

Dec. 11, 1962

J. C. BLETZINGER ETAL

3,067,746

MANUFACTURE OF CELLULOSIC PRODUCTS

Filed Aug. 28, 1958

2 Sheets-Sheet 1

Fig-1

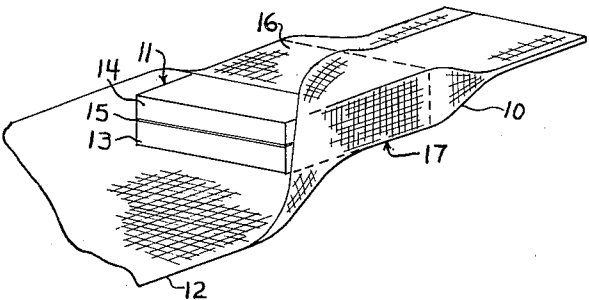


Fig-2

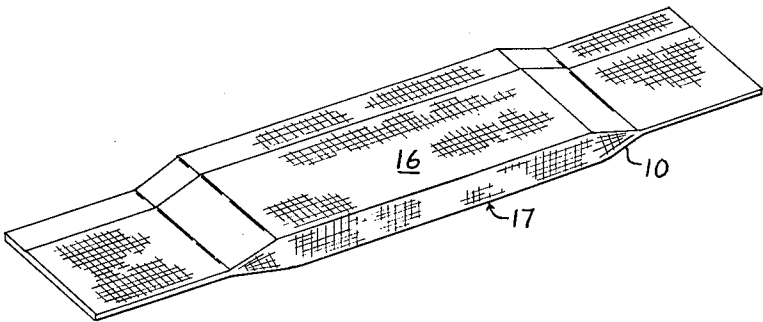


Fig-3

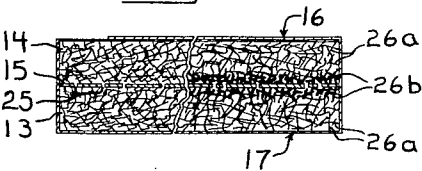
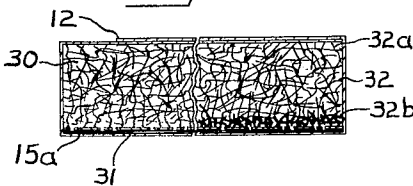


