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2,960,089

CELLULOSIC PRODUCT

Filed May 2, 1958

Fig - 1

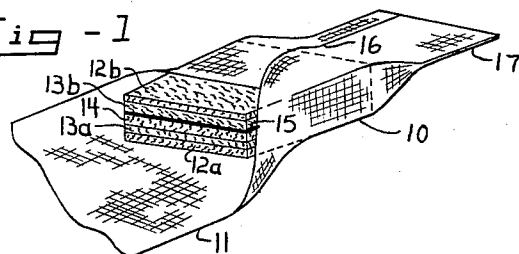


Fig - 2

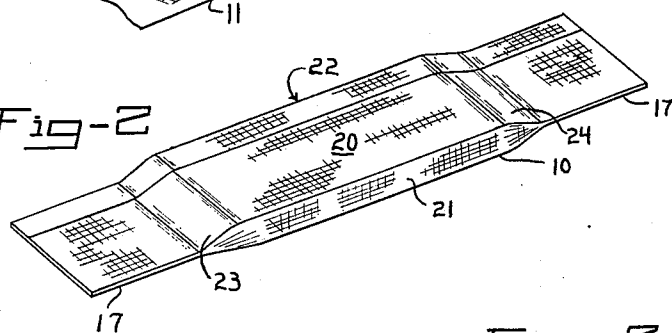
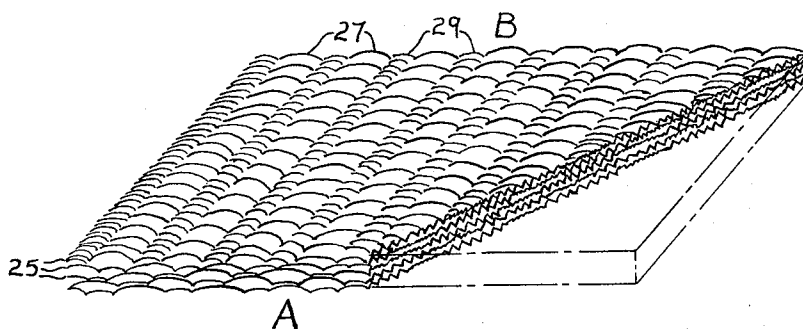


Fig - 3



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CELLULOSIC PRODUCT

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4 Claims. (Cl. 128—290)

This invention relates to improved sanitary bandages, such as sanitary napkins, diapers and absorbent dressings, which include as at least part of the absorbent medium creped tissue paper or wadding.

In the embodiment of a sanitary napkin there must be provided a great capacity for fluid absorption, and the capacity for absorption at a high rate, at least for short intervals. To provide for comfort to the wearer, the napkin must be soft and with smooth texture, without sharp edges, protrusions or the like, and with a substantial ability to maintain these characteristics even after having absorbed a substantial quantity of fluid. So that the absorptive potential of the napkin may be substantially realized, under conditions of ordinary use it has been found desirable to incorporate in the napkin some means by which fluid impinged thereon may be directed throughout a large part of the body of the napkin in its penetration thereof and absorption thereby. Obviously, so that the cost of sanitary napkins may be kept sufficiently low to attract the wide market necessary for economical commercial production and distribution, low cost of materials and distribution of the product are vital factors.

The type of sanitary napkin most commonly encountered comprises a main absorbent body portion consisting of a number of plies of absorbent and flow-directing materials carefully arranged in a predetermined fashion, and a covering or wrapper of soft permeable material serving to secure together the various plies of the absorbent body portion, the wrapper having extended ends by means of which the napkin may be pinned or otherwise secured to attachment means for retention against the body of the wearer. In the case of a napkin particularly adapted to be retained against the body by a sanitary panty or the like, the wrapper extensions may be largely or completely eliminated, and by the use of other known means of securing the body portion plies together, it may be feasible to entirely eliminate the wrapper.

Absorbent materials used in commercially available sanitary napkins include layers of light creped tissue paper and of fluffy wood cellulose, and fiber batts of cotton, rayon or the like. The direction and to some degree the rate of penetration of fluid may be controlled by suitable baffles, for example, lightly waxed sheets of tissue paper.

