

DESCRIPTION
ABSORBENT UNITS FOR USE IN ABSORBENT ARTICLES

This invention relates to absorbent units for use in absorbent articles, e.g.

5 disposable diapers including a batt which is constructed and arranged to provide increased strength and absorptive capacity in the crotch region of the diaper, while at the same time providing an improved wicking mechanism for transporting liquid
10 away from an initially wetted area into remote regions of the batt.

 Disposable diapers provide substantial advantages and convenience over diapers intended to
15 be laundered and reused, and in recent years disposable diapers have met with increased success in the marketplace. Typical disposable diaper structures include a moisture retaining layer of relatively high liquid holding capacity sandwiched
20 between a moisture pervious facing layer to be directed against the infant's skin, and a moisture impervious plastic backing sheet to confine moisture within the moisture retaining layer. Such diapers are shown in U.S. Patent No. 3,612,055 to Mesek et
25 al. and in U.S. Patent No. Re: 26,151 to Duncan et al.

 The moisture retaining layer of prior art diapers have typically been comprised of a batt of loosely compacted cellulosic fibers. It has been known to provide such absorbent batts with an
30 integrally formed densified paper-like layer or skin, and U.S. Patent Nos. 3,017,304 to Burgeni and 3,612,055 to Mesek et al. are typical of such constructions. It is also known to provide absorbent batts having a continuous densified paper-like layer

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or skin with longitudinally extending thickened densified regions for directing moisture in a lengthwise direction of the batt, and Repke U.S. Patent No. 3,938,522 is typical of such constructions.

5 It is also known to provide disposable
diapers with reduced width crotch regions to reduce
the bulk and provide improved fit and comfort. Such
diapers are generally I-shaped, T-shaped or hour
glass-shaped, and U.S. Patent Nos. 3,559,648 to
10 Mason, Jr. and 3,768,479 to Widland are typical of
such constructions.

 It is also known to provide absorbent batts
for disposable diapers with increased liquid holding
capacity in the central region of the batt, and
15 heretofore this has been done by providing an extra
batt layer (U.S. Patent No. 3,612,055), depositing
more absorbent material in the mid-portion of the
batt (U.S. Patent No. 3,938,522), or folding over the
side marginal edges of the batt (U.S. Patent No.
20 3,559,648). Such absorbent batts have had inadequate
inherent structural integrity, and have not provided
an adequate wicking mechanism for directing liquid
away from an initially wetted area.

 It would be desirable to provide an
25 absorbent unit for a disposable diaper, or the like,
with increased liquid storage capacity in the central
region thereof, while providing a wicking layer
directly adjacent to the undersurface of the facing
layer in contact with the infant's skin for rapidly
30 directing liquid away from an initially wetted area.
It would also be desirable to provide such a batt
with a wicking mechanism whereby liquid spreading
outwardly would be directed downwardly into lower
portions of the batt remote from the layer in contact
35 with the infant's skin. It would also be desirable

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to provide the mid-portion of such a batt with a strengthening means, so as to provide increased structural integrity, particularly when the diaper is to be worn for a prolonged period of time, such as overnight.

The present invention provides an absorbent unit for use in an

absorbent article comprising: a highly porous, loosely compacted, cellulosic fibrous batt, said batt having formed integrally therewith a paper-like, densified compacted cellulosic fibrous layer, said batt being formed from an initially generally rectangular member having an end portion and a body portion, said body portion including a medial section flanked by a flap section at each side thereof, said flap sections being folded into overlapping relationship with one another, whereby the body portion of said batt includes (1) a first densified layer at one side thereof, (2) a first loosely compacted layer adjacent to said first densified layer, (3) a second loosely compacted layer adjacent to said first loosely compacted layer, (4) a second densified layer adjacent to said second loosely compacted layer, (5) a third loosely compacted layer adjacent to said second densified layer, and (6) a third densified layer at the side of said batt opposite said one side, said inwardly folded flap sections providing increased liquid holding capacity in the body portion of said absorbent batt.

A preferred absorbent unit according to the present invention is an absorbent unit as specified in the last preceding paragraph, said initially generally rectangular member having widened end portions at opposite ends of said body portion, wherein said batt is generally I-shaped, and this shaping of it results from the folding of said flap sections into overlapping relationship with one another.

Where an absorbent unit in accordance with the present invention is a unit for use in an absorbent article constituted by a disposable diaper, the batt desirably is associated with a

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diaper product wherein the other diaper components (the facing and backing layers) are shaped, or contoured, for improved fit about the perineal region of an infant.

In the accompanying Figures:

Figure 1 is a perspective view of a disposable diaper using a unit in accordance with the teachings of the present invention and laid out flat in preparation for application to an infant;

Figure 2 is an exploded perspective view of the disposable diaper of Figure 1, and illustrating the batt in an intermediate step of formation;

Figure 3 is a perspective view of the diaper of Figure 1 as applied to an infant; and

Figure 4 is an enlarged cross-sectional view taken generally along line 4-4 of Figure 1.

