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ABSORBENT ARTICLE WITH INTERNAL WICKING MEANS

Background of the Invention

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The use of superabsorbents in absorbent articles permits a substantial reduction in the bulk of the absorbent article. However, attempts to utilize superabsorbent materials in absorbent structures such as diapers and sanitary napkins have met with limited success. It is often difficult to "fix in place" or secure superabsorbents within the absorbent article. U.S. Patent 3,971,379 discloses absorbent articles wherein a layer of super-absorbent is folded or rolled with another absorbent component of the absorbent article. Secondly, superabsorbent materials absorb and retain hundreds of times their weight of fluids, but they do not easily wick fluids. In an absorbent article, rapid swelling of the superabsorbent together with its lack of wicking ability can create a fluid "block", preventing the utilization of the remainder of the superabsorbent, or other absorbent materials in the absorbent article.

New methods of utilizing superabsorbents into absorbent articles focus on methods of incorporating the superabsorbent into a fibrous structure so as to avoid the blocking problem. U.S. Patent 4,105,033 discloses a method of incorporating a superabsorbent into a fibrous structure, and U.S. Patent 4,226,237 discloses a more elaborate fibrous structure of absorbent fibers and peat moss, into which superabsorbent may be distributed.

The present invention involves a new approach to the use of superabsorbents in an absorbent article. Rather than attempt to create new fibrous structures wherein the superabsorbent is so dispersed as to prevent blocking, the

present invention may use known fibrous materials containing superabsorbents which materials when used alone may block. In the absorbent article of the present invention, the superabsorbent may be dispersed within a fibrous structure or cellular foam or may be present in a film, alone or together with other ingredients. According to the present invention, an internal wicking means is provided within the absorbent article to bring the fluid to the superabsorbent. The wicking means is wrapped or folded about discrete layers containing the superabsorbent.

Methods of folding absorbent fibrous materials to form absorbent articles are shown in U.S. Patent 2,952,259. However, there is no teaching of superabsorbents or internal wicking means.

Summary of the Invention

The present invention comprises an absorbent article having discrete superabsorbent layers. The absorbent article has a wicking means which is wound about and between the superabsorbent layers. The wicking means may comprise a wicking layer, and a fluid transfer means between the wicking layer and the superabsorbent layers. The superabsorbent layers may comprise superabsorbent ingredients dispersed within a fibrous layer or upon a fibrous layer, or superabsorbent dispersed within a cellular foam material, or films made partially or entirely of superabsorbent materials. Acrylic fiber fabric*, peat moss, or wood pulp tissue material may be used as the wicking layer. The fluid transfer layer may comprise pulp tissue material. A partial outer wrap of fluid impermeable material may be disposed about all but one major surface of the absorbent article. In a disposable diaper the plastic film partial outer wrap may be sealed

*E.g. Orlon fabric ("Orlon" is a registered Trade Mark).

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to the outer surface of the disposable diaper, reinforcing the diaper and enhancing the repositionability of adhesive tape tabs thereto.

5 Brief Description of the Drawings

Figure 1 shows a schematic cross-section of one embodiment of the absorbent article of the present invention.

10 Figure 2 shows a cross-section of a one embodiment of the absorbent article shown schematically in Figure 1.

Figure 2A shows a cross-section of another embodiment of the absorbent article shown schematically in Figure 1.

15 Figure 3 shows a cross-section of another preferred embodiment of the absorbent article of the present invention.

20 Figure 4 shows a cross-section of a disposable diaper incorporating the absorbent article of the present invention.

25 Figure 5 shows a preferred embodiment of a disposable diaper incorporating the absorbent article of the present invention.

Figure 6 shows a perspective view of the diaper of Figure 5.

30 Detailed Description of the Invention

The present invention comprises an absorbent article which utilizes superabsorbent materials in a novel way.
35 According to the present invention, an internal wicking means is utilized to move fluid within an absorbent article that contains superabsorbent materials.

As shown schematically in Figure 1, one embodiment of the absorbent article of this invention shown generally at 10

comprises at least two discrete layers 12 having a superabsorbent material incorporated therein. The

5 absorbent article further comprises a wicking means 14 which extends in an S-shape wound about and between the superabsorbent layers. The present invention does not

rely on the form or construction of the superabsorbent layer, and many varieties of materials incorporating

10 superabsorbent agents may be utilized. For instance, the superabsorbent layer may comprise superabsorbent material incorporated within a fibrous layer, or a cellular foam

layer. The method of incorporating the superabsorbent into the fibrous layer or cellular foam is not critical as

15 it is not required that fluid pass through the superabsorbent layer, but only that the surfaces of the superabsorbent layers absorb. Indeed, according to the

present invention, the superabsorbent layers may comprise films made wholly or in part of superabsorbent materials.

20 In the absorbent article of the present invention, the superabsorbent layers need not wick or transport fluid as the internal wick of the absorbent article brings the

fluid to the superabsorbent material. Hence, when the superabsorbent material within the layers swell, it cannot

25 block the movement of the fluid through the absorbent article. If the superabsorbent at any particular part of the absorbent article swells or reaches saturation, the

internal wicking means merely moves the fluid to be absorbed on to the next available superabsorbent

30 material.

