April 2, 1968 J. C. BLETZINGER ET AL 3,375,827

SANITARY NAPKIN WITH FLOW CONTROL ELEMENT

Filed March 30, 1965

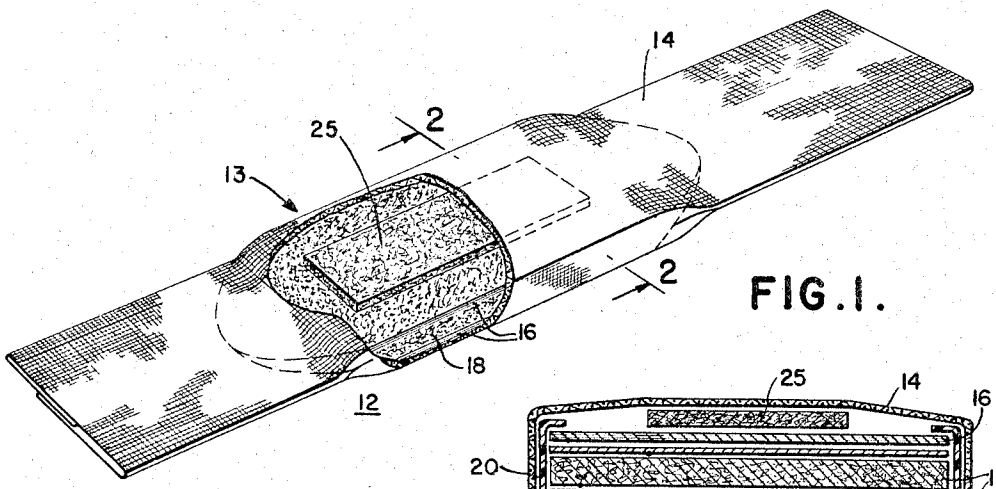

FIG. 1.

FIG. 2.

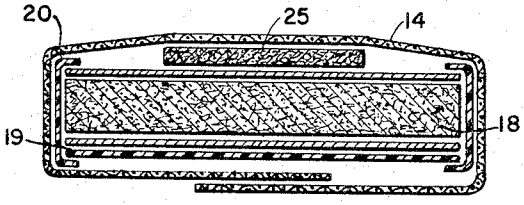

FIG. 3.

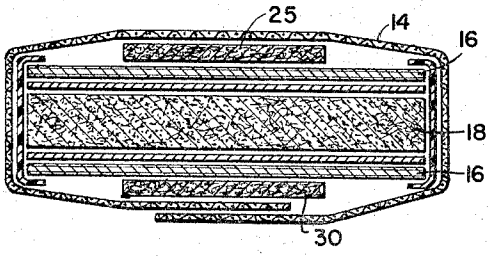

FIG. 4.

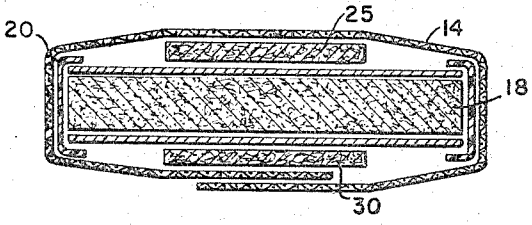

FIG. 5.

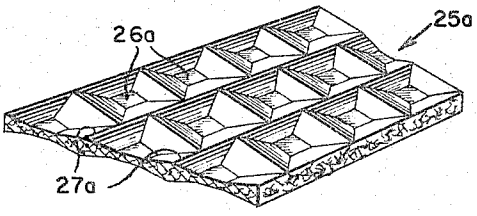

FIG. 6.

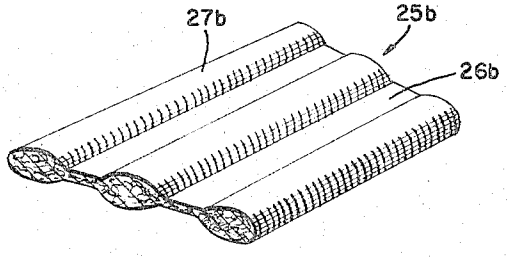

FIG. 7.