Fig-4



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2 Sheets-Sheet 2

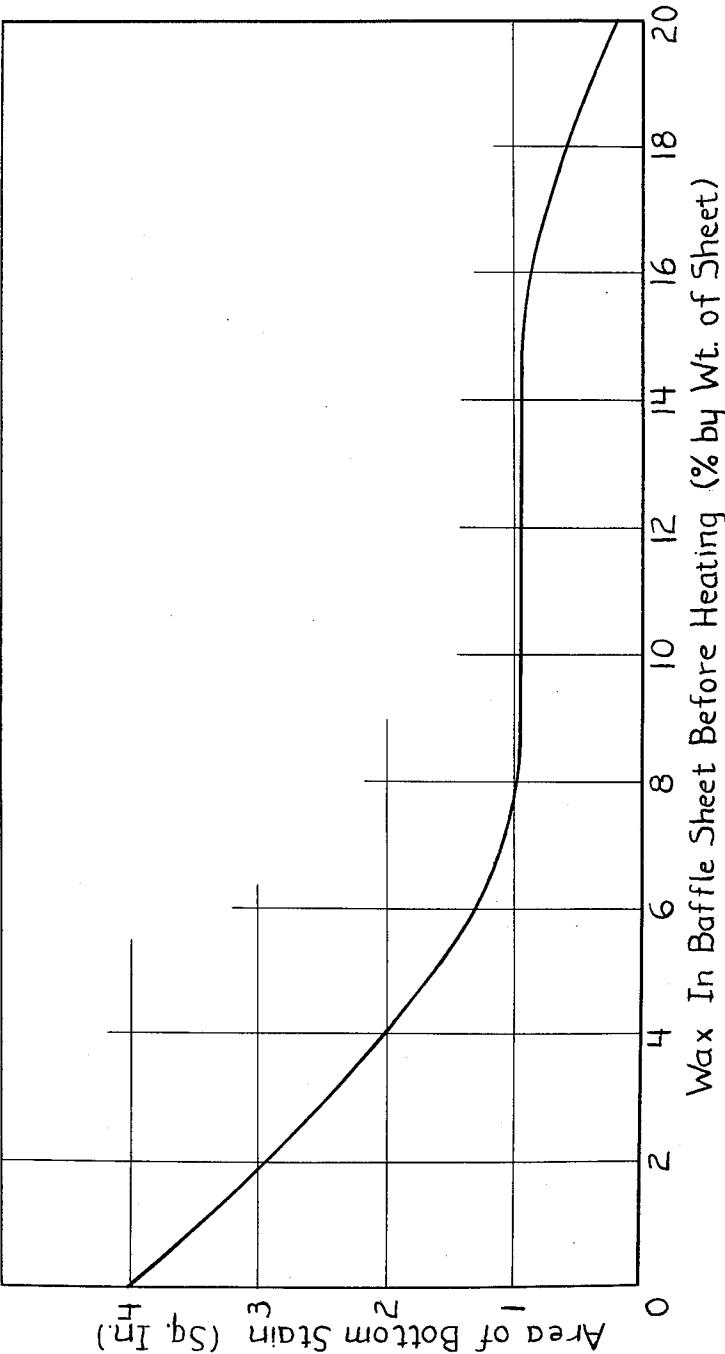


Fig - 5

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MANUFACTURE OF CELLULOSIC PRODUCTS

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This invention relates to the manufacture of an improved absorbent pad or bandage and is particularly directed to a novel sanitary napkin, including a napkin of the hospital maternity pad type, and a method of its manufacture.

In order to utilize to the greatest degree the potential absorptive capacity of an absorbent pad, such as a sanitary napkin, it is necessary that the flow of body fluid be directed throughout the absorbent body of the pad. Ordinarily the fluid is imposed upon the surface of the body of the pad or bandage in a rather limited area, and there is a tendency for the fluid, if there be a sufficient quantity imposed, to travel through the pad perpendicular to the main surface on which it was imposed, with limited spread of the fluid laterally and longitudinally of the pad body. The result is that there is an immediate danger that the fluid will penetrate through the thickness of the pad body, with resultant staining of undergarments in immediate contact with the pad body, discomfort to the wearer, and a substantial sense of insecurity.

In order to avoid these difficulties, and to realize to a greater degree the absorptive potential of the pad, various means of spreading the flow of fluid laterally and longitudinally of the body have been proposed. These means have included various types of barriers and baffles placed within the pad body to provide partial barriers to the flow of fluid, or complete barriers in limited areas, all aimed at spreading fluid flow throughout a larger portion of the absorbent napkin or pad body.

In order to prevent ultimate penetration or strike-through of menstrual or other body fluid to the external surface of the absorbent pad body, there have been proposed various types of absolute barriers to be placed at or near the external pad surface. However, such barriers ordinarily do not particularly well produce a dissemination of the fluid throughout the pad body for full utilization of the absorptive capacity, but tend merely to provide a dam which can be overrun along its edges upon presentation to the pad of a substantial fluid flow. Further, in providing impenetrable barriers to fluid flow, these means ordinarily present a substantial moisture vapor barrier, which results in a feeling of excessive humid warmth against the body of the wearer.

If the medium employed presents an actual barrier to passage of body fluid, it is clear that the absorbency of any material beyond the barrier will not be utilized. And if such means is located near one surface of the pad, it is obvious the pad will be "one sided," that is, adapted to be worn only with the other surface or "body side" adjacent the body, and with the side whereat the barrier is situated being positioned away from the body.