The following test data demonstrate the superiority of Applicant's absorbent article having internal wicking

means. The absorbent capacity of three diaper structures incorporating the absorbent article of the present

35 invention as described in Figure 1 was tested. In the

test procedure used, which is intended to simulate diaper use, the diapers are fastened around a lifesize doll and test solution is poured through the doll into the diaper in 150 milliliter aliquats, with a twenty minute wait
5 between aliquats. The test is stopped at the first indication of a leak. The diapers are weighed before and after the test so that the amount of liquid absorbed by the diaper can be determined. Each of the diapers had a co-extruded Visqueen polypropylene film backing (17 1/2" X
10 12") and a similarly sized facing material of 100 percent embossed polypropylene 0.7 oz/yd.² fabric. The superabsorbent layers comprise 8 gr/ft² Henkel fabric S6P manufactured by the Henkel Corporation. The Henkel fabric comprises S6P-147, a ceric ion catalyzed starch acrylonitrile graft
15 polymer in powder form, sandwiched between two layers of tissue. In diaper No. 1, the absorbent body of the diaper, contained between the facing and backing sheet, comprised two layers of the Henkel superabsorbent fibrous layer S6P and had no internal wick. The absorbent capacity
20 was 72.8 grams. In diaper No. 2, the absorbent article incorporated between the backing and the facing comprised two layers of the same Henkel fabric with an S-shaped wicking layer of tissue. The absorbent capacity of diaper No. 2 was 165.9 grams. In diaper No. 3, the absorbent
25 article contained between the backing sheet and the facing comprised two layers of the same Henkel superabsorbent fibrous layer, and an S-shaped internal wicking layer of acrylic fiber fabric. The absorbent capacity of diaper No. 3 was 179.1 grams.

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Figure 2 discloses one embodiment of the absorbent article of the present invention shown schematically in Figure 1. In this embodiment, the absorbent article shown at 20 comprises superabsorbent layers 22 and an internal wicking means 24 which comprises a wicking layer 26 and a fluid
35 transfer means 28. The wicking layer 26 may comprise any

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material which has good wicking properties. It is not required that this material have good absorbent capacity or be able to retain fluids under stress. Suitable materials for use as the wicking layer are acrylic fiber fabric, pulp tissue material or peat moss. Fluid transfer means may be present between the wicking layer and at least the major surfaces of the superabsorbent layers. In the examples listed above, the tissue layers of the Henkel fabric serve as the fluid transfer means. The fluid transfer means effects the transfer of the fluid from the wicking layer to the superabsorbent layer. The use of the intermediate fluid transfer means aids in keeping the internal wicking means or pathway open at all times and allows the wicking layer to wick while the fluid transfer means holds the fluid for absorption in the superabsorbent layers. Thus it will be understood that the fluid transfer means is an element distinct from the wicking layer.

The absorbent article has major surfaces 32 and 32b, side edges 34, and end edges, not shown. The absorbent article may have a partial outer wrap 30 of a fluid impervious material, which covers at least one major surface 32 and the side edges 34 of the absorbent article, and may also cover the end edges. This partial outer wrap comprises a preferred construction of the absorbent article, as the fluid impermeable layer retains the fluid in the absorbent article, allowing time for the fluid to be absorbed by the superabsorbent layers. In addition, in an absorbent article utilizing this wrapped construction, the fluid impervious layer hides the off color appearance or texture of other absorbent materials e.g., reground pulp used in the absorbent article and encapsulates and hides the gel-like nature of the superabsorbent when wetted. This preferred absorbent article may also be provided with a facing layer 36 on the other major surface 32b not covered by the partial outer wrap.

Figure 2A discloses another embodiment of the absorbent article of the present invention shown schematically in Figure 1. The absorbent article shown generally at 20a comprises superabsorbent layers 22a and internal wicking means 24a. The wicking means comprises a wicking layer 26a and fluid transfer means 28 and 28a. As shown in this embodiment, the fluid transfer means may comprise a layer coextensive with the wicking layer. In this construction, the wicking layer may be incorporated between two layers of fluid transfer means, and this multilayer composite structure wound in an S-shape about and around the superabsorbent layers. This construction of the wicking means and of the absorbent article of the present invention differs from that shown in Figure 2 wherein the fluid transfer means is disposed between the wicking layer and the major surfaces of each superabsorbent layer. This embodiment may also incorporate a fluid impermeable layer 30 and a facing layer 36 comparable to those described at 30 and 36 of Figure 2. When used as a sanitary napkin the absorbent article may further comprise adhesive strips 38 for attachment to an undergarment.

