

# United States Patent

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[56]

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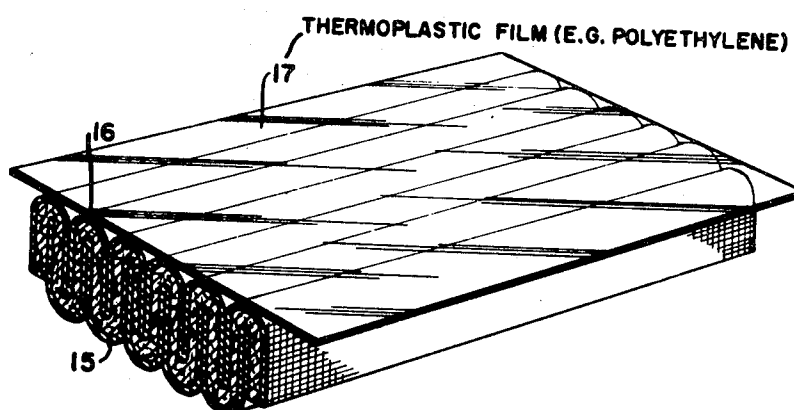
[54] **ABSORBENT ACCORDION-PLEATED SHAPED  
PAD WITH BACKING SHEET**  
18 Claims, 6 Drawing Figs.

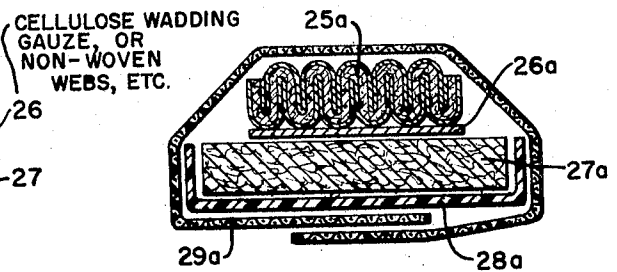
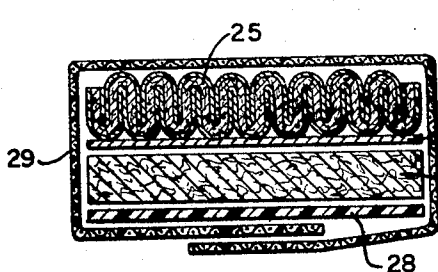
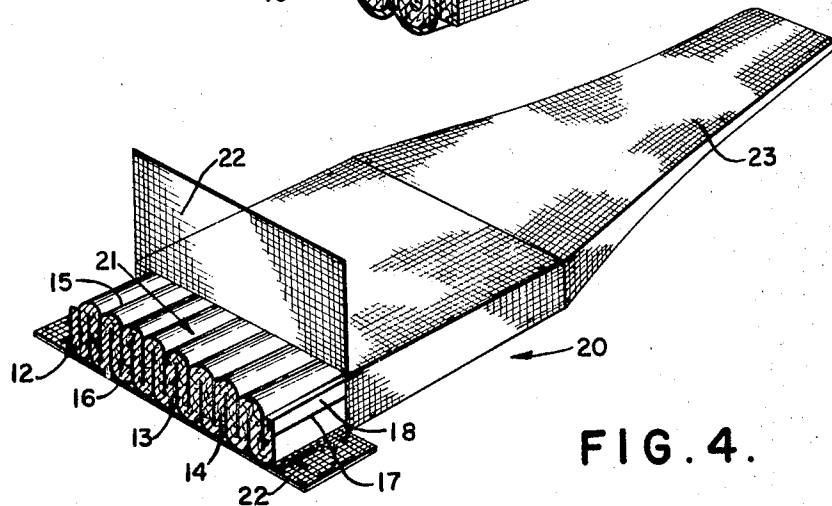
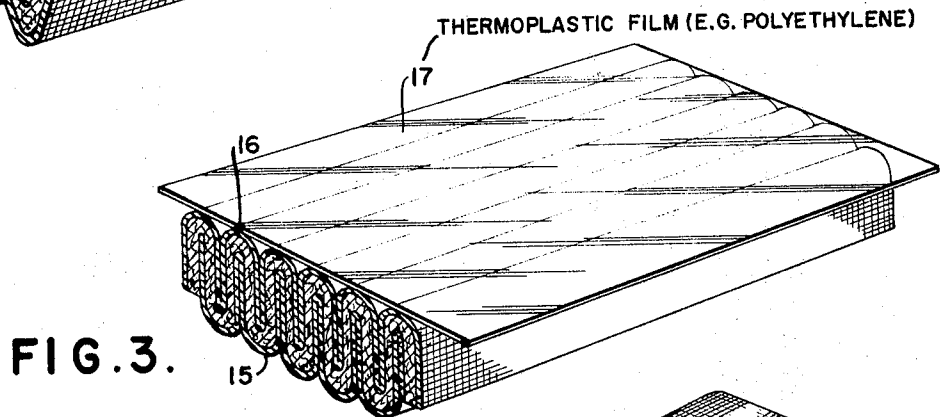
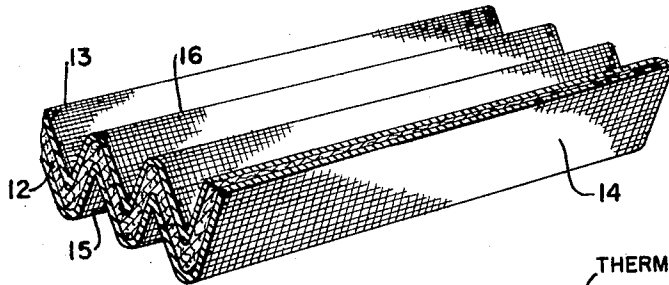
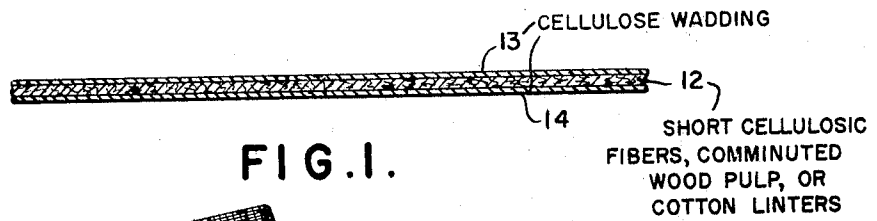
[52] U.S. Cl..... 128/290