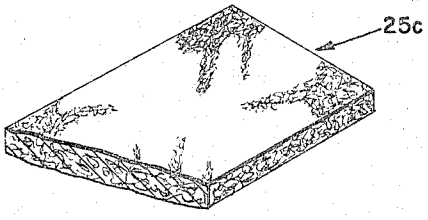

FIG. 8.

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SANITARY NAPKIN WITH FLOW CONTROL ELEMENT

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ABSTRACT OF THE DISCLOSURE

A sanitary napkin provided with an absorbent control element of higher average density than the main absorbent pad in the napkin. The denser control element is centrally positioned on the main pad with the peripheral edges of the element spaced inwardly from the peripheral edges of the pad. In this position the control element becomes the first part of the napkin structure to receive body exudate and spread a substantial portion of the exudate within its own boundaries before any of the exudate is transferred to and absorbed by the main pad.

This invention relates to sanitary napkins, and more particularly to improvements in sanitary napkin construction which provide more efficient performance, especially with respect to the distribution of absorbent fluids and shape retention during use.

A primary object of the invention is to provide an improved sanitary napkin having incorporated therein a fluid control element and absorbing means which effectively collects body exudates and confines the collected exudate within a predetermined medial area of the pad.

Another object is to provide a sanitary napkin with a structure which assists in maintaining the shape of the napkin during use.

Still another object is to provide a sanitary napkin of improved performance and comfort.

Other objects and advantages will become apparent to persons skilled in the art upon examination of the description and drawing, without departing from the scope of the invention as defined in the appended claims.

In the drawings, in which like parts are identified by the same reference numeral.

FIG. 1 is a perspective view of an sanitary napkin incorporating one embodiment of the invention, with a top central portion partially cut away to show some details of construction.

FIG. 2 is a section taken along line 2—2 of FIG. 1.

FIG. 3 is similar to FIG. 2 showing an alternate structure.

FIGS. 4 and 5 are similar to FIGS. 2 and 3 but with an additional control element shown along the bottom portion.

FIGS. 6, 7, and 8 are perspective views, partially in section, of various control element structures.

In sanitary napkin construction, it is desirable to have an absorbent structure, which (1) immediately accepts body exudate, (2) rapidly transports the exudate away from the discharge source, and (3) effectively contains the exudate within the confines of the napkin, all while the top surface of the napkin is maintained relatively dry. In addition, the absorbed exudate should not be allowed to spread to the sides of the napkin, run over the top edges of the napkin, or soak through the bottom of the napkin, especially if the absorptive capacity of the napkin has not been reached.

In order to avoid the above problems, and to realize to a greater degree the absorptive and protective potential of sanitary napkins, various means of controlling the spreading of fluid in the pad have been proposed. Among these is the utilization of density or compression differences within, or between, the material used for various absorptive elements.

This invention defines an improved means for better utilizing the differences in density and pore size of absorptive elements to achieve more effective control of fluid distribution in sanitary pads.

As is well-known in the sanitary napkin art, fluid which is introduced into an absorptive element migrates more rapidly through densified areas of such elements than it does through areas of less density. That general principle was first taught by Heitmeyer Patent No. 1,863,333, assigned to applicant's assignee. Since then many variations of this basic principle have been proposed and patented.

Among the latter is Harwood Patent No. 3,046,986, also assigned to applicant's assignee. The Harwood patent employes a fluid control element positioned contiguous to the fluid pervious wrapper. The fluid control element in the patent is provided with a centrally-located embossed portion comprising spaced-apart cup-like depressions whereby the element is substantially densified in the areas marginally of said depressions and throughout the cup-like portions while being of normal uncompressed density in the intervening areas. The described construction is effective in directing recepted fluid in a downward direction to an interiorly placed major absorbent element, and in reducing to some extent transverse flow at the pad surface. However, because the Harwood control element is coextensive with the rest of the pad, transverse and longitudinal migration through the element may occur during heavy flow or when the top element is temporarily saturated causing some side stains and occasional surface overflow.

