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MacDonald et al.

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[54] **STABILIZED ABSORBENT PAD**

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[52] **U.S. Cl.** **128/284**

[51] **Int. Cl.** **A61f 13/18**

[58] **Field of Search** 128/284, 287, 290, 296

[56] **References Cited**

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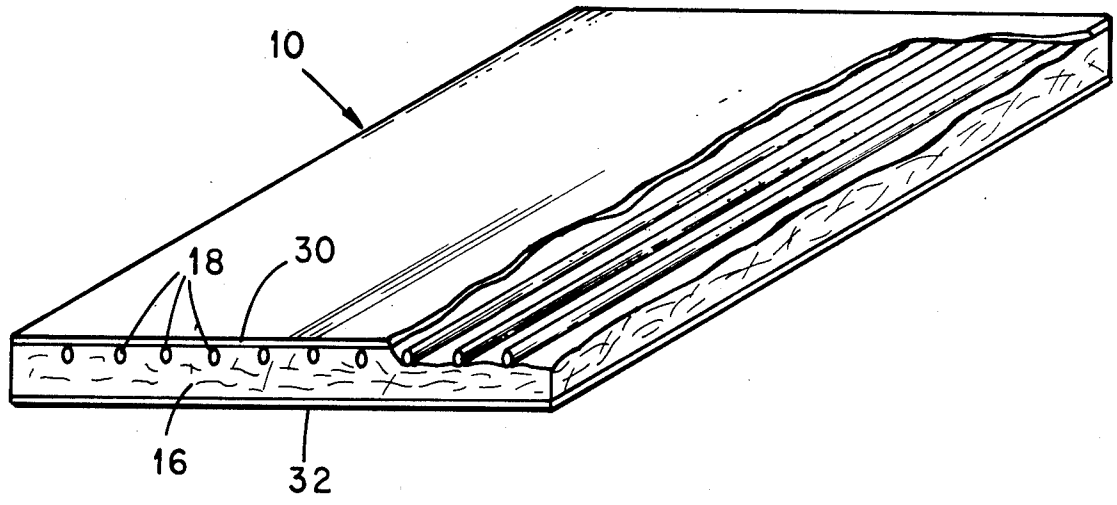
[57] **ABSTRACT**

An absorbent pad comprising fluff that is stabilized against slumping or lumpiness by means of a plurality of filaments incorporated into the pad with a network of adhesive bonds.