The main body portion of the pad is elongate, and substantially wider than it is thick. In use, it is preferred that the relatively flat napkin be folded around a longitudinal center line into a substantially U configuration, the base of the U being applied against the body. However, there is a tendency for the napkin to twist and "rope," which tendency is increased as the ratio of body portion width to thickness increases, with a resultant discomfort to the wearer and danger of stain of garments and of failure of the napkin to perform its intended function. These deficiencies can be reduced by a relative thickening of the napkin. However, until this inven-

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tion, such thickening involved the addition of materials, or the substitution of higher priced materials, with obvious economic disadvantages, increase in weight, and/or increase in manufacturing complexities.

5 It is the purpose of this invention to provide a sanitary napkin incorporating materials permitting a decrease in weight of the absorbent body portion without decrease in bulk, i.e., permitting a decrease in density or greater bulk per unit weight, permitting a directionalizing of
10 fluid penetration, particularly for full realization of absorptive potential, and permitting relative increase of napkin thickness without increase in cost or weight. Details of the improved sanitary napkin comprising this invention, and of the objects and advantages of the invention, will be clear from the following description of the appended drawings, in which:

Figure 1 is a perspective view, partially cut away, and without wrapper, partially opened, of a napkin according to the invention,

20 Figure 2 is a perspective view of a sanitary napkin according to this invention, and

Figure 3 is a perspective view, partially cut away, of absorbent material forming a component of the invention.

25 Referring first to Figures 1 and 2, it is seen that a representative sanitary napkin 10 includes a wrapper 11 of gauze or similar materials, and a main absorbent body portion comprising outer plies 12a and 12b of creped tissue paper, intermediate plies 13a and 13b of fluffy cellulose pulp, an intermediate layer 14 of cotton linters or the like providing bulk, softness and additional absorptive capacity, and a second intermediate ply 15 of waxed tissue paper or the like to serve as a baffle for the direction of fluid throughout the absorbent body.
30 Other conventional elements in various arrangements may be included as desired. Wrapper 10 is folded around the body of the napkin with the resulting seam as at 16 along one face of the pad, and with extended ends 17, by which the napkin is pinned or otherwise fastened to a belt or the like for retention against the body.

40 Various arrangements and modifications of the components of the sanitary napkin are in common use, or are quite feasible, including those in which the main absorbent body portion comprises but a single material such as fluffy cellulose pulp or multiple plies of creped tissue paper.

For ready conformation to the contour of the body, and in order to achieve presence of the napkin at the necessary points, the napkin body is elongate and wider than it is thick. Consequently, in order to provide for substantial utilization of the absorptive capacity of the body portion of the napkin, without premature strike through of fluid through the thickness of the napkin, it is desirable to include some means whereby flow of fluid widthwise, and even more lengthwise, of the body portion is enhanced. Ideally, this control would be such that fluid applied to one face 20 of the napkin would penetrate to the opposite face, to the sides 21 and 22, and to the ends 23 and 24 simultaneously. While this ideal cannot be consistently attained, it is a goal the attainment of which has been the cause of considerable research and attendant exercise of inventive ingenuity and one with which the present invention is concerned.

Thus far, control of fluid penetration has been achieved
65 through added media primarily such as lightly waxed tissue paper baffles, such as illustrated at 15 in Figure 1. These baffles slow the penetration of fluid through the thickness of the napkin, thus adding a time factor during which flow occurs widthwise and lengthwise of the body portion of the napkin. To account for the fact that the body portion is longer than it is wide, side strips of similarly waxed tissue paper may be enfolded about the side

edges of the body portion to reduce or eliminate strike through of fluid through these side edges, thus adding another time factor during which fluid flow may occur lengthwise of the body portion.

As previously noted, it is a primary object of this invention to provide sanitary bandages combining features of greater absorptive capacity, greater bulk with less weight and less material, greater thickness to width ratio, and reduced cost. It is also an object of this invention to provide such combinations of desirable factors simultaneously with increase in desired directionalizing of fluid penetration aimed at approaching the ideal of simultaneous depth, width and length penetrations under ordinary conditions of use.