It is the principal object of this invention to provide an absorbent bandage, such as a sanitary pad or napkin, presenting a particularly effective baffle serving to disseminate fluid flow throughout the absorbent body, and which has certain unique and desirable characteristics of a barrier under particular conditions of use. It is a further primary object of the invention to provide a method whereby such pads may be manufactured. Other objects and advantages of the invention will be apparent from the following description of the appended drawings, in which:

FIGURE 1 is a perspective view of a sanitary napkin according to the present invention, with the wrapper at one end opened and partially cut away,

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FIGURE 2 is a perspective view of the completed sanitary napkin of FIGURE 1,

FIGURE 3 is an enlarged broken cross-section of a sanitary napkin corresponding to that of FIGURE 1, showing the napkin construction before and after a particular step in the process of the invention,

FIGURE 4 is a view similar to FIGURE 3, but showing a modified sanitary napkin according to the invention, and

FIGURE 5 shows the relationship of area of bottom stain of a sanitary napkin incorporating the invention to the percent of fluid-repellent material with which the baffle sheet was originally impregnated.

With reference to FIGURES 1 and 2, in a preferred form of the invention there is provided a sanitary napkin 10 comprising a main absorbent body portion 11 made up of a plurality of layers secured together by a porous wrapper 12. Wrapper 12 is essentially non-resistant to body exudate such as menstrual fluid, so that it does not hinder flow into and absorption of such exudate by the absorbent body of the pad. The main body of such an absorbent pad, for example a sanitary napkin, may include layers 13 and 14 of highly absorbent material commonly referred to a "fluff." Associated with such absorbent material is a baffle sheet 15, which in a preferred form comprises a creped tissue paper sheet substantially impregnated with a fluid-repellent material such as wax of various sorts.

The purpose of baffle sheet 15 is to control the flow of body fluid which is applied to one of the main surfaces 16 and 17 of the napkin, so that the fluid to a substantial degree is caused to penetrate throughout a large part of the absorbent material of body portion 11, and restrain from passing directly through to the other, externally-positioned one of surfaces 16 and 17. Thus, a larger part of the absorptive capacity of the napkin is utilized, and there is a reduced possibility that the fluid will strike through to the external surface of the pad in a manner which will cause staining of adjacent clothing and discomfort to and a sense of insecurity on the part of the wearer of the napkin.

While a baffle sheet such as 15 by itself may be constructed so as to produce to a considerable degree the results above described, there is difficulty in achieving the desired degree of baffling without carrying the baffling effect to such a great extent that a barrier to fluid flow results. If the baffle construction results in a barrier to fluid flow, it is clear that there will be a proportionate reduction in the available fluid capacity of the napkin, since to the extent that an absolute barrier results there will be a loss in possible utilization of the absorbent material in the main body 11 which lies beyond or toward the external napkin surface from baffle sheet 15. In other words, for a baffle sheet placed substantially medially of the main body 11, as shown in FIGURE 1, sheet 15 should provide a baffling effect, merely resisting flow of fluid to the extent necessary to direct the flow longitudinally and laterally of the pad, but permitting penetration of sheet 15 sufficient to realize substantial use of the absorbent capacity of the main napkin body in the part opposite that to which the body fluid is applied. Sheet 15 should not provide a complete fluid barrier between the parts of the body 11 laying to opposite sides of the sheet 15. This invention provides a napkin meeting these requirements, and a method for its manufacture.

To achieve the desired improved baffling effect in a preferred embodiment, this invention provides a baffle layer 15 which in preferred form is a single sheet, having a basis weight of about 9 to 12 pounds per ream (2880 square feet), and a crepe ratio of about 1.10 to 1.35. The sheet is impregnated with a thermoplastic fluid-repellent material such as, for example, petroleum wax having a

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melting point of about 135° F., the wax being present in amount about 1 to 3 percent by weight of the sheet. After sheet 15 is combined with the rest of pad body 11, and alternatively after the complete napkin has been formed, the article as formed is subjected to an elevated temperature of about 200° F. to 275° F. to cause a substantial liquification of the thermoplastic material in baffle sheet 15 and flow of this material into adjacent portions of absorbent layers 13 and 14. Layers 13 and 14 commonly comprise fibrous material such as comminuted wood pulp ("fluff"), rayon or plastic fibers, cotton fibers, multiple layers of creped tissue paper, and/or combinations of these materials. Upon being heated, liquifiable material from sheet 15 flows along the absorbent fibers of layers 13 and 14 which are immediately adjacent sheet 15. The amount of thermoplastic material which will so flow, the extent to which such flow will proceed from sheet 15, and the degree of saturation of the adjacent material affected by the flow will of course depend upon the temperature to which the material is subjected, the length of time the treatment continues, and the types of thermoplastic material, baffle sheet and absorbent material involved. With the materials above noted, and layers 13 and 14 comprising fluff, an excellent result is obtained when the finished napkin is raised to the stated temperature of above 220° F. which is maintained for an interval of 20 minutes.