3 Claims, 5 Drawing Figures



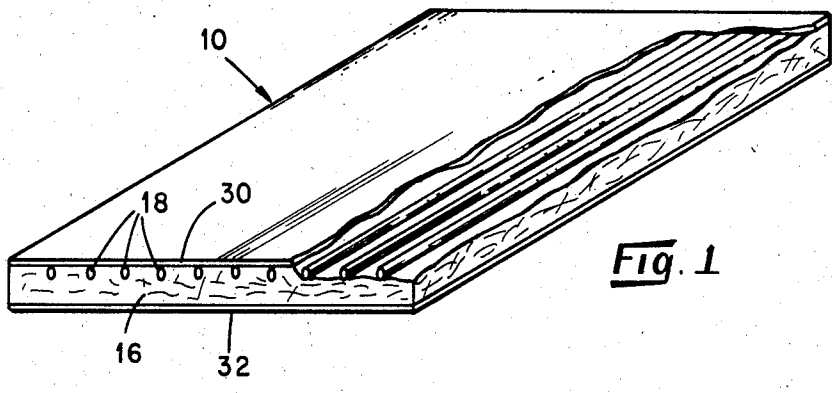


Fig. 1

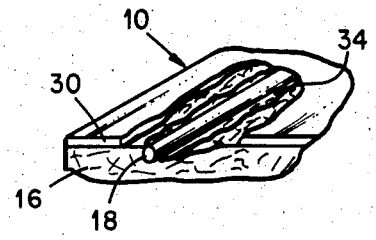


Fig. 2

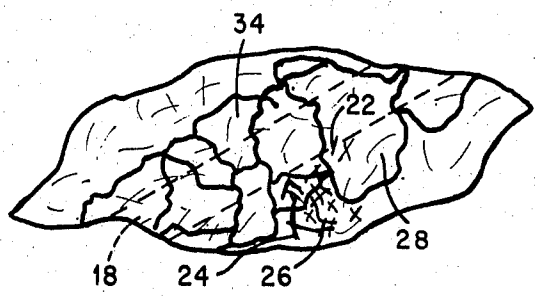


Fig. 3

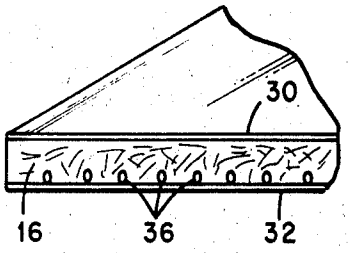


Fig. 4

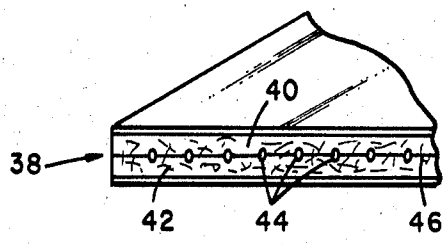


Fig. 5

STABILIZED ABSORBENT PAD

This invention relates to absorbent pads, particularly pads useful in absorbing exudate from the human body.

Absorbent pads are used in such items as surgical dressings, sanitary napkins, disposable diapers, and the like. In each of these items, the pad is expected to maintain its position with respect to the human body and readily receive and absorb exudate. These pads are commonly secured to the body by means such as nether garments, straps, tapes, or the like.

Defibrated wood fibers, referred to in the art as fluff, frequently are used in such pads. In the manufacture of an absorbent pad employing wood fibers, one technique includes air laying the fibers upon a foraminous substrate to build up a pad of the desired contour and thickness. In accordance with this technique, the fibers are randomnly deposited onto the foraminous substrate to mechanically interlock one with the other to give the pad integrity. The fiber to fiber relationship of the fluff is one of loose association between fibers so that the pad possesses very little integrity. One such manufacturing procedure is disclosed in U.S. Pat. No. 3,598,680 issued Aug. 10, 1971 to C. A. Lee. This patent also discloses one kind of fluff pad. Copending application Ser. No. 174,092, now U.S. Pat. No. 3,717,905, filed Aug. 31, 1971, Inventor: Warren R. Furbeck, discloses a further fluff pad.

When applied to a human body, such a pad as that described above is caused to work by reason of the normal body movements. This working of the pad results in the fibrous material migrating within the pad. Such migration is especially evident when the pad is wetted as by liquid exudate. In many absorbent pads, the absorbent material is disposed between sheets that support the pad and prevent it from falling apart. Disposable diaper pads frequently are so constructed. In use, the weak fiber-to-fiber association is insufficient to keep the pad together so that fibrous material slumps within the pad toward the lowest point in the pad. When the pad is used in a disposable diaper, for example, the fluff tends to migrate from the waist area toward the crotch area as the child moves during its normal activities. When this same diaper becomes wetted as by a urinary discharge into it, the fibers that absorb the urine become heavier than the dry, or drier, fibers. The moisture also appears to reduce the mechanical association of the fibers. In any event, the wetted fibers tend to form into lumps or agglomerates of fibers, some of which are sufficiently large as to cause discomfort to the child. Such slumping and lumpiness also reduces the desired absorptive properties of the pad for receiving further exudate and promotes leakage of exudate.

It is an object of the present invention to provide a fibrous absorptive pad which is stabilized against migration of the fibrous material therein. It is a further object of the invention to provide an absorptive pad comprising fluff which is held in its relative position within the pad by means of a network of bonds between the fibers of the fluff and a plurality of filaments incorporated in the pad.