The present invention largely solves these problems. As shown in the drawings, sanitary napkin **12** comprises a main absorbent core of fluid absorbent material, generally designated **13**, a fluid control element **25**, and a fluid-pervious wrapper **14** enclosing the absorbent elements and overlapped in a known manner, and providing end tabs for fastening purposes. The fluid-pervious wrapper **14** may consist of a woven gauze, a non-woven scrim, a perforated non-woven fibrous web, a light weight web of bonded fibers, or similar materials well-known in the art.

The main body portion **13** of sanitary napkin **12** may also be of varying construction, including top and bottom layers comprising multiple plies of cellulose wadding **16** and a central pad of wood fluff **18**, as shown in FIGS. 2 and 4; or the main body portion **13** may be all fluff as shown at **18** in FIGS. 3 and 5. Other known absorbent materials such as batts of cotton and/or various types of synthetic fibers may also be used for the main body portion. The main body portion, in itself being of conventional construction, acts only as a cooperating part of the present invention, the important requisite being that the main body portion **13** be lower in density and consequently have larger interstices than the control element **25** hereinafter described.

Other parts of the pad construction are also known, such as fluid-impervious baffles **19** of plastic film or the like which are often employed to inhibit strike-through, and side strips **20**, such as waxed tissue or water-resistant film may be employed to inhibit inadvertent side-staining caused by migration of exudate to side edges of the pad.

The present invention lies primarily in the construction and location of fluid-control element **25** which cooperates with a main absorbent pad **13** to provide improved performance. The fluid control element may be used simply on the top surface as shown at **25** in FIGS. 1 through 3, or in combination with a similar supplementary element **30** at the bottom of the pad as shown in FIGS. 4 and 5.

In general, elements **25** and **30**, comprise a compressed strip of absorbent material of smaller dimension in length and width, than the length and width of main absorbent pad **13**. As shown, element **25** is positioned centrally on the top, or body contacting side, of main pad **13**, contiguous to the fluid-pervious wrapper **14**. Element **25** is of substantially smaller peripheral dimension than main pad **13**, accordingly the end and side edges of element **25** are spaced inwardly a substantial distance from the respective end and side edges of main pad **13**. Such spacing of element **25** is extremely important for reasons of both fluid control and wearing comfort, and is essential to proper functioning of the sanitary napkin of this invention. In the preferred construction, the space from the side edges of the main pad to the side edges of the control element is about ⅝". However, this spacing may be varied to be from about ¼" to 1" in width. The important considerations in placing the control element **25** with respect to the main pad **13** are: (1) that there be sufficient space from control element edge to main pad edge to prevent transverse migration from the control element to the pad edge, (2) that the control element have sufficient width to be able to transfer fluid along its length, and (3) that the control element be shorter in length than the main pad.

Element **25** may be compressed overall in a flat non-patterned configuration as is the element shown at **25***c* in FIG. 8, or may have an embossed pattern defining various degrees of compression such as in element **25***a* in FIG. 6, or in element **25***b* in FIG. 7. In FIG. 6 areas **26***a* are more highly compressed than areas **27***a*. In FIG. 7 areas **26***b* are more highly compressed than areas **27***b*. It is apparent that many other variations in pattern may be used. The important consideration in constructing the element is that it have a significantly higher average density and smaller pores than the elements **16** and/or **18** which make up main absorbent pad **13**.

In sanitary napkins now on the market, cellulose wadding components such as at **16** and fluff components such as at **18**, have an average apparent density of about 1.9 pounds per cubic foot, or an apparent density range within the component varying from about 1.5 pounds per cubic foot to about 2.5 pounds per cubic foot.

