SMALL SIZE SANITARY NAPKINS WITH IMPROVED ABSORPTION CAPABILITY

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ABSTRACT

A small-size sanitary napkin capable of absorbing menstrual exudate in amounts approaching full-size napkins. The small pad is a multilayered sanitary napkin in which the absorbent element is comprised of a stratified web made up of multiple plies of creped cellulose tissue folded longitudinally in zig-zag sequence so that the ridges and valleys of the creped tissue extend in the longitudinal direction. The lowermost of the layers defines the full width of the element and each successive layer disposed above the lowermost layer is narrower than the layer immediately underneath, each successive layer having less surface area than its underlying neighbor. Menstrual exudate which strikes the top layer is selectively absorbed by that layer and longitudinally spread within that layer to a point of near saturation before the exudate is transported to the outer areas of the next layer. Improved utilization of the available absorbent capacity is obtained.

5 Claims, 3 Drawing Figures
SMALL SIZE SANITARY NAPKINS WITH IMPROVED ABSORPTION CAPABILITY

BACKGROUND OF THE INVENTION

In the construction of sanitary napkins, an important objective is to control the absorption and flow of fluid exudates in a manner which obtains maximum utilization of the available absorbent capacity. While this is desirable in sanitary napkins of all sizes, it is much more important in the small size napkins which are now becoming popular. Ideally, a sanitary napkin is expected to (1) accept immediately all exudate which strikes its top surface, (2) rapidly transport the exudate away from the point of acceptance at the discharge source to other parts of the napkin (3) contain the transported exudate within the marginal confines of the napkin until substantially all of the absorbent capacity of the napkin is used, and (4) maintain the body-contacting surface of the napkin as dry as possible. At the same time, since sanitary napkins are single use, disposable items, it is desirable that the absorbent media be low in cost and readily available. While a large variety of absorbent materials have been tried for this purpose, the most economical material has been found to be absorbent wood pulp fibers either in the form of airlayed batts called fluff or in the form of multiple plies of lightweight waterlaid and creped tissue commonly called creped cellulose wadding. However, when these preferred wood pulp fibers are used in their simple unmodified batt form, fluid applied to the surface normally penetrates rapidly and strikes through to the bottom surface and causes early staining at the near side edges. There is a minimum of spreading in any direction in the body of the batt. The absence of such spreading is attributed to poor capillarity in the planar directions of the batt. The batt therefore becomes quickly saturated with fluid in the localized region of fluid application and large areas in the outlying regions of the batt which still have potential absorbent capacity remain unused. Even when a plurality of mixed layers of fluff and cellulose wadding are used in the pad construction, rapid strike-through in localized regions still occurs.

Attempts have been made to overcome this lack of directionality by incorporating compressed elements, spacers, baffles, special fiber layers, and the like to provide better fluid distribution. While these modifications improve directional flow in most instances, the complicated structures required to obtain this directionality add considerably to the cost of manufacture, and frequently the improvement in results does not justify the added cost.

The present invention provides a simple construction for small size pads which obtains in those pads the desired directionality and a concomitant increase in useful capacity without the need for a plurality of elements of varying composition.