Further objects and advantages of the invention will be recognized from the following description, including the drawings, in which:

FIG. **1** is a representation of an absorbent pad embodying various features of the invention;

FIG. **2** is a fragmentary, partly cut-away, view of one corner of the adsorbent pad shown in FIG. **1**;

FIG. **3** is an enlarged fragmentary representation of a portion of an absorbent pad including various features of the invention and showing filaments having adhesive associated therewith;

FIG. **4** is a fragmentary representation of a further embodiment of the absorbent pad; and,

FIG. **5** is a fragmentary representation of a still further embodiment of the absorbent pad.

Stated generally, the absorptive pad disclosed herein comprises a plurality of defibrated cellulosic fibers randomly accumulated to define the pad. A plurality of elongated filaments are incorporated into the pad in a manner which anchors many of the fibers in the pad to the filaments so that the pad is stabilized against slumping and/or lumpiness. The filaments are spaced apart from each other and each bears adhesive which extends from the filament into the fibrous material of the pad to contact and bond individual fibers to the filament. These bonds act to join the fibers of any given portion of the pad to that part of the filament in such portion so that such fibers are not free to migrate away from the filament. The unitary filament extends from one portion of the pad into the other portions of the pad. In each portion, the fibers are bonded to the filament so that the filament serves as an elongated anchor extending into and tying together many portions of the pad. Other portions are tied together by other filaments. In short, the filaments and network of adhesive function to anchor individual fibers and to maintain the anchored fibers in their proper position within the pad, thereby integrating and stabilizing the fibrous material within the pad.

The present inventors have found that both slump and lumpiness can be effectively reduced or substantially eliminated by incorporating into a fluff pad **16** a plurality of elongated filaments **18** that are bonded within the pad by a network of bonds that stabilizes the fibers against migration. The bonds between each filament **18** and those fibers adjacent to the filament establish a network of bonds wherein those fibers **22** closest to the filament **18** are effectively held in position next to the filament such that the fibers do not migrate away from the filament. A major portion or all of each of these fibers may be embedded in the adhesive so that they are well anchored to the filament. Those fibers **24** that are slightly more distant from the filament are less effectively held but are anchored to the filament **18** sufficiently to reduce their tendency to migrate away from the filament. Fibers **26** that are further away from the filament **18** also have a reduced tendency to migrate inasmuch as they are mechanically interlocked with a number of fibers which, in turn, are securely bonded to the filament. The anchorage of individual fibers to a filament thus is transferred, albeit to a lesser degree, to fibers that are out of direct contact with the adhesive. This pattern of reducing fastness of attachment of the fibers to a filament as a function of their distance from the filament is repeated with each filament. Accordingly, the spacing of filaments within the pad is chosen so that the fiber bonding afforded by one filament commences after the fiber bonding of an adjacent filament has dropped away substantially or has ceased to be an effective force. This network of bonds is desirable for

the reason, among other, that it provides good retention of the fiber distribution in the pad. Importantly, the network of bonds is open to the extent that flow of liquid exudate into and within the pad is not reduced unacceptably, but rather the spacing between adjacent fibers, their alignment, and the distribution of adhesive are selected to minimize interference with the desired flow of liquid exudate to and within the pad.

As used herein, the term "filament" is intended to include natural or synthetic fiber threads such as threads formed from stable length textile fibers, synthetic fibers of stable length, or twisted synthetic filaments. It is preferred, however, to use twisted fibrous threads as the filaments referred to herein. These filaments readily receive the adhesive in the spaces between the fibers of the filament, thereby serving as good carriers for the adhesive to develop good bonding between the pad fibers and the filament. Such twisted filaments are soft and flexible so that their presence in the pad does not detract appreciably from the desired softness and flexibility of the pad.

With reference to the Figures, in FIG. **1** there is shown an absorbent pad **10** comprising a quantity of fibrous material collected in a manner that defines the pad outline and contour.