While this invention is susceptible of embodiment in many different forms, there is shown in the drawing and will herein be described in detail a preferred embodiment, with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiment illustrated. The scope of the invention will be pointed out in the appended claims.

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Referring now to the drawings, the disposable diaper, shown at 10, includes a facing layer 12 formed of a moisture pervious material, and arranged to be positioned adjacent to the infant's skin. Diaper 10 further includes a moisture impervious outer layer 16 substantially coextensive in external dimension with facing layer 12. Sandwiched between outer layers 12 and 16 is an absorbent unit 14 which is smaller in external dimension than outer layers 12 and 16, and which is disposed symmetrically with respect thereto. Absorbent unit 14 may be secured to backing sheet 16 by spaced, parallel glue lines, and layers 12 and 16 may be secured to one another outwardly of batt 14 by such glue lines, as is well understood by those skilled in the art.

Securement means is provided for releasably attaching the diaper 10 about the perineal area of the wearer, and such securement means may take the form of tape tabs 18 secured to backing sheet 16 at one end thereof, as is also well known to those skilled in the art.

As can be best seen in Figure 1, batt 14 of Figures 1-4 is generally I-shaped. Batt 14 includes relatively wide end portions 20 and 22 connected by a relatively narrow central portion 24. Central portion 24 is arranged to be disposed in the crotch area of the wearer, and includes a plurality of thicknesses, or layers, to provide increased absorptive capacity in the crotch region. With reference to Figure 2, central portion 24 includes a pair of side flap portions 26 at opposite sides of a medial portion 28. Side flap portions 26 are defined by lines of cutting 30 which extend inwardly from the side marginal edges of batt 14, and in the

illustrated embodiment, batt 14 is initially a generally rectangular member, with cutting lines 30 being parallel to one another and to the end portions of the batt. Cutting lines 30 may be disposed at an angle with respect to one another and with respect to the side edges of the batt 14. Similarly, cutting lines 30 could be curved, if desired. Cutting lines 30 extend about 1/3 of the width dimension of the batt 14, so that side flaps 26 and medial portion 28 have substantially the same dimension. As is evident by comparing Figures 2 and 4, batt 14 is given its I-shaped configuration by folding side flaps 26 inwardly into overlapping relationship with one another.

Several different types of facing materials may be used, for example, the facing may be a non-woven web made of a mixture of fibers consisting predominantly of inexpensive, short, cellulosic fibers such as short wood pulp fibers or cotton linters in amounts of 75 percent to 98 percent, the balance being textile length fibers such as rayon as described in U.S. Pat. No. 3,663,348 to Liloia, et al.

Non-woven facing materials suitable for use in disposable diapers like the diaper 10 can have fabric weights in the range of from 0.5 to 5 ounces per square yard^a and densities of less than 0.15 g/cc., generally in the range of 0.05 to 0.1 g/cc. The dry strength of the facing sheet for a fabric having a weight of about 1.5 ounces per square yard^b is at least 0.15 lbs. per inch^c of width in the machine direction and at least 0.1 lb. per inch^d of width in the cross direction. Such fabrics have good elongation, loft, softness, and drape characteristics. Facings may also be made of an apertured non-woven fabric which is formed, for

^a17 to 170 g/m². ^b50.9 g/m². ^c26.8 g/cm. ^d17.9 g/cm.



example, in accordance with the teachings of commonly assigned U.S. Pat. Nos. 2,862,251; 3,081,514; and 3,081,515. Furthermore, facings may also be made from other types of fabric such as those disclosed and described in U.S. Pat. No. 3,485,706 to Evans. Such facings can be made of naturally occurring fibers, synthetic fibers or blends thereof. Typical facing sheets made of polyester type fibers may have a weight of about 0.75 ounces per square yard^e.

In addition, facings may be made from non-apertured materials such as non-woven isotropic webs or apertured polyolefin or polyester films having the desired moisture permeability. In all of the aforementioned facings, the materials should be relatively hydrophobic so as to retard wicking within the facing.

A suitable backing material for the disposable diapers embodying the present invention can be an opaque polyolefin; for example, polyethylene about 0.001 inch^f thick. Another suitable material for this purpose is polyethylene terephthalate having a thickness of about 0.005 inch^g.

The absorbent batt 14 preferably is formed of loosely compacted short cellulose fibers, such as wood pulp fibers, or cotton linters, or mixtures thereof, which primarily are held together by interfiber bonds requiring little or no added adhesive, as is known in the art. Briefly, these batts are a low bulk density coherent web of loosely compacted cellulose fibers, preferably comminuted wood pulp fibers, in the form of so-called "fluff."

The term "short fibers" as used herein, refers to fibers less than $1/4$ inch^h in length, in contrast to "long fibers" or "textile length fibers" which are longer than $1/4$ inch^h.