SUMMARY OF THE INVENTION

The improved small size sanitary napkin of this invention is made up of an elongate multilayered pad element, in turn the element consists of a unitary stratified web folded longitudinally on itself in zig-zag sequence to obtain the multiple layers. The strata in the web are individual sheets of lightweight absorbent creped tissue, and the ridges and valleys of the crepes in the tissue sheets are arranged to run longitudinally in the multilayered pad element. The width dimension of the web layers defined by the zig-zag folds gradually decreases from bottom to top of the pad element to provide a stepped construction. The lowermost layer defines the full or maximum width of the pad element and each successive layer disposed thereabove is narrower than its immediately underlying neighbor. A full length fluid-impermeable sheet of plastic film is disposed directly underneath the folded pad element. In the preferred construction this film extends up, around, and over the marginal side edges of the lower layer of the pad element. The pad element and underlying film are enclosed in a fluid-permeable outer wrapper. Preferably this wrapper is a non-woven web of hydrophobic fibers. A preferred hydrophobic web is comprised of polypropylene or polyester fibers which may be either in the form of a bonded carded web or a spot-bonded web of continuous heterogeneously arranged synthetic filaments each of which webs are known in the art. Preferably the wrapper and film extend only a short distance beyond each edge of the pad element where they are united by heat sealing or the like to form short, closed-end tabs. Preferably, too, a pressure sensitive adhesive is applied to the bottom of the completed napkin for purposes of securing the pad to an undergarment or other supporting device. The small pads of this construction have only 4 to 6 grams of absorbent material and in normal use are capable of absorbing up to about 10 grams of fluid before side or end-staining occurs. This performance compares favorably with regular size pads which have 13 to 16 grams of absorbent material, and which in normal use absorb on the average of about 9 to 12 grams of exudate before change is needed. Accordingly, since the more efficient small size pads of this invention are capable of absorbing exudate in amounts which approach, and are sometimes equal to, the amounts absorbed by regular pads, they are suitable for use in place of regular size pads.

Further advantages of the above and other embodiments of the invention will become apparent upon consideration of the following detailed description and accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a perspective view partially broken away showing a preferred embodiment of the small size sanitary napkin of this invention.

FIG. 2 is a section taken on lines 2—2 of FIG. 1.

FIG. 3 is a greatly enlarged sectional view of the stratified web used in the construction of the sanitary napkin of this invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIGS. 1 and 2 show a preferred embodiment of a small size sanitary napkin 10 constructed in accordance with this invention. As shown therein the napkin 10 comprises a central multilayered pad element 11 of zig-zag configuration formed by folding a unitary stratified web back and forth on itself along longitudinal folds 12, 13, 14, 15, and 16. These folds divide the pad element 11 into multiple layers 17, 18, 19, 20, and 21. Bottom layer 17 is the widest layer of pad element 11, with each successive layer proceeding toward the top of the pad being successively narrower. Each success-
sive layer thus has progressively less overall surface area than the layer underneath it. That is, layer 18 is smaller than 17, layer 19 is smaller than 18, and so on to layer 21 which is the narrowest layer and is disposed at the top of the pad element. A preferred size for such a pad is 2 to 2 ½ inches in width and 6 to 7 inches in length. The width of the top layer preferably is in the range of ¾ inch to 1 inch.

FIG. 3 is a greatly enlarged sectional view of a fragmentary portion of the stratified web from which pad element 11 is made and also has one fold represented. This figure is provided primarily to indicate that the stratified web from which pad element 11 is folded is made up of a multiplicity of individual plies of light-weight creped absorbent tissue 22, with the ridges 23 and valleys 24 of the crepe in each tissue extending in the longitudinal direction of the finished pad element. While in FIG. 3, four plies are shown, the use of four to nine plies is appropriate for providing the improved performance obtained by the improved structure defined herein. In general, the lighter the weight of the individual plies, the more plies may be used. A preferred number of plies is six.

The type of creped tissue which is normally used is a lightweight sheet having a basis weight in the range of about 4 to 6 pounds per 2,880 square feet with about 5 pounds preferred. The sheets may have a crepe ratio in the range of 2.5 to 3.5 with 2.75 preferred.

The number of layers of the stratified web which may be used in the pad element are 4 to 10, although six to eight layers are preferred.

Referring again to FIGS. 1 and 2, a thin plastic film 25 is disposed directly under pad element 11 and extends the full length thereof. In a useful embodiment, film 25 may be coextensive with bottom layer 17, but it is preferred that film edge 26 on each side of the pad extend up and around the edges of layer 17 and over the marginal top edges thereof for a short distance to provide better edge containment. The ends of film 25 also should extend beyond the ends of pad element 11 far enough to be combined with fluid permissive wrapper 27 by heat sealing or the like to form tab ends 32. Wrapper 27, of course, serves to enclose the pad element and film and is overlapped at 28 to complete the napkin structure. It will be noted that the wrapper disposed on the top face of the pad element is in full contact with the element only at the surface of layer 21. Other contacts on the top face are made only at the folds of subsequent layers, with the wrapper bridging spaces in between.