Under the treatment just described, there results a baffle of greatly increased quality, which in a sanitary napkin under customary conditions of use provides a greatly increased utilization of the absorbent capacity of the napkin in the area between sheet 15 and the body side of the napkin, but which also permits penetration of exudate into the absorbent material beyond sheet 15 for substantial utilization of the absorbent capacity of that portion also.

FIGURE 3 is a cross-section of the napkin construction of FIGURE 1. The lefthand portion of FIGURE 3 shows the construction prior to raising the napkin to an elevated temperature for liquification of the fluid-repellent impregnant of sheet 15 and consequent flow into adjacent layers 13 and 14, while the righthand portion of FIGURE 3 illustrates the construction of the napkin subsequent to such temperature elevation and as it is in condition for use. As shown in exaggerated form at the lefthand portion of FIGURE 3, baffle 15, although substantially impregnated with the liquifiable material, inherently contains a number of minute holes 25 therethrough. While it is quite possible to apply to baffle sheet 15 an impregnant and/or coating sufficient to eliminate such holes 25, to do so causes sheet 15 to become an absolute barrier to flow of body exudate, with the above-described consequences. Thus, without further treatment, baffle 15 serves to restrain flow of fluid from one side of the sheet 15 to the other side, but does not absolutely prevent such flow. Due to the highly absorbent nature of layers 13 and 14, and their inherent strong liquid wicking character, the near contact of the layer to one side of sheet 15 with the layer to the other side serves to provide for fairly ready transmission of fluid from one absorbent layer to the other. In fact, such transmission tends to be too rapid and substantial, and it is to improve the quality in this respect with which this invention is largely concerned.

The righthand portion of FIGURE 3 illustrates a napkin construction after raising the product to the elevated degree as described. It will be observed that the fibers 26a remote from sheet 15 are quite the same as those appearing throughout layers 13 and 14 in the lefthand portion of FIGURE 3, while the fibers 26b immediately adjacent sheet 15 have a considerable wax deposition thereon due to their absorption of and being coated by thermoplastic material flowing from sheet 15. The degree of absorption by and coating of the fibers decreases with increasing distance thereof from sheet 15. This provides a baffle area of increasing moisture resistance as the original baffle sheet 15 is approached, and with a

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greater overall baffling effect. The gradual, and increasingly difficult, penetration of the total baffle layer produces a spreading of fluid throughout a larger part of the absorbent pad body, but without the total resistance which may produce fluid flooding if gushes of fluid impinge upon the napkin. This increased baffle efficiency further is attained without the requirement of an increased amount of wax or similar material in the original baffle sheet 15, and in certain applications the amount of wax may even be decreased.

This coating of the fibers 26b continues to only a small distance from sheet 15, but serves to provide immediately adjacent sheet 15 a network or web of substantially non-absorbent fibers, the efficacy of the network as a non-absorbent material diminishing with distance from sheet 15. The effect of this is to provide a baffle of materially increased depth, i.e., dimension in the vertical direction of the drawing, so that there is a greater spread in distance between the more absorbent portions of layers 13 and 14 respectively. Thus there results a baffle of increased efficiency, although since the baffle is very substantially porous a complete moisture barrier is not presented. The baffle thus may serve to restrain flow of fluid through the napkin, in order to obtain the longitudinal and transverse flow of fluid necessary to substantial utilization of absorptive capacity. However, it will not withstand the fluid pressure and pumping action resulting from impingement of large volumes of fluid flow and activity on the part of the wearer, which tend to force the fluid into the opposite or more remote side of the napkin for utilization of the absorptive capacity of that side.