One suitable fibrous material comprises cellulosic fluff **16,** the fibers of which have a length less than about three-eighths inch and which are derived by divellication of a wood pulp batt into individual fibers, or as nearly so as possible. These divellicated fibers are accumulated in pad form as by air laying the fibers onto a foraminous substrate. When accumulated into a pad such as that depicted in FIG. **1,** the fibers are randomly oriented within the pad and are mechanically interlocked one with another to the extent at least that the pad is self-supporting. In general, this means that the pad will not fall apart nor will the fibers shift relative to one another when the dry pad is held without movement. The interfiber bonds between the fibers in the fluff are such however, that working of the fibers relative to each other frees the fibers and causes the pad to disintegrate. The fluff pad is commonly enclosed to permit handling of the fluff without it disintegrating. One suitable means for thus enclosing the fluff is to sandwich it between sheets **30** and **32** of a material which is pervious to liquids but which provides support to the fluff and inhibits the escape of loose fibers. Tissue sheets having a basis weight of between about 7 and 15 pounds per ream of 2,880 square feet serve satisfactorily in this function. These sheets **30** and **32** provide sufficient support to the fluff **16** so that it can be handled, as during assembly of the fluff pad into a disposable diaper.

The filaments **18** in the depicted embodiments lie generally straight and parallel. This orientation of the filaments has been found satisfactory and amenable to high-speed manufacturing processes. It is recognized however, that the filaments may extend in the transverse, longitudinal or diagonal dimensions of the pad or in a combination of these. Also, the filaments may extend through the fluff in serpentine fashion.

The filaments desirably are not so large as to stiffen the pad unacceptedly or to produce undesirable bulges, ridges or the like in the pad. Synthetic fibrous filaments or synthetic multifilament filaments having a denier between about 100 or 200 provide anchoring ties for the pad. Textile filaments of between about 30 and 100 Tex also are suitable for use in the pad as disclosed herein. Cotton filaments have been found particularly suitable due to their receptivity for the preferred adhesive, their relative softness, flexibility and low cost. Seventy Tex cotton filaments are preferred in that they supply the desired strength and are not so large as to introduce discomfort or unsightliness in the product.

Various adhesives provide acceptable bonds between the fluff fibers and the filaments. Preferably, the adhesive is of the cold, water-soluble type such as polyvinyl acetate or polyvinyl alcohol and others. These adhesives bond the filaments and fibers as described above but do not introduce harshness to the pad. They also permit more complete disintegration of the pad during its disposal after use. Further, these adhesives are compatible with the environment existing in fluff manufacturing and handling where volatile or flammable solvents present unacceptable hazards.

In accordance with one embodiment of the disclosed absorbent pad **10,** the fluff **16** is formed into a generally rectangular pad having a plurality of individual spaced apart aligned filaments **18** extending generally along the length of the pad. As depicted in FIGS. **1, 2** and **3,** each of the filaments **18** is provided with a quantity of adhesive **34** that extends from the filament into the fibrous material adjacent to the filament. The tentacular-type spreading of the adhesive from the filament into the fibrous pad results in an effective bond between the filament and those fibers **22** contiguous to the filament. Other fibers **24** more distant from the filament are only partially anchored to the filament through the adhesive tentacles **34.** Still other more remote fibers **26** are not directly contacted by the adhesive but are mechanically interlocked to the fibers which are either directly or substantially directly adhered by the adhesive **34** to a filament **18.** As noted before, the bonds between the fibers and each filament act to join the fibers of any given portion of the pad to that part of the filament in such portion. The filament functions to join each portion of the diaper to other portions of the pad into which the filament extends.

In addition to the bonding between the fibers and a filament, the adhesive **34** also anchors the filament, in one embodiment, to the tissue cover sheet **30** and the absorbent pad. In this manner, each filament is anchored along its length to both the fibrous material of the pad and to the integral tissue cover sheet so that the filament is less subject to movement within the pad.