The sanitary napkin shown in FIG. 1 has a short tab 32 at one end, and it is understood that a similar tab is located at the opposite end. When the napkin is constructed with short tabs of this nature, and this is the preferred style for small size pads, it is provided with a pressure-sensitive adhesive strip 29 disposed along the bottom center line of the pad, and the adhesive is covered by a removable protective sheet 30. The purpose of the adhesive 29, of course, is to provide a means for securing the napkin to a suitable supporting garment.

While a pad with short tabs is the preferred version because of its convenience, it will be understood that the wrapper may be provided with longer extensions at each end if desired, which extensions may be used to attach the napkin to a belt or other means of support.

In the preferred embodiment, wrapper 27 is a fluid-permeable non-woven web of hydrophobic synthetic fibers such as polypropylene, polyesters, or the like. The hydrophobic non-woven web may consist of bonded carded fibers, or a web of heterogeneously arranged continuous filaments suitably bonded to each other. Absorbent webs may also be used for the wrapper but they are less desirable in that during use they tend to retain some of the exudate in the web structure which may convey an uncomfortable wet feel to the user. Hydrophobic webs retain little if any of the exudate during use and generally provide much better performance.

It should be noted here that the broad concept of utilizing multiple plies of creped tissue as the absorbent element in sanitary napkins is old in the art, as is the concept of aligning the ridges and valleys of the creped tissue in the longitudinal direction of the napkin to aid in transporting absorbed fluids in the longitudinal direction. However, for some unexplained reason, the adoption of this broad concept by simply laying up a plurality of plies of creped tissues and aligning the crepes longitudinally does not provide the advantages arising from this invention. Fluid deposited on a sample layered pad element without folds was found to penetrate all the layers rapidly and form a localized area of saturation throughout the pad at the point of entry which is considered undesirable, as noted many times in the prior art. Even when a stratified web of creped tissue is zig-zag folded in a manner to provide a layered structure in which the layers are coextensive, the pad element fails to utilize its maximum absorbent capacity as does the stepped pad of this invention. The folded and stepped features are therefore both essential.

Alternatively, even when the multiple plies are arranged in unattached layers such that the bottom layer is widest and each successive layer positioned above the bottom layer is successively narrower to provide a stepped construction similar to that described herein, except that there is no continuity between layers as provided by the zig-zag folds of this invention, the fluid penetrates rapidly to the bottom, stains the edges early, and remains more or less localized at the point of entry.

It is only when the alternating zig-zag folds are used in the stepped arrangement as defined herein, that the fluid is preferably distributed throughout the entire length of the top layer first and then to the outlying areas of each successive layer in turn before complete penetration and edge staining occurs.

It is not understood why this unexpected difference should exist between two very similarly stepped structures which, except for the folds, are substantially the same. However, it is theorized that the longitudinal folds tend to keep the successive stratified layers out of intimate contact with each other, and it is only when the added weight of the absorbed fluid compacts each successive overlying layer sufficiently to force that layer into contact with the neighboring layer next beneath that substantial fluid transfer to the next layer takes place. The channels provided by the folds also appear to facilitate longitudinal transport of the fluids.

In a typical example of this invention, a stratified web 6 inches wide and about 9 ½ inches long and comprising six plies of absorbent creped tissue having a crepe ratio of about 2.05 and a basis weight of about 5 lbs. per 2,880 square feet was zig-zag folded to provide longitudinally connected layers having widths of approximately 2 ¼ inches, 2 inches, 1 ½ inches, 1 ½ inches, and 1 inch respectively from bottom to top.
The total weight of the absorbent material was about 4.5 grams. A thin polyethylene film baffle as shown in FIG. 1 was disposed under the folded pad element. The film was one-half inch wider than the bottom layer and was folded around the side edges of the layer to extend over the top edges of the layer about one-fourth inch. This combination was wrapped with a fluid-pervious web comprised of heat-bonded, random-oriented polypropylene filaments. The finished pad was about 2 ¼ inch wide and 6 inches long.