When material of the above density is used to make up the main pad **13**, control element **25** should have an apparent density of over 5 pounds per cubic foot or an apparent density within the element ranging from as low as about 5 pounds per cubic foot at the points of lowest compression to as high as about 100 pounds per cubic foot at the points of highest compression. An average apparent density in the range of about 7.5 pounds per cubic foot to about 50 pounds per cubic foot is preferred. It is understood that when a patterned compression, such as shown in FIGS. 6 and 7, is employed for element **25** that the density and pore size will vary from point to point within the element itself according to the pattern used. However, for the most effective functioning, the lowest density in the major part of element **25** should be substantially higher than the highest density existing in the major part of main absorbent pad **13**.

It is believed that during use, the following reaction occurs in a sanitary napkin of the above construction. When fluid strikes compressed element **25**, the contacted area immediately expands and the pores in the wetted area become larger. The fluid then is drawn to the immediately adjacent smaller pores, which also expand. The absorption and spread of fluid then moves through the element in a continuous flow pattern from the source point of the fluid as long as fluid is being supplied. Very little fluid appears to transfer to the main absorbent pad **13** in the early stages of use because of the strong capillary action of the small pores which exist within denser element **25** as compared with the larger pores which exist within the main absorbent pad **13** construction. However, depending upon the length of time the pad is worn, more and more of the fluid in element **25** is transferred by gravity or free flow to main absorbent pad **13**, and rate of transfer between element **25** and main absorbent pad **13** increases as local areas in element **25** are temporarily saturated. Thus, as fluid is introduced to element **25**, it tends to spread rapidly in both the lengthwise and transverse directions even if the fluid is introduced at a remote end thereof, before any substantial amount reaches, or is transferred to the main absorbent pad **13**. The transfer of fluid to the main absorbent pad which starts at a slow rate and gradually increases is largely confined to an area in the main absorbent pad defined by the marginal edges of element **25**. This is believed to be true because the forces which govern the transverse and lengthwise migration of fluid are stronger, due to higher capillarity within the smaller pores of the compressed element, than such forces are in the main absorbent pad, and the transfer to the main absorbent pad is largely the result of gravity or free flow. As a result, the fluid which first srtikes the surface of the napkin is effectively confined within the dimensions of the compressed element and fluid will not overflow the sides or edges of the main absorbent pad unless all of its central absorbent capacity is utilized.

The higher density of the control element **25** also aids in maintaining the dimensioned stability of the pad whereby the pad has increased ability to hold its shape during use. In locating the element centrally of the top surface of the main absorbent pad, it is possible to provide a relatively planar surface in the principal area of contact between the pad and the perineal area of the wearer. The relatively less dense main body portion of the pad extending beyond the edges of the compressed element is soft and fluffy and conforms readily to the thighs and body movement to insure against chafing and avoid discomfort.

The dimensional stability is further improved when a second control element **30** is located at the bottom of the main absorbent pad. The second or bottom control element **30** is preferably of the same dimensions and density as the first, or top, control element **25** and is positioned centrally of the main absorbent pad's bottom surface similarly to, and congruent with, the position of top element **25** with respect to the top pad surface.

Structure of this latter type is exemplified in FIGS. 4 and 5. In FIG. 4 the main absorbent pad comprises multiple layers of absorbent cellulose wadding **16** on each side of a central fluff section **18**. In FIG. 5, the main absorbent pad is comprised only of a fluff section **18**.

As shown in the drawings, the compressed elements, top **25** and bottom **30**, provide dimension stabilizing components and are made relatively narrow to more readily accommodate the narrow dimension of the perineal crotch without undue side compression. The soft central element, or main absorbent pad, is wider than the compressed element permitting it to contract and expand as required by body movements and pressures while the top and bottom compressed elements remain essentially planar.

The structure shown in FIGS. 4 and 5 is also suitable for two-sided or reversible sanitary napkins, i.e., napkins which may be worn with either side facing upwardly. When a reversible napkin in desired, the conventional polyethylene baffle, shown at **19** in FIGS. 2 and 3 is either eliminated entirely, or is located within the main absorbent pad intermediate the top and bottom surfaces of the napkin. In the event a napkin of such construction is worn "upside down," element **30** acts to control spread of the exudate in the same manner as described previously for element **25**.