Figure 3 shows another embodiment of the absorbent article of the present invention, shown generally at 40. The absorbent article shown here in cross-section comprises superabsorbent layers 42 and an internal wicking means 44 which comprises a wicking layer 46 wound about and between the superabsorbent layers in an "e" shape. The wicking means comprises a wicking layer 46 and a fluid transfer means 48. In the particular embodiment shown, each of the superabsorbent layers has been wrapped in a fluid transfer means such as tissue prior to the winding of the wicking layer about and between the superabsorbent layers. When the wrapping of the fluid transfer means and the winding of the wick is completed, the wicking layer extends across the major surfaces of the superabsorbent layers and fluid

transfer means are disposed between the wicking layer and each major face of the superabsorbent layers. The juxtapositioning of the wicking layer and fluid transfer means to this superabsorbent layer provides an internal wicking means for the superabsorbent layers. Optionally, this embodiment of the absorbent article of the present invention may also incorporate a facing layer 36 and a partial outer wrap 30 as described in relation to Figures 2 and 2A.

The superabsorbent materials utilized in the present invention comprise various hydrocolloid and hydrogel materials which have the ability to absorb 10 to 30 times their own dry weight and preferably many hundreds of times their own dry weight of fluids. Many superabsorbent materials are known in the art and the present invention does not depend on the chemical or physical structure of the superabsorbent, or the structure of a composite wherein the superabsorbent is incorporated with other materials, e.g., fibers in a fibrous layer. As superabsorbents tend to swell quickly and block the passage of additional fluid, in most product applications superabsorbent materials are incorporated with other materials such as fibers or foams to disperse the superabsorbent materials and prevent blocking. As the absorbent article of the present invention comprises discrete superabsorbent layers, it avoids the "working" by folding and bending of the fibrous layer or cellular foam layer which may cause the superabsorbent to become disattached from the fibrous layer or cellular foam, and agglomerate. In addition, the construction of the absorbent article of the present invention provides an easier method of manufacture than folding of the superabsorbent layers and requires a lesser length of wicking material in the wicking layer than would be utilized in a folded shape such as that shown in U.S. Patent 3,791,379.

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Figure 4 discloses a disposable diaper utilizing the absorbent article of the present invention. The absorbent article of the present invention may be utilized in many structures such as sanitary napkins and dressings, as well as in various diaper structures. Figure 4 discloses a diaper structure shown generally at 50, said structure comprising an outer layer 52, an absorbent article of the present invention 10, attached thereto, and tape tabs 56. The diaper may further comprise a facing layer 58 comprising the inside surface of the diaper.

As shown in Figure 5, when the absorbent article of the present invention comprises a partial outer wrap 30 of fluid impermeable material as shown with relation to absorbent articles 20 (or 40, not shown) in Figures 2, 2A (or 3) above, it is not necessary that the outer layer 62 of the diaper, shown generally at 60, be fluid impermeable. In a preferred construction, both the outer layer 62 and the outer wrap 30 of the absorbent article comprise plastic films, whereas the facing 68 is liquid permeable. The securing of the absorbent article within the diaper secures the two plastic films, reinforcing the outer layer of the diaper. As the tape tabs 66 can be more easily peeled from the two layer plastic laminate, the diaper may be opened without tearing the plastic film outer layer which can render the adhesive tape tab unusable as well as allowing the inner absorbent material of the diaper to leak out. In addition, the cleanly peeled adhesive tape tab is available to make a new diaper fastening. Also with this absorbent article construction of the present invention having an outer wrap 30, neither pulp or superabsorbent gel may leak from the diaper.

Figure 6 shows the diaper of Figure 5 view from the outer surface of the diaper illustrating that the region wherein the outer layer 62 is juxtaposed to the partial outer wrap

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30, reinforcing the outer layer and enhancing the repositionability of the tape tabs, 66. In the preferred embodiment shown, the diaper includes elastic gathering means in the leg regions.



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Claims:

1. An absorbent article comprising at least two discrete superabsorbent layers and a wicking means extending about
5 and between the superabsorbent layers.
2. An absorbent article as in Claim 1 wherein said wicking means comprises a wicking layer and a fluid transfer means between the wicking layer and each
10 superabsorbent layer.
3. An absorbent article as in Claim 1 or 2 wherein said superabsorbent layers comprise fibrous layers having superabsorbent incorporated therein.
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4. An absorbent article as in Claim 1 or 2 wherein said superabsorbent layers comprise cellular foam material having superabsorbent incorporated therein.
- 20 5. An absorbent article as in Claim 1 or 2 wherein said superabsorbent layers comprise a film comprising superabsorbent material.
- 25 6. An absorbent article as in claim 2, or claim 3, 4 or 5 when read with claim 2, wherein said wicking layer comprises an acrylic fiber fabric, peat moss, or tissue material.
- 30 7. An absorbent article as in claim 2 or 6, or claim 3, 4 or 5 when read with claim 2, wherein said fluid transfer means, being an element distinct from the wicking layer, comprises tissue material.



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- 5 8. An absorbent article as in Claim 1 or 2 further comprising a partial outer wrap of fluid impermeable material.
- 10 9. A disposable diaper comprising a backing sheet, at least two adhesive tape tabs affixed to said backing sheet, and the absorbent article of Claim 1, 2, or 8 affixed to said backing sheet.
- 15 10. An absorbent article as in claim 1, substantially as described with reference to Fig. 1, 2, 2A or 3 of the accompanying drawings.
11. A diaper as in claim 9, substantially as described with reference to Fig. 4 or Figs. 5 and 6 of the accompanying drawings.
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