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296, 284, 287, 156; 19/144.5, 145

**ABSTRACT:** An absorbent element for sanitary napkins or the like consisting of an accordion-pleated pad formed from a thin layer of absorbent fibers faced on each side with sheets of absorbent cellulose wadding. The pleats are secured in their folded configuration by having the peaks of the folds on one side of the pad attached to an anchoring sheet.





# ABSORBENT ACCORDION-PLEATED SHAPED PAD WITH BACKING SHEET

## BACKGROUND OF THE INVENTION

Sanitary napkins having absorbent elements comprised primarily of fluffed wood pulp or other short cellulosic fibers such as cotton linters have been known in the art for many years. Short fibers of such types are highly desirable for use in absorbent elements because the fibers are relatively inexpensive, have high bulk and volume, and have high fluid absorption capacity. However, fibrous bodies made from fluff in thicknesses suitable for use as sanitary napkins have low cohesive and tensile strength; do not retain their shape and bulk when wetted; have poor internal fluid transfer capabilities; and have low retentivity for absorbed fluids. As a result, when fluff has been used in sanitary napkins, it has been common practice to incorporate along with the fluff other more expensive components such as multilayer cellulose wadding, compressed fiber strips, bonded webs, gauze and the like, to give the napkin better structural form and stability, and also to improve fluid flow and absorbency characteristics.

The present invention utilizes short-fibered cellulosic fluff as the main component of an absorbent element for absorbent pads, arranging the fluff in a manner to give the resulting element improved structural form and better absorbency characteristics.

## SUMMARY OF THE INVENTION

In a preferred embodiment of the present invention, comminuted wood pulp fibers or cotton linters, commonly known as fluff, are formed into a thin, tenuous layer. Thin sheets of absorbent cellulose wadding are placed in contact with the top and bottom of the tenuous fluff layer, and the laminate thus formed is then folded back and forth upon itself in zig-zag folds. The fold lines are parallel to each other and equally spaced so that the pleats thus formed are of equal width. Such pleats are commonly known as accordion pleats. The surface of the pleats between fold lines are urged against each other into face-to-face contact to form a pleated pad of substantial thickness. While the faces of the pleats are held in contact with each other, a flat sheet of material is placed against the folds formed on one side of the pad, and the sheet is secured to the peaks of substantially all of the folds on that side along their entire length. Attachment of the sheet to the peaks of the folds, binds the pleats together in their vertical upstanding condition, and prevents the pleated pad from expanding transversely. The pad, thus assembled, may be used as the complete absorption element in a sanitary napkin, diaper, hospital pad, bandage or the like, or it may be combined with other absorbent components to form a composite unit. The depth, width, and length of the pleated element is readily adaptable to the particular requirements of its end use, and for cooperative association with other components.

It is the principal object of this invention to provide for use in sanitary napkins and similar absorbent devices, an absorbent element of improved structure in which a major portion of the absorbent fibrous material in the element comprises shortfibered fluff.