In producing the compressed elements **25** and **30**, a large variety of embossing patterns may be used. The elements may be totally compresed without a pattern (FIG. 8), or they may be compressed in a range of patterns to provide gradient densities which result in varying degrees of resilience and softness to the touch (FIGS.

6 and 7). Dimensions of the compressed element and main pad may also be varied to provide a range of sizes to accommodate the normal range of perineal dimensions.

In one specific example, the compressed elements were 5" long and 1¼" wide and the soft middle section comprising the main absorbent pad were 8⅞" long and 2 11/16" wide. The middle section had an average apparent density of about 1.9 pounds per cubic foot and the compressed elements had an average apparent density of about 24 pounds per cubic foot. While the drawing shows the control elements as being rectangular, the ends may be rounded or the element may have an oval configuration. In each of these alternate forms, however, the peripheral edges of the control element must still be spaced from the respective peripheral edges of the main absorbent pad.

Also in constructing the control elements a variety of absorbent materials may be employed. Materials which have proved satisfactory include wood fluff, a combination of wood fluff and uniformly interspersed pieces of shredded sponge such as polyurethane and cellulose sponge, multilayers of cellulose wadding, absorbent cotton, and various combination of such materials.

In connection with the control element **25***a*, illustrated in FIG. 6, it will be observed that the more highly compressed areas **26***a* in adjacent rows are staggered with respect to each other. We have found, with this staggered relationship, that fluid migrates easily from one compressed area **26***a* to adjacent compressed areas **26***a* in adjacent rows, diagonally across the control element. This migration occurs particularly within the lower surfaces of the control element, leaving the relatively uncompressed areas on the top surface of the element, as appearing in FIG. 6, dry for a time while the fluid continues to migrate and flow within the element **25***a*. In case the fluid flow to the control element **25***a* is quite limited, the fluid flow remains on the lower surface of the control element and penetrates from there onto the main body of the pad while leaving the top surface of the control element **25***a* in contact with the human body in dry condition. The compression of the areas **26***a* apparently reduces the capillary voids in cross section within the control element **25***a* causing migration of fluid to occur particularly internally of and on the underside of the control element **25***a*, between the compressed areas **26***a*, leaving the outer, less compressed, surfaces drier.

It is apparent that various changes in the described structure may be made without departing from the principles of the invention.

What is claimed is:

1. A sanitary napkin comprising a main fluid absorbent pad, a separate fluid control element, and a fluid previous wrapper enclosing said pad and said element, said control element comprising absorbent material of substantially higher average apparent density than the average apparent density of the absorbent material in said pad, the length and width dimensions of said element being smaller than the length and width dimensions of said pad, said element being centrally positioned on said pad.

2. A sanitary napkin comprising a main fluid absorbent pad, a pair of separate fluid control elements, and a fluid pervious wrapper enclosing said pad and said elements, said elements comprising absorbent material of substantially higher average apparent density than the average apparent density of the absorbent material in said pad, the length and width dimensions of said elements being smaller than the length and width dimensions of said pad, one of said elements being centrally positioned on the top of said pad, and the second of said elements being centrally positioned on the bottom of said pad.

3. A sanitary napkin comprising an assembly of elongate fluid absorbent components enclosed in a fluid pervious wrapper, said assembly comprising a main absorbent pad having an average apparent density in the range of from about 1.5 pounds per cubic foot to about 2.5 pounds per cubic foot and a separate fluid control element having an average apparent density in the range of about 5 pounds per cubic foot to about 100 pounds per cubic foot, the peripheral dimension of said element being substantially less than the peripheral dimension of said pad, said element being positioned on top of said pad and inwardly spaced from the periphery thereof.