A colored fluid compounded to synthesize the viscosity of menstrual exudate was dropped at a controlled rate onto the top of the pad while the pad was flexed to simulate walking motion. Fluid was added until staining was observed at the pad perimeter. On the average, these pads absorbed about 9.85 grams per pad before edge staining was observed. Visual observation of the total stained area of the pad element at the end of the test indicated that on the average about 90 percent of the available absorbent material had been used.

A pad element similar to the above except that layers were separated from each other by slitting each of the folds was also constructed.

Synthetic exudate was dropped on these latter pads at the same rate as in the first example and it was found that an average absorption of 6 grams was obtained before edge staining occurred. The stained area at this stage was confined largely to the central portion of the pad. Visual observation indicated that on the average about 50 percent of the total available absorbent material was used, the remainder being unstained.

A small commercial sanitary napkin in the same weight range as the above examples was also tested. This pad was comprised of a fluff core about ¾ inch thick, about 6 inches long, and about 1 ½ inches wide, weighing about 4 grams, and wrapped in a single sheet of creped cellulose tissue with the crepes extending longitudinally. A polyethylene baffle extended the full length of the pad but did not extend up the side edges. The pad was wrapped with a fluid-pervious web comprised of adhesively bonded carded rayon fibers. Average absorption was found to be about 4 grams before staining and about 50 percent of the available absorbent material appeared to be.

The following information may be used to compare performance of small pads with regular size napkins. A commercial regular size napkin having 12 grams of absorptive media, comprising 6 grams of fluff and 6 grams of creped cellulose wadding was tested in the same manner as indicated above. The fluff was disposed in the center of the pad and multiple plies of the cellulose wadding were disposed on each side of the fluff. The pad was about 7 ½ inches long, 2 ½ inches wide and 

inch thick. Under the same controlled tests as described for the small size napkins, the regular size napkins absorbed an average of about 10 grams of fluid which was localized around the area of entry. Visual observation indicated that about 50 percent of the absorbent pad area available was unstained and therefore unused.

In actual use tests of these regular size napkins the average recorded amount of exudate absorbed before change by the user ranged between 9 and 12 grams.

In actual use tests of the small size napkin of this invention, the average recorded amount of exudate absorbed was in the range of about 8 to 10 grams. Thus, the napkins of this invention having only about one-third of the amount of absorptive material as regular size pads were found to effectively absorb about 80 percent as much exudate as that absorbed by pads three times their size.

What is claimed is:

1. A small size sanitary napkin comprising an elongate multilayered absorbent element enclosed in a fluid-pervious wrapper and having a fluid-impervious film disposed between the bottom of the element and the enclosing wrapper, the improvement wherein said multilayered element is comprised of a unitary stratified web, said stratified web being arranged in a multiplicity of layers, said layers being formed by longitudinally extending folds in said stratified web with said folds alternating from one side to the other in zig-zag sequence, the width of the lowermost of said layers defining the full width of said element with each succeeding layer disposed above said lowermost layer being narrower and having successively less surface area than the adjacent layer directly therebeneath, said stratified web comprising multiple plies of creped absorbent cellulose tissue in which the ridges and valleys of the crepe in the tissue plies run in the longitudinal direction of said element.

2. The sanitary napkin of claim 1 wherein said fluid-pervious wrapper is a non-woven web of hydrophobic fibers.

3. The sanitary napkin of claim 1 wherein said fluid-pervious wrapper is comprised of a bonded non-woven web of hydrophobic continuous heterogeneously arranged synthetic filaments.

4. The sanitary napkin of claim 1 wherein the longitudinal edges of said fluid-impervious film extend around the edges of said element to cover marginal edge portions of the bottom layer of said element.

5. The sanitary napkin of claim 1 wherein pressure-sensitive attachment means are disposed on the bottom surface of said napkin.

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