprises a relatively wide strip of spongy tape and fixed between the portions 13b, 14b so as to be longitudinally contractible. The elastic member 25 is preferably made of an open-cell type polyurethane foam, since an air-permeability as well as a softness of this material are ideal to obtain an appropriate fitness of the diaper's waist line to the infant of several month old. The elastic members 25 having such characteristics may be employed in the place of the elastic members 22, 23 for the side flaps and the barrier flaps, respectively.

A material for the topsheet 13 is not limited to the foregoing nonwoven fabric and the perforated plastic film well known as typical surface material for an article such as the diaper or the like may be also employed. The backsheet 14 may be made of a moisture-permeable plastic film or laminated sheet of the plastic film and the fibrous nonwoven fabric. It will be obviously understood that the side and end flaps 9, 10 have high flexibilities because they are made of the plastic film and/or nonwoven fabric. The liquid-

absorbent core 15 is substantially made from a mixture of fluff pulp fibers obtained by pulverizing a wood pulp sheet and a hydrocolloid material. A panel of appropriate thickness is obtained by compression-molding this mixture and covered with a liquid-diffusible tissue paper. With such a configuration, the core 15 is semi-rigid and well retains its shape so far as the diaper is worn in a normal manner. The hydrocolloid material 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 as the super absorbent material for sanitary napkins and disposable diapers.

The diaper comprising the laminated panel 1 having the construction as has been described above may be put on the wearer's body by releasably adhering respective free ends of strips of well known pressure-sensitive adhesive tapes 26, 26 provided on transversely opposite sides of the rear waist region 3 to the outer surface of the backsheet 14 in the front waist region 2. Such diaper is commonly referred to as an open type diaper. The diaper according to the invention is applicable not only to this open type diaper but also to so-called shorts type (pull on type) diaper having its front

and rear waist regions previously connected along its transversely opposite side edges.

While no detailed description has been make about the manner as well as the method of bonding, these manner and method are well known to those skilled in the art. For example, the adhesive means includes hot melt adhesive, heat- or ultrasonic sealing.

The undergarment according to the invention comprises the layer of continuous filaments so improved that the void content among the individual filaments is considerably higher than the void content among the material of the topsheet as well as the liquid-absorbent core and the individual filaments are ready for their lateral movement. This feature allows fluidal excrement to settle down among the individual filaments of the layer and to be held therein. Consequently, there is no apprehension that the fluidal excrement might spread along the skin-contactable surface and leak beyond the transversely opposite side edges and/or longitudinally opposite ends of the undergarment. In addition, the layer of continuous filaments has a sufficiently high compressive elastic recovery under its wetted condition to maintain the void content even when the layer is wetted with body fluids. Thus the undergarment according to the invention provides the

wearer with comfortable touch in addition to a good softness and an air-permeability.

When the layer of continuous filaments has its lower side covered with a liquid-permeable sheet, the barriers against the fluidal excrement may be formed by said layer itself along the transversely opposite sides or the longitudinally opposite ends of the layer and thereby flowing and spreading of the fluidal excrement can be further reliably prevented.

When the layer of continuous filaments is disposed between the topsheet and the liquid-absorbent core and exposed through the opening formed in the topsheet, the layer of continuous filaments can be easily fixed to the laminated panel with a good appearance and only a desired portion of the filaments is exposed to the skin-contactable surface of the undergarment. Such an arrangement is effective to avoid any apprehension that the individual filaments might transfer from the layer to the wearer's skin as they contact with the latter.

When the layer of continuous filaments is received in the recess formed in the upper surface of the liquid-absorbent core, the fluidal excrement once held among the layer of continuous filaments can be effectively prevented

from spreading beyond the recess.

When the perforated topsheet is employed, it is not essential to provide the topsheet with the opening substantially larger than the individual perforations, since these smaller perforations will permeate the fluidal excrement.



WHAT IS CLAIMED IS:

1. A disposable absorbent undergarment generally comprising a laminated panel having front and rear waist regions, a crotch region longitudinally extending therebetween, and skin-contactable and skin-noncontactable surfaces, the laminated panel comprising a liquid-permeable topsheet extending along the skin-contactable surface, a liquid-impermeable backsheet extending along said skin-noncontactable surface and a liquid-absorbent core disposed therebetween, and the crotch region being provided with holding means for excrement, the disposable absorbent undergarment being characterized in that:

the holding means comprises a layer of continuous filaments extending above and longitudinally of the liquid-absorbent core and exhibiting a compressive elastic recovery and a void content among the individual filaments under its wetted condition higher than compressive elastic recoveries of the topsheet and liquid-absorbent core and a void content among materials thereof under their wetted conditions wherein the individual filaments are not fixed one to another at least along their longitudinal length of 10 mm so as to be freely movable transversely of the layer of continuous



filaments at least along the length of 10 mm.

2. The undergarment according to Claim 1, wherein the layer of continuous filaments has its lower surface covered with a sheet having a basis weight and a density lower than those of said topsheet and a liquid-permeability higher than that of the topsheet so as to maintain its layered state in which the layer of continuous filaments is fixed to an upper surface of the topsheet.

3. The undergarment according to Claim 2, wherein the layer of continuous filaments is rolled inward together with the sheet covering the lower surface of said layer along its transversely opposite sides to form barriers against fluidal excrement.

4. The undergarment according to Claim 1, wherein the layer of continuous filaments is disposed between the topsheet and the liquid-absorbent core and wherein a region of the topsheet overlying a central region of the layer is formed with an opening defined by a length of at least 50 mm and a width of at least 30 mm through which the layer is partially exposed.



5. The undergarment according to Claim 1, wherein the layer of continuous filaments is received in a recess having a length of at least 50 mm and a width of at least 30 mm formed in an upper surface of the liquid-absorbent core and wherein a region of the topsheet covering said layer is formed with an opening defined by a length of at least 50 mm and a width of at least 30 mm.

6. The undergarment according to Claim 1, wherein the layer of continuous filaments is received in a recess having a length of at least 50 mm and a width of at least 30 mm formed in an upper surface of the liquid-absorbent core and wherein at least a region of the topsheet covering said layer is formed with a plurality of perforations each defined by a diameter of 2 ~ 15 mm.

7. The undergarment according to any one of Claims 1 through 3, wherein the topsheet is formed with a plurality of perforations each defined by a diameter of 2 ~ 15 mm.