

SPECIFICATION

Non-woven fabric and feminine sanitary towel incorporating it

5 The present invention relates to a feminine sanitary towel incorporating a non-woven fabric.

Conventional sanitary towels comprise an absorbent material in the form of a pad of fluffed pulp, absorbent tissue, absorbent cotton or the like, a liquid-impervious layer covering the bottom, sides and edge portion of top surface of the absorbent, a thin layer of fibers on the top surface of the absorbent, and a non-woven cotton or rayon fabric wrapper covering the assembly. As the non-woven fabric wrapper, there have been used non-woven fabrics made by the wet process and the dry process. The non-woven fabrics made by the wet process have the disadvantages that such fabrics are relatively dense and they are somewhat water-repellent because of the binder that is used therein or because of the hydrophobic fibers that are incorporated therein, so that their blood absorbency is relatively poor, even when they are subjected to a creping treatment. The non-woven fabrics made by the dry process also have the disadvantages that their surfaces are flat and they are water-repellent because a hydrophobic binder is used therein, so that their blood absorbency is relatively poor. Therefore, in actual use of conventional sanitary towels, if the menstrual discharge flow is too fast, the discharge floods and runs off the the surface of the towel to cause unwanted leakage from the sides thereof, rather than being entirely absorbed in the sanitary towel.

According to the invention we provide a sanitary towel for menstrual discharges, comprising an absorbent core, a liquid-impervious layer covering the bottom, sides and edge portions of the top surface of the core and a non-woven fabric covering the remainder of the top surface of the core, wherein the non-woven fabric consists essentially of a laminate comprising an inner layer disposed adjacent to said core and an outer layer disposed on the side of said inner layer remote from said core, each of said inner and outer layers consisting essentially of a blend of hydrophilic fibers and heat-fusible hydrophobic fibers with said inner layer containing a higher proportion of hydrophilic fibres than said outer layer, one of said inner and outer layers consisting essentially of randomly oriented fibers in a fluffy bulky state, and the other of said inner and outer layers consisting essentially of substantially uniformly oriented fibers, the hydrophobic fibers of said first and second layers being heat-fused to each other at their points of contact.

Embodiments of the invention are described below by way of Example, and with reference to the accompanying drawings, in which:-

60 *Figure 1* is a perspective view of a sanitary towel according to the present invention;

Figure 2 is a cross-section of the towel taken along the line X-X' in *Figure 1*; and

65 *Figures 3 and 4* are cross sections of non-woven fabrics of double layer structure according to the

present invention.

The towel shown comprises a pad of absorbent material 3, a liquid-impervious layer 2 covering the entire bottom and sides and the edge portions of the top surface of the absorbent material 3 and a non-woven fabric 1 covering the entire assembly, where the non-woven covering fabric 1 has a double layer structure comprising a first web layer in which most of the fibers are oriented uniformly and a second web layer in which the fibers are randomly arranged.

In the sanitary towel shown, the outer surface of the non-woven fabric 1 (i.e. the surface to be in contact with the skin; the same shall apply hereinbefore) can comprise the web layer 4 of random fibers as shown in *Figure 3* or the outer surface can comprise the web layer 5 of uniformly oriented fibers as shown in *Figure 4*.

The sanitary towel in which the outer surface of the non-woven fabric 1 comprises the web layer 4 of randomly oriented fibers will first be described. The fibers constituting the outer web layer 4 of random fibers of the non-woven fabric comprise hydrophilic fibers having a high absorbing rate for menstrual discharges and having incorporated therein heat-fusible hydrophobic fibers capable of preventing excessive wetting thereof, so as to maintain a fluffed bulky condition of the web layer 4 and to cause the fibers to adhere together. For satisfying these requirements, the weight ratio of the hydrophilic fibers to the hydrophobic fibers in the web layer 4 is preferably in the range of from 90/10 to 40/60, more preferably in the range of from 80/20 to 50/50. In the fiber structure of the inner web layer 5 of uniformly oriented fibers, the proportion of the hydrophilic fibers relative to the hydrophobic fibers is higher than it is in layer 4 in order to increase the absorbing rate of the layer 5 for menstrual discharges. The weight ratio of the hydrophilic fibers to the hydrophobic fibers in the layer 5 is in the range of from 95/5 to 50/50, preferably in the range of from 90/10 to 60/40. The weight ratio of the random web layer 4 to the oriented web layer 5 is in the range of from 80/20 to 20/80, preferably in the range of from 80/20 to 50/50.