To achieve these objectives, the body portion of the sanitary napkin of this invention incorporates a number of plies of a differentially creped tissue product. Referring to Figure 3, this product comprises a plurality of superposed cellulosic sheets or webs 25, the individual sheets having a basis weight, on a bone dry basis, of about 4.6 pounds before creping and about 9.8 pounds after creping, per ream of 3000 square feet. Each of the cellulosic tissue sheets or webs 25 has a series of coarsely creped areas 27 and more finely creped areas 29, respectively providing alternating relatively puffed and flat areas which give the product properties which when incorporated in the napkin provide the unique advantages mentioned above. The fine crepes 29 act to stabilize the more coarsely creped portions 27, thus maintaining the increased bulk characteristic of the sheets as provided by the coarser creping. Although as shown in Figure 3 with respective creped areas or a series of parallel bands, for particular purposes they may be in suitable patterns such as diagonals, circles, squares, discontinuous areas and the like. The important consideration is that the coarsely and finely creped areas be interspersed so that the finely creped areas will provide structural stability to the total web.

It is well known that to a certain degree coarser creping can be achieved by using thicker creping blades. However, at a certain point the effect reaches a maximum, due to the tendency of the coarser crepe to collapse or flatten out under the imposition of any perpendicular or stretching load. The finer crepes, however, are able to withstand substantial loads without material flattening, and it is this characteristic of which advantage is taken in the present invention.

It has been found that fluid applied to the surface of randomly superposed plies of differentially creped tissue, such as shown in Figure 3, has an increased tendency to be absorbed along the lines of differentiation, that is, along the lines front to rear (A to B) of Figure 3, as compared to superposed sheets uniformly creped in the conventional fashion. It will be appreciated that the direction from A to B is at right angles to what is by those skilled in the art considered to be the line of creping. This tendency toward directionalizing of the flow and penetration of fluid may be anchored by a predetermined incorporation of a fluid-repellent material in lines parallel to the differential creping, for example, by incorporating such fluid-repellent material along the lines 27 of coarser crepe. It will thus be clear that the differentially creped tissue may be employed to direct the flow of fluid in a sanitary napkin either relatively longitudinally or laterally of the absorbent body portion.

The sheets 25 of differentially creped tissue may be made on the conventional Yankee drier of a paper machine, by an addition to and modification of the conventional creping process. This modification involves applying to the surface of the rotating Yankee drier in a predetermined pattern a release agent selected to provide the desired result. The release agent may be applied, for example, by a series of sheets spaced along the face of the drier, directing spaced lines of release agent to the drier surface. The release agent makes easier the re-

lease of the paper sheet from the drier, upon impingement against the creping doctor blade, which has the effect of coarsening the creping in lines corresponding to the lines of the release agent applied to the drier. In lines corresponding to the areas between lines of application of the release agent, normal finer creping occurs.

The release agent may be one or more components miscible with water or another volatile carrier. Air may also be used as the carrier, applying the release agent as a mist. The release agent may, for example, impart a degree of oiliness to the drier surface to provide a ready release of the tissue sheet from the drier as compared to those areas where the agent is not present. Other means and apparatus may be used to apply the release agent to the drier surface in a controlled pattern, for example, a patterned printing roll may be used, in which event patterns in exact register may be printed on the drier, and the patterns may be varied to provide directions of differential creping particularly suited to finer degrees of fluid control in various directions through the absorbent napkin body. In addition, an arrangement of wicks or other equipment may be used to wipe the release agent on selected areas of the drier surface. The release agent preferably is applied to the drier surface in the area between the creping doctor blade and the nip of the drier cylinder and press roll. In the event a series of heated drier rolls is used in place of a single Yankee drier, the release agent may be applied to the surface of the drier roll on which creping is performed prior to the pressure nip between the drier roll and associated press roll. Alternatively, a slightly adhesive agent may be applied to the drier instead of a release agent, in which event the added tack will result in a finer crepe where the adhesive agent is present, with a standard yet relatively more coarse crepe in the adhesive-free areas.

For incorporation into a sanitary napkin of this invention, the differentially creped tissue sheets 25 should have between about 5 and about 30 crepes per inch, and preferably between about 10 and about 20 crepes per inch, in the coarsely creped area 27. The more finely creped area 29 should have between about 20 and about 200 crepes per inch and preferably between about 30 and about 50 crepes per inch. The webs or sheets 25 should have a crepe ratio of about 1.5 to 3.0, and preferably about 2.5. The crepe ratio is the ratio of the length of the flat sheet before creping to the length of the sheet after creping. It will be clear that the crepe ratio of the sheets 25 in the coarse area 27 is the same as in the finer creped area 29. Crepe ratio is based on the combination of amplitude of creping and frequency of creping. In the coarser area 27 the creping is of relatively greater amplitude and lesser frequency, while in the finer creped area 29 the creping is of relatively lesser amplitude and greater frequency.