^e25.4 g/m². ^f0.00254 cm. ^g0.0127 cm. ^h0.635 cm.

and generally are $\frac{1}{2}$ to $2\frac{1}{2}$ inches in length.

The batt 14 of Figures 1-4 includes a paper-like, densified compacted cellulosic fibrous layer 34 of relatively high wettability and relatively high fluid retentivity integral with the batt on the side thereof in contact with the backing sheet 16. The paper-like densified layer 34 is formed by slight moistening of one surface of the batt followed by the application of pressure thereto. This densified layer 34 provides a wickability gradient to draw urine from the more loosely compacted cellulosic fibrous layer into the densified layer. The densified layer is described in more detail in Burgeni U.S. Patent No. 3,017,304.

The composite density of the absorbent batt is preferably above 0.07 gm/cc. and more preferably 0.10 to 0.15 gm/cc. The foregoing density values are applicable to the diaper as produced. In storage and handling, the loft or thickness of the batt is increased to some extent, resulting in lower densities.

Densified layer 34 preferably includes regions of increased dimensions in the thickness direction of layer 34, for adding strength to the batt 14 and providing a further wicking mechanism. Such regions are shown at 36 in Figure 4 as parallel longitudinally extending spike-like densified portions.

Such regions may be formed in accordance with the teachings of U.S. Patent No. 3,938,522.

When the side flap sections 26 of a batt of the type described above are folded into overlapping relationship with one another, as is best seen in Figure 4, a unique and highly advantageous batt

J 1.27 to 6.35 cm.



structure is produced. In this regard, the central portion 24 of the batt includes a first densified layer 34a secured to backing sheet 16, a first loosely compacted layer 28a above layer 34a, a second
5 loosely compacted layer 26a above layer 28a, a second densified layer 34b above layer 26a, a third loosely compacted layer 26b above densified layer 34b and a third densified layer 34c adjacent to, and in contact with, the undersurface of facing 12. Densified
10 bridging portions 34d and 34e connect densified layers 34a and 34c, and 34a and 34b, respectively.

The densified layer 34 adds sufficient stiffness to the panel 14 to make it practical to form cutting lines 30 on a high speed production
15 basis, and also provides sufficient integrity to the batt to enable the side flaps 26 to be folded into overlapping relationship with one another. The densified layers 34a, 34b and 34c, together with thickened lines 36 integral therewith, provide a
20 wicking network for transmitting liquid rapidly toward unwetted remote portions of the batt. Bridging portions 34d and 34e provide a mechanism for directing liquid downwardly toward the lower portion of the batt 14. Loosely compacted layers 26a, 26b
25 and 28a provide a reservoir for increased liquid storage capacity in the central or crotch region of the diaper.

In use, the disposable diaper is applied to the baby by laying out the diaper on a single flat
30 surface and placing the baby thereon. The waist underlying end of the diaper is that end having the fastener means and the other end of the diaper extends downwardly between the baby's legs. Next, the downwardly extending edge of the diaper is
35 brought up between the baby's legs to a position

covering the perineum and contiguous with the front
portion of the baby's waist. The diaper thereafter
is secured to the baby by placing the corners of the
waist portion of the abdomen covering end as far
5 around the baby's waist as they will go and by
bringing the corners of the underlying end of the
diaper into an overlapping relationship with the
aforementioned corners so that the diaper snugly
encircles the baby's waist and provides a custom
10 fit. The adhesive tape fasteners are then prepared
for use and the diaper is secured in a desired
position by simply urging the pressure-sensitive
adhesive surface of the tape tab in contact with the
adjacent outer surfaces of the opposite corner of the
15 diaper.

We draw attention to our Application
No.84.30299 (2150815), relating to a "Disposable
Diaper with Folded Absorbent Batt", from which the
20 present Application has been divided out.

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CLAIMS



1. An absorbent unit for use in an absorbent article comprising: a highly porous, loosely compacted, cellulosic fibrous batt, said batt having formed integrally therewith a paper-like, densified compacted cellulosic fibrous layer, said batt being formed from an initially generally rectangular member having an end portion and a body portion, said body portion including a medial section flanked by a flap section at each side thereof, said flap sections being folded into overlapping relationship with one another, whereby the body portion of said batt includes (1) a first densified layer at one side thereof, (2) a first loosely compacted layer adjacent to said first densified layer, (3) a second loosely compacted layer adjacent to said first loosely compacted layer, (4) a second densified layer adjacent to said second loosely compacted layer, (5) a third loosely compacted layer adjacent to said second densified layer, and (6) a third densified layer at the side of said batt opposite said one side, said inwardly folded flap sections providing increased liquid holding capacity in the body portion of said absorbent batt.



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2. An absorbent unit as set forth in claim 1, said initially generally rectangular member having widened end portions at opposite ends of said body portion, wherein said batt is generally I-shaped, and this shaping of it results from the folding of said flap sections into overlapping relationship with one another.

3. An absorbent unit as claimed in claim 1, substantially as described with reference to the accompanying Figures 1, 2 and 4.