As the hydrophilic fibers, there can be used, for example, cellulosic fibers or water-absorbing synthetic resin fibers. As the hydrophilic fibers, there can be used, for example, polypropylene fibers and polyethylene-polypropylene conjugately spun fibers. Further, polyacrylic fibers, polyester fibers and polyamide fibers can also be used.

By employing such a non-woven fabric of double layer structure comprising an outer random web layer 4 and an inner oriented web layer 5, excellent sanitary towels having the advantages described below can be obtained. Since the outer random web layer 4 is bulky, it has a low density and a high voids content, thereby exhibiting a high blood-absorbing rate. Consequently, the blood does not run off along the surface of the towel, but rather is absorbed readily by the absorbent in the sanitary towel. Thus, the amount of blood that remains on the surface of the non-woven fabric is very small so that the users are not subjected to discomfort. The inner, uniformly

oriented web layer 5 acts as a support for the outer random web layer 4. The inner uniformly oriented web layer 5 has a high longitudinal tensile strength which facilitates the preparation of the non-woven fabric and the sanitary towel and also prevents the non-woven fabric from breaking due to friction or the like during use, even though the outer random web layer 4 having a bulkiness does not have sufficient strength because adhesion between the fibers thereof is weak. Another advantage of the non-woven fabric is that the feel thereof on the skin is excellent and it is easily shaped to conform to body contours owing to the soft random web layer 4 on the outer surface.

The sanitary towel in which the outer surface of the non-woven fabric comprises the uniformly oriented web layer (Figure 4) will now be described.

In the outer, uniformly oriented web layer 5 in the fiber structure of the non-woven fabric, a mixture of the hydrophilic fibers and the hydrophobic fibers is used in order to reduce the wetting property while maintaining a high absorbing rate. The weight ratio of the hydrophilic fibers to the hydrophobic fibers in the uniformly oriented outer web layer 5 ranges from 90/10 to 40/60, preferably from 80/20 to 50/50. In the inner random web layer 4, the proportion of the hydrophilic fibers is higher in order to maintain a high absorption capacity. Heat-fusible hydrophobic fibers can be incorporated therein, however, in order to impart a durable bulkiness thereto and to adhere the inner layer 4 to the outer, uniformly oriented web layer 5 and also to adhere the fibers in the layer 4 together. The weight ratio of the hydrophilic fibers to the hydrophobic fibers in the layer 4 preferably ranges from 100/0 to 50/50, more preferably from 90/10 to 60/40. The weight of the fibers is 10-40g/m², preferably 12-30g/m². The weight ratio of the outer layer to the inner layer ranges from 20/80 to 80/20.

Although a staple fiber layer is inserted between the non-woven fabric cover and the absorbent in conventional sanitary towels, such a staple fiber layer is unnecessary when there is used the double layer non-woven fabric of the present invention comprising the outer, uniformly oriented web layer 5 and the inner random web layer 4. The inner random web layer 4 provides the same results as the staple fiber layer. By combining the inner random web layer 4 with the outer uniformly oriented web layer 5 in a unitary body, the strength of the fabric assembly is increased and the thickness and weight of the oriented web layer 5 can be reduced and, in addition, the fiber density is decreased to improve remarkably the absorption of the menstrual discharges on the surface. It has been found that the menstrual discharges rapidly penetrate into the absorbent placed therewith through the inner random web layer 4, and only a very small quantity of the menstrual discharges remain on the surface, whereby the users are free of any uncomfortable, sticky feeling.

The non-woven fabric is characterized by a high flexibility, a soft pleasant touch to the skin and a very good ability to fit the user's body. As compared with conventional sanitary towels, the towels of the present invention can be prepared advantageously

by simpler steps, because the staple fiber layer is omitted.

As the absorbent materials suitable for use to form the absorbent layer 3 in the sanitary towels of the present invention, there can be used, for example, fluffed pulp pads, creped tissue and absorbent cotton. Further, hydrophilic synthetic polymer absorbents having a high absorbing capacity can be used together therewith. As the layer 2, there can be used, for example, water-proof liquid-impervious tissue which have been subjected to a water-repellant treatment, plastics sheets, laminates of plastics films and papers and polyvinyl alcohol sheets.

The heat-fusible hydrophobic fibers are heat-fused to each other at the points where they are in contact in order to unite the layers to each other to form a unitary two-layer non-woven fabric. The heat-fused hydrophilic fibers also maintain the structural integrity of the layers and, particularly, maintain the fluffed condition of the random fiber web layer.