The coarsely creped area 27 should comprise between about 15 percent and about 85 percent of the total area of each of the plies 25, and in the particular embodiment under discussion preferably about 50 percent of the area. However, this relationship, as well as the factors of crepe ratio, basis weight, density, amplitude and frequency of crepes, number of differentially creped sheets used, and precise pattern of the differential creping will be determined by the other materials incorporated into the sanitary napkin and particular conditions of use. The respective plies of the overall differentially creped product preferably are assembled in a random fashion with respect to alignment of coarsely and finely creped areas, since this will produce the greatest average increase in bulk. Such product has a bulk up to about 100 percent greater than comparable commercially available creped products. Its density in a typical example is about 1.38 pounds per cubic foot, as compared to a density of about 2.75 pounds per cubic foot for the product without differential creping.

When incorporated into a sanitary napkin as a com-

ponent thereof, for example, as plies 12a and 12b of the napkin of Figure 1, the product in the proportion employed provides an increase in bulk of up to 100 percent, without increase in the amount of material employed. According to the pattern of differential creping employed and the properties of differential creping agents applied to the drier, the tissue provides control over direction of fluid flow and penetration, which may be adjusted as above described to provide for maximum utilization of the absorptive potential of the napkin.

While the sheets 25 preferably are formed of various cellulosic and other fibers commonly used in the fabrication of tissue webs or sheets, various synthetic fibers such as rayon, nylon, glass and the like may be added in varying amounts to provide specific properties.

Only a relatively minute amount of release agent is needed to provide the desired differential creping, so that the cost is generally slight. However, this slight additional manufacturing cost provides an increase in bulk (aside from other desirable factors) which results in a considerable lower total cost of the sanitary napkin which may be produced by the employment of this product. Examples of suitable release agents are: soaps comprising the sodium salts of oleic, stearic and other fatty acids; emulsified mineral oil; sulfonated castor oil; softening agents of the sulfonated long-chain hydrocarbon type; and polyethylene glycol di-laurate. An adhesive agent to be employed alternatively to the release agent may be, for example, such as a starch solution. It will be appreciated that either the release or adhesive agent might be applied to the tissue sheet ahead of the drier, rather than being applied to the drier itself.

While the absorptive potential of creped tissue is very closely related to the mass of material present, it is also dependent to a definite degree upon the bulk of the absorptive material, possibly due to the increased absorptive capacity provided by the larger interstices between adjacent portions of absorptive material when increased bulk without increased mass is present. Employment of a differentially creped sheet in a sanitary napkin permits this increased bulk without increased mass, thus providing for increased absorptive capacity, or permits decrease in mass, and consequent decrease in cost, without loss of absorptive capacity.

Thus, a napkin or other absorbent bandage may be produced at lower cost without loss of absorptive capacity; on the other hand, at essentially the same cost,

a napkin of increased capacity may be made. In addition, use of the differentially creped product permits control of fluid flow for maximum utilization of absorptive capacity, and readily permits a more favorable length-width-thickness ratio for greater comfort and less tendency of roping or twisting of a sanitary napkin when in use.

Having now described the invention in preferred form, it is to be understood that limitations on the invention are intended only as set forth in the accompanying claims.

What is claimed is:

1. In a sanitary napkin, a multiple element absorbent body portion of greater width than thickness and greater length than width and a fluid preamble wrapper enclosing and maintaining said body portion in unitary assembly, said body portion including a plurality of adjacent plies of differentially creped cellulosic sheets disposed with the direction of crepe lengthwise of the body and having alternate coarsely and finely creped areas extending substantially the width of the body, said areas being disposed in registry in the direction of pad thickness, said alternate areas being provided, respectively, with about 10 to 20 crepes per inch and about 30 to 50 crepes per inch, all areas of said sheets being substantially uniformly creped at a ratio of between 1.5 and 3, whereby to increase the bulk-to-weight ratio of said pad while promoting fluid flow in a direction transversely thereof.

2. The device of claim 1 wherein said creped cellulosic sheets are of a basis weight of 10 pounds per 3,000 square feet.

3. The device of claim 1 wherein at least 15 percent of the total area of each of said sheets is finally creped to provide structural stability to the sheet.

4. The device of claim 1 wherein at least a portion of said creped areas is treated with a fluid-repellent material.

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