4. The napkin of claim **3** in which the space between the side edges along the periphery of said element and the side edges along the periphery of said pad is from ¼" to about 1".

5. A sanitary napkin comprising an assembly of elongate fluid absorbent components enclosed in a fluid pervious wrapper, said assembly comprising a main absorbent pad having an average apparent density in the range of from about 1.5 pounds per cubic foot to about 2.5 pounds per cubic foot and a pair of separate fluid control elements having an average apparent density in the range of about 5 pounds per cubic foot to about 100 pounds per cubic foot, the peripheral dimension of said elements being substantially less than the peripheral dimension of said pad, one of said elements being positioned on top of said pad and inwardly spaced from the periphery thereof, the other of said elements being positioned on the bottom of said pad and inwardly spaced from the periphery thereof.

6. A sanitary napkin comprising an assembly of elongate fluid absorbent components enclosed in a fluid pervious wrapper, said assembly comprising a main absorbent pad having an average apparent density in the range of from about 1.5 pounds per cubic foot to about 2.5 pounds per cubic foot and a separate fluid control element having an average apparent density in the range of about 7.5 pounds per cubic foot to about 50 pounds per cubic foot, the peripheral dimension of said element being substantially less than the peripheral dimension of said pad, said element being positioned on top of said pad and inwardly spaced from the periphery thereof.

7. A sanitary napkin comprising an assembly of elongate fluid absorbent components enclosed in a fluid pervious wrapper, said assembly comprising a main absorbent pad having an average apparent density in the range of from about 1.5 pounds per cubic foot to about 2.5 pounds per cubic foot and a pair of separate fluid control elements having an average apparent density in the range of about 7.5 pounds per cublic foot to about 50 pounds per cubic foot, the peripheral dimension of said elements being substantially less than the peripheral dimension of said pad, one of said elements being positioned on top of said pad and inwardly spaced from the periphery thereof, the other of said elements being positioned on the bottom of said pad and inwardly spaced from the periphery thereof.

8. A sanitary napkin comprising a main fluid absorbent pad, a separate fluid control element in association therewith, and a fluid pervious wrapper enclosing said pad and said element, said element having a pattern impressed therein comprising areas of high density and areas of low density, the apparent density of said low density areas being substantially higher than the highest apparent density of said pad, said element being non-coextensive with said pad and being positioned on top of said pad with the edges of said element spaced inwardly from the outside edges of said pad.

9. A sanitary napkin comprising a main fluid absorbent pad, a separate fluid control element in association therewith, and a fluid pervious wrapper enclosing said pad and said element, said element having a pattern impressed therein comprising areas of high density and areas of low density, the apparent density of said low density areas being substantially higher than the highest apparent density of said pad, the average apparent density of said pad being in the range of from about 1.5 pounds per cubic foot to about 2.5 pounds per cubic foot, the apparent density of said element ranging from as low as

about 5 pounds per cubic foot in the low density areas to as high as about 100 pounds per cubic foot in the high density areas, the peripheral dimension of said element being substantially less than the peripheral dimension of said pad, said element being positioned on top of said pad and inwardly spaced from the periphery thereof.

10. A sanitary napkin comprising a main fluid absorbent pad, a pair of separate fluid control elements in association therewith, and a fluid pervious wrapper enclosing said pad and said element, said element having a pattern impressed thereon comprising areas of high density and areas of low density, the apparent density of said low density areas being substantially higher than the highest apparent density of said pad, the average apparent density of said pad being in the range of from about 1.5 pounds per cubic foot to about 2.5 pounds per cubic foot, the apparent density of said element ranging from as low as about 5 pounds per cubic foot in the low density areas to as high as about 100 pounds per cubic foot in the high

density areas, the peripheral dimension of said element being substantially less than the peripheral dimension of said pad, one of said elements being positioned on top of said pad and inwardly spaced from the periphery thereof, and the other of said elements being positioned at the bottom of said pad and inwardly spaced from the periphery thereof in congruency with said top element.

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