CLAIMS

1. A sanitary towel for menstrual discharges, comprising an absorbent core, a liquid-impervious layer covering the bottom, sides and edge portions of the top surface of the core and a non-woven fabric covering the remainder of the top surface of the core, wherein the non-woven fabric consists essentially of a laminate comprising an inner layer disposed adjacent to said core and an outer layer disposed on the side of said inner layer remote from said core, each of said inner and outer layers consisting essentially of a blend of hydrophilic fibers and heat-fusible hydrophobic fibers with said inner layer containing a higher proportion of hydrophilic fibers than said outer layer, one of said inner and outer layers consisting essentially of randomly oriented fibers in a fluffy bulk state, and the other of said inner and outer layers consisting essentially of substantially uniformly oriented fibers, the hydrophobic fibers of said first and second layers being heat-fused to each other at their points of contact.

2. A sanitary towel according to claim 1, wherein the outer surface of the non-woven fabric comprises the random fiber layer.

3. A sanitary towel according to claim 1, wherein the outer surface of the non-woven fabric comprises the uniformly oriented fiber layer.

4. A sanitary towel as claimed in claim 2, in which in the outer layer comprises a mixture of hydrophilic fibers and heat fusible hydrophobic fibers, the fibers are arranged at random, and the weight ratio of hydrophilic fibers to hydrophobic fibers is from 90/10 to 40/60, the inner layer comprises a mixture of hydrophilic fibers and hydrophobic fibers wherein most of the fibers are substantially parallel to each other and the weight ratio of hydrophilic fibers to hydrophobic fibers is from 95/5 to 50/50 and is higher than the corresponding ratio in the outer layer, and the weight ratio of the outer layer to the inner layer is from 80/20 to 20/80.

5. A sanitary towel as claimed in claim 4, in which the weight ratio of hydrophilic fibers to hydrophobic fibers in the outer layer is from 80/20 to

oriented web layer 5 acts as a support for the outer random web layer 4. The inner uniformly oriented web layer 5 has a high longitudinal tensile strength which facilitates the preparation of the non-woven fabric and the sanitary towel and also prevents the non-woven fabric from breaking due to friction or the like during use, even though the outer random web layer 4 having a bulkiness does not have sufficient strength because adhesion between the fibers thereof is weak. Another advantage of the non-woven fabric is that the feel thereof on the skin is excellent and it is easily shaped to conform to body contours owing to the soft random web layer 4 on the outer surface.

The sanitary towel in which the outer surface of the non-woven fabric comprises the uniformly oriented web layer (Figure 4) will now be described. In the outer, uniformly oriented web layer 5 in the fiber structure of the non-woven fabric, a mixture of the hydrophilic fibers and the hydrophobic fibers is used in order to reduce the wetting property while maintaining a high absorbing rate. The weight ratio of the hydrophilic fibers to the hydrophobic fibers in the uniformly oriented outer web layer 5 ranges from 90/10 to 40/60, preferably from 80/20 to 50/50. In the inner random web layer 4, the proportion of the hydrophilic fibers is higher in order to maintain a high absorption capacity. Heat-fusible hydrophobic fibers can be incorporated therein, however, in order to impart a durable bulkiness thereto and to adhere the inner layer 4 to the outer, uniformly oriented web layer 5 and also to adhere the fibers in the layer 4 together. The weight ratio of the hydrophilic fibers to the hydrophobic fibers in the layer 4 preferably ranges from 100/0 to 50/50, more preferably from 90/10 to 60/40. The weight of the fibers is 10-40g/m², preferably 12-30g/m². The weight ratio of the outer layer to the inner layer ranges from 20/80 to 80/20.

Although a staple fiber layer is inserted between the non-woven fabric cover and the absorbent in conventional sanitary towels, such a staple fiber layer is unnecessary when there is used the double layer non-woven fabric of the present invention comprising the outer, uniformly oriented web layer 5 and the inner random web layer 4. The inner random web layer 4 provides the same results as the staple fiber layer. By combining the inner random web layer 4 with the outer uniformly oriented web layer 5 in a unitary body, the strength of the fabric assembly is increased and the thickness and weight of the oriented web layer 5 can be reduced and, in addition, the fiber density is decreased to improve remarkably the absorption of the menstrual discharges on the surface. It has been found that the menstrual discharges rapidly penetrate into the absorbent placed therewith through the inner random web layer 4, and only a very small quantity of the menstrual discharges remain on the surface, whereby the users are free of any uncomfortable, sticky feeling.