In some instances, such as sanitary napkins particularly intended for post-maternity use, there is little reason why a one-sided napkin may not be used, and there are certain advantages in napkins of such type. Since a sanitary napkin for this purpose is used under controlled conditions, at the direction of and with the assistance of trained personnel such as doctors and nurses, proper application and use of the appliance is practically assured. For such use, a one-sided napkin, of larger dimensions and materially increased absorptive capacity, is desired, and in view of the large volumes of body exudate which tend to be presented to the napkin it is desired that the napkin include a substantial barrier to fluid-flow which will in the ultimate essentially prevent flow of fluid beyond the bounds of the napkin itself. This invention provides such a napkin and a method for its manufacture.

Referring to FIGURE 4, a form of sanitary napkin for the use just described includes the conventional wrapper 12 securing together an absorbent main body portion comprising fluff 30, a thermoplastic material-impregnated baffle layer 15a, and a plurality of layers of creped tissue paper 31. Baffle 15a is similar to baffle 15 previously described. Although as shown the overlap or seam of wrapper 12 is placed to the side of the napkin remote from layer 15a, certain known advantages may be obtained by placing the seam at the surface adjacent the baffle.

Prior to subjecting the napkin of FIGURE 4, or at least the assembled main body portion, to an elevated temperature, baffle 15a is subjected to the same deficiencies as previously described in connection with baffle 15 as in FIGURES 1, 2 and 3. However, in view of the primary requirement that a post-maternity napkin be capable of absorption of large quantities of body exudate at a high rate, and commonly is subjected to such conditions, a primary deficiency of a baffle such as at 15a is that while it would promote lateral and longitudinal spread of fluid for substantial utilization of the absorbent capacity of the napkin, it may not sufficiently act as a barrier to prevent strike through of fluid and consequent staining of undergarments and bedclothing. The lefthand portion of FIGURE 4 shows such a napkin in its condition prior to being raised to an elevated temperature.

The righthand portion of FIGURE 4 shows the post-

maternity type sanitary napkin after being raised to an elevated temperature of about 250° F. for a period of about 30 minutes, in which again the thermoplastic impregnant of baffle 15a has flowed into the adjacent absorbent material such as fibers 32, the fibers 32b immediately adjacent sheet 15a being more heavily impregnated and coated, and the fibers 32a substantially remote from sheet 15a begin completely unaffected. A corresponding flow of the thermoplastic material onto the immediately adjacent fibers of creped sheets 31 also occurs.

Again, the net effect is to provide a baffle as previously described, although in the particular instance of a post-maternity type napkin, it is preferred that a greater amount of thermoplastic material be initially applied to sheet 15a, in order that a greater extent of liquid flow and degree of saturation of adjacent fibers by the thermoplastic materials may occur, for the purpose of providing an effective and substantial barrier to the flow of body fluid to the exterior surface of the pad.

The amount of thermoplastic fluid-repellent material which initially should be applied to the baffle layer is of course dependent upon a number of factors, including the type, weight and number of plies of sheet material making up the baffle layer, the type of absorbent material into which the thermoplastic material is to flow upon being raised to an elevated temperature, and the degree of baffling effect it is desired to achieve. However, for a napkin as presented in the embodiment of FIGURES 1 and 3, with absorbent layers 13 and 14 of fluff and a baffle sheet 15 comprising a single sheet of creped tissue paper having a basis weight of 4.0 to 20 pounds per ream and a crepe ratio of 1.10 to 3.0, a preferred impregnant comprises petroleum wax in an amount of about 1 percent to 5 percent of the weight of the baffle sheet. Upon heating the resulting napkin to a temperature of about 250° F. maintained for an interval of about 30 minutes, a baffle of highly superior quality and greatly increased effectiveness is obtained.