In one embodiment, **70** Tex cotton filaments were passed into a bath of polyvinyl chloride adhesive from which each was withdrawn through a 1/16 inch diameter hole in the bath tank. This resulted in the deposition of about one-half gram of adhesive on each 140 inches of filament length. These adhesive-bearing threads were overlaid on a fluff pad and covered with a tissue web. This assemblage was compressed to the extent that adhesive spread from each filament into the fluff. In one embodiment of an absorbent pad for a disposable diaper, the compression was sufficient to spread the adhesive from the filament as much as about ¼ inch radially from the filament surface. In a diaper pad 12 inches wide, these filaments were spaced about 1 inch apart, commencing about 1½ inches inwardly from a side edge of the pad. This spacing was found to be sufficient to effectively eliminate objectionable slumping or lumpiness in the diaper pad. Other spacings and spread of the adhesive can be used, depending upon the antici-

pated propensity of the fibers to migrate and the degree of anchoring necessary to forestall such.

Additional embodiments of the disclosed absorptive pad are depicted in FIGS. **4** and **5**. In FIG. **4**, the elongated filaments **36** are disposed in that portion of the fluff pad **16** adjacent the bottom tissue sheet **32** as opposed to the upper position of the filaments **18** as shown in FIG. **1**. In the embodiments shown in FIG. **4**, there is offered the advantage of having the filamentary material disposed away from the body of the wearer. In general, this does not constitute a serious problem when employing filaments of relatively small diameter but it is to be recognized that larger filaments may be employed which might induce discomfort if present next to the body of a wearer. In FIG. **5**, there is shown an absorptive pad **38** wherein the pad comprises two layers of fluff **40** and **42** that are overlayed with reinforcing filaments **44** disposed at the interface **46** between the two fluff layers **40** and **42**. It will be recognized that other positions or combinations of positions of the filaments within the absorptive pad are permissible and in fact may be desirable such as when it is desired to provide maximized stabilization of the fluff within the pad. This latter objective may be accomplished by providing filaments on both the top and bottom of the fluff pad and/or by providing filaments in the center of the pad as well as on one or more of the opposite flat surfaces of the pad.

In a further embodiment, the filaments **18** may extend beyond the side or end edges of the pad **10**. Inasmuch as these filaments bear adhesive, those portions which extend beyond the pad edges are useful in bonding together sheets of material between which the pad may be disposed. For example, the tissue sheets **30** and **32** may be made wider and/or longer than the fluff **16** so that such sheets extend beyond the edges of the fluff to form an envelope for the fluff. By extending the filaments beyond the fluff edges, and between the two tissue sheets, the adhesive-bearing filaments serve to bond the tissue sheets to each other at spaced apart locations along the edges of the fluff and aid in preventing escape of the fluff.

What is claimed is:

1. A stabilized absorbent pad comprising a quantity of wood fibers defining said pad,

a plurality of filaments spaced apart from each other and extending from portion to portion of said pad,

water soluble adhesive interposed between each of said filaments and adjacent fibers, said adhesive and filaments defining a bond network wherein the tenacity of adhesion of said fibers to a filament decreases as a function of their proximity to said filament and wherein those fibers in one portion of said pad that are adhesively connected to a particular filament are further connected through said filament to such other portions of said pad to which said filament extends thereby stabilizing said pad against migration of said fibers within said pad.

2. The absorbent pad of claim **1** and including a tissue sheet disposed on at least one flat side of said pad, and wherein said filaments are bonded to said tissue sheet.

3. An absorbent pad comprising

a first tissue sheet,

a plurality of wood fibers divellicated from a pulp batt and air laid in random orientation upon said tissue sheet to define said pad, said fibers being mechanically associated one with another by a force insufficient to withstand the normal working of said pad when in use,

a plurality of fibrous filaments spaced apart from each other extending from portion to portion of said pad,

water soluble adhesive extending tentacularly from each of said filaments into said pad by a distance less than about ¼ inch as measured radially from the longitudinal axis of a filament, said adhesive and filaments defining a bond network wherein the tenacity of adhesion of those fibers disposed between adjacent spaced apart filaments to one of said filaments generally decreases as a function of the proximity of such fibers from its closest filament so that said fibers are anchored to a filament and those fibers in one portion of said pad that are anchored to a particular filament are further connected through such filament to such other portions of said pad to which said filament extends thereby stabilizing said pad against migration of said fibers within said pad.

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