The non-woven fabric is characterized by a high flexibility, a soft pleasant touch to the skin and a very good ability to fit the user's body. As compared with conventional sanitary towels, the towels of the present invention can be prepared advantageously

by simpler steps, because the staple fiber layer is omitted.

As the absorbent materials suitable for use to form the absorbent layer 3 in the sanitary towels of the present invention, there can be used, for example, fluffed pulp pads, creped tissue and absorbent cotton. Further, hydrophilic synthetic polymer absorbents having a high absorbing capacity can be used together therewith. As the layer 2, there can be used, for example, water-proof liquid-impervious tissue which have been subjected to a water-repellant treatment, plastics sheets, laminates of plastics films and papers and polyvinyl alcohol sheets.

The heat-fusible hydrophobic fibers are heat-fused to each other at the points where they are in contact in order to unite the layers to each other to form a unitary two-layer non-woven fabric. The heat-fused hydrophilic fibers also maintain the structural integrity of the layers and, particularly, maintain the fluffed condition of the random fiber web layer.

CLAIMS

1. A sanitary towel for menstrual discharges, comprising an absorbent core, a liquid-impervious layer covering the bottom, sides and edge portions of the top surface of the core and a non-woven fabric covering the remainder of the top surface of the core, wherein the non-woven fabric consists essentially of a laminate comprising an inner layer disposed adjacent to said core and an outer layer disposed on the side of said inner layer remote from said core, each of said inner and outer layers consisting essentially of a blend of hydrophilic fibers and heat-fusible hydrophobic fibers with said inner layer containing a higher proportion of hydrophilic fibers than said outer layer, one of said inner and outer layers consisting essentially of randomly oriented fibers in a fluffy bulk state, and the other of said inner and outer layers consisting essentially of substantially uniformly oriented fibers, the hydrophobic fibers of said first and second layers being heat-fused to each other at their points of contact.

2. A sanitary towel according to claim 1, wherein the outer surface of the non-woven fabric comprises the random fiber layer.

3. A sanitary towel according to claim 1, wherein the outer surface of the non-woven fabric comprises the uniformly oriented fiber layer.

4. A sanitary towel as claimed in claim 2, in which in the outer layer comprises a mixture of hydrophilic fibers and heat fusible hydrophobic fibers, the fibers are arranged at random, and the weight ratio of hydrophilic fibers to hydrophobic fibers is from 90/10 to 40/60, the inner layer comprises a mixture of hydrophilic fibers and hydrophobic fibers wherein most of the fibers are substantially parallel to each other and the weight ratio of hydrophilic fibers to hydrophobic fibers is from 95/5 to 50/50 and is higher than the corresponding ratio in the outer layer, and the weight ratio of the outer layer to the inner layer is from 80/20 to 20/80.

5. A sanitary towel as claimed in claim 4, in which the weight ratio of hydrophilic fibers to hydrophobic fibers in the outer layer is from 80/20 to



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50/50, the weight ratio of hydrophilic fibers to hydrophobic fibers in the inner layer is from 90/10 to 60/40, and the weight ratio of the outer layer to the inner layer is 80/20 to 50/50.

- 5 6. A sanitary towel as claimed in claim 3 in which in the outer layer comprises a mixture of hydrophilic fibers and heat-fusible hydrophobic fibers, most of the fibers are substantially parallel with each other and wherein the weight ratio of hydrophilic fibers to
- 10 hydrophobic fibers is 90/10 to 40/60, the inner layer comprises hydrophilic fibers or a mixture of hydrophobic fibers and hydrophilic fibers arranged at random, the weight ratio of hydrophilic to hydrophobic fibers is from 100/0 to 50/50 and is higher than
- 15 the corresponding ratio in the outer layer and the weight ratio of the layer to the inner layer is from 80/20 to 20/80.

7. A sanitary towel as claimed in claim 6, in which the weight ratio of hydrophilic fibers to
- 20 hydrophobic fibers in the outer layer is from 80/20 to 50/50, and the weight ratio of hydrophilic fibers to hydrophobic fibers in the inner layer is from 90/10 to 60/40.

8. A sanitary towel according to claim 1 and
- 25 substantially as herein described, with reference to Figures 1 and 2 of the accompanying drawings.