For a napkin according to the embodiment of FIGURE 4, where baffle sheet 15a comprises creped tissue paper having a basis weight of about 4.0 to 20 pounds per ream and a crepe ratio of about 1.1 to 3.0, absorbent material 30 is fluff and absorbent material 31 is a plurality of plies of creped tissue paper having a basis weight of about 4.0 to 7.0 pounds per ream and a crepe ratio of about 1.1 to 2.0, a preferred impregnant for baffle sheet 15a comprises petroleum wax present in an amount of about 4 percent to 16 percent by weight of the baffle sheet. Upon raising this napkin to an elevated temperature of about 220° F. maintained for about 30 minutes, a superior and more effective post-maternity napkin results.

FIGURE 5 shows the effect on degree of bottom staining of the napkin of FIGURES 1 and 3 with variation in percent moisture-repellent. In the tests resulting in the data represented by FIGURE 5, creped paper baffle sheets, measuring 6" long by 2 3/4" wide and the weighing 0.24 gram, were impregnated with varying weights of petroleum wax and then incorporated as baffle sheet 15 into napkins as described in connection with FIGURES 1 and 3. The napkins were subjected to an elevated temperature as above described. The amount of bottom staining resulting under standard test conditions, is from FIGURE 5 seen to vary quite proportionally with percent impregnant in the range from .0 percent to 7 percent, and then hold fairly constant up to 16 percent.

It will be observed that the napkin of the present invention experiences a bottom stain of about 2.8 square inches when the original impregnant was present at 2.1 percent of the weight of the baffle sheet. In contrast, in a conventional napkin wherein the elevated temperature is not employed pursuant to this invention, the same degree of staining occurs with an original impregnant of 16 percent of the weight of the baffle sheet. Thus it is clear

that by means of the present invention a very great and economically important saving in moisture-repellent may be achieved, or a substantial reduction in staining may be achieved, or an advantageous combination of the two may be obtained.

It will be noted that the fluid-repellent material might be applied to an intermediate portion of the main absorbent material itself, rather than to a separately fashioned and emplaced baffle sheet. And if in such application the fluid repellent is applied by spraying, the desired variation in degree of saturation of the absorbent material may be achieved by virtue of the application, without the need for heating or otherwise obtaining dispersion of the repellent.

In addition to the advantages previously described, a sanitary napkin according to this invention exhibits an increased resiliency which is particularly evident as the napkin absorbs moisture, thus tending to reduce collapse of the napkin in use. Greater comfort and security result.

Having now described particular preferred embodiments of this invention, various obvious modifications may occur to those skilled in the art. Accordingly, it is to be understood that limitations upon the invention are intended only as explicitly set forth in the following claims.

What is claimed is:

1. A sanitary napkin comprising a pad-like main body portion of fluid absorbent material having an inwardly positioned fluid control zone extending in the major plane of the body portion and substantially co-extensive therewith, said fluid control zone consisting of a sheet of light weight creped tissue impregnated with a thermoplastic material to an extent to render said sheet fluid repellent but not a total fluid barrier, and immediately adjacent areas of fluid absorbent material having discrete particles of thermoplastic material interspersed therethrough in amounts which diminish outwardly of said sheet, the depth of said zone being substantially less than the depth of said body portion.

2. A sanitary napkin according to claim 1, wherein said sheet comprises a sheet of creped tissue paper of basis weight about 4 to 12 pounds per ream of 2880 sq. ft., and said thermoplastic material comprises petroleum wax in amount of about 1 to 16 percent by weight of the baffle sheet.

3. A sanitary napkin according to claim 1, in which said sheet is of planiform configuration and is positioned substantially medially of the two main surfaces of said body portion and comprises a sheet of creped tissue paper of basis weight about 9 to 12 pounds per ream of 2880 sq. ft., and said thermoplastic material comprises petroleum wax present in amount of about 1 to 3 percent by weight of said sheet.

4. A sanitary napkin comprising an absorbent main body portion including a fluid-repellent baffle layer disposed in a major plane of said body portion and comprising an intermediate layer of body portion material having thermoplastic material dispersed therethrough, said thermoplastic material being present in lesser quantity in the part of said layer most closely adjacent at least one of the main surfaces of said napkin than in a portion of said layer more remote from said one main surface.

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