Another object is to provide an absorbent element of cellulosic fluff having improved structural stability.

An additional object is to provide an absorbent element of cellulosic fluff having improved fluid flow and absorbency characteristics.

Other objects and advantages of the invention will be understood by reference to the following specification and accompanying drawings wherein there is described and illustrated selected forms of the invention.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a sectional view of one form of the laminated fibrous sheet from which the absorbent element of this invention is formed.

FIG. 2 is a perspective view illustrating a portion of the laminate of FIG. 1 which has been folded into a zig-zag configuration preparatory to forming the pleated absorbent element of this invention.

FIG. 3 is a perspective view illustrating one form of a portion of a pleated element made in accordance with this invention.

FIG. 4 is a perspective view, partially in section, and partially cut away, showing a sanitary napkin incorporating in its construction one form of the absorbent element of this invention.

FIG. 5 is a sectional view showing another sanitary napkin construction.

FIG. 6 is a sectional view showing still another sanitary napkin construction.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

As indicated above, fibrous bodies consisting of comminuted wood pulp fibers or short cotton linters are highly desirable for use as absorbent elements in sanitary napkins and similar absorbent devices, but have certain disadvantages including poor wet bulk characteristics, low tensile strength, and poor fluid transfer. Accordingly, when fluff is used in pads for fluid absorption purposes, structural modification in the way of reinforcing materials and flow control devices is required if fluff elements are to perform efficiently. The present invention provides such improved structure and flow control to enable better utilization of the desirable properties of fluff when used for fluid-absorbing purposes.

Referring now to FIG. 1, layer 12 represents a thin layer of airlaid fluff approximately 0.2" thick in its unloaded, uncompressed condition. 13 and 14 are thin sheets of cellulose wadding of the type and weight commonly used in sanitary napkins. The cellulose wadding layers 13 and 14, serve to confine the short cellulosic fibers in batt 12 to keep them from dusting and also give batt 12 some coherent tensile strength.

To form the element of this invention, the thin laminated batt of FIG. 1 is first folded back and forth upon itself into a zig-zag configuration such as is shown in FIG. 2. Alternate folds 15 at the bottom and 16 at the top are equally spaced from each other so that the reaches of the laminated web between fold lines 15 and 16 are of equal depth, and at this stage, resemble accordion pleats.

The accordion-pleated folds shown in FIG. 2 are then urged closer together with their sides in vertical upstanding alignment to give the final configuration shown in FIG. 3, wherein the reaches of the laminated batt between fold lines 15 and 16 are juxtaposed in face-to-face association. While held in this face-to-face association, a thin sheet of flat material 17 is applied to the peaks of the folds on one side, in this case folds 16, and secured to the peaks of the folds along at least a major portion of their length. In the embodiment shown, sheet 17 is represented as a thin thermoplastic film such as polyethylene, and the attachment to fold lines 16 is accomplished by heat sealing or fusion of the film thereto. Other permeable or non-permeable sheet materials may be used to anchor the folds depending on the end-use requirements, and the attachment may be obtained by adhesive means other than by thermoplastic adhesion.

After the laminate has been zig-zag folded, pressed together transversely to vertically align the folds, and fastened to an anchoring sheet as shown, the element is ready for use in an absorbent pad.

In the embodiment illustrated in FIG. 4 there is shown a sanitary napkin 20 comprising an elongate absorbent body 21 enveloped by a fluid pervious wrapper 22 which extends beyond both ends of the pad to provide tabs 23 for fastening purposes. As in conventional pads, fluid pervious wrapper 22 may consist of woven gauze, non-woven scrim, perforated non-woven fibrous webs, bonded fiber webs, or the like.

Absorbent body 21 is made in accordance with this invention and comprises a thin fluff layer 12 enclosed in a top and

bottom sheet of thin cellulose wadding 13 and 14 respectively, folded into a zig-zag pleated configuration along fold lines 15 and 16, with one set of fold lines, i.e., 16, heat-sealed to thermoplastic film 17. The lateral edges of film 17 are also shown as extending up the sides of the outer folded portion 18.

A sanitary napkin of this construction has highly directional pore orientation which is very desirable for controlled flow spreading. Deep channels between folds forming the pleats extend substantially the full depth of the pad and run the entire length of the napkin, helping to transfer accepted fluid away from the surface and distributing the fluid primarily in the length direction of the pad. Such a flow pattern provides for maximum utilization of the absorbent capacity of the fluff filler in each pleat from the point of fluid entry while delaying migration of fluid to the adjacent pleat and to the side edges of the pad. The cellulose wadding between folds provides stronger capillary forces than the fluff and helps in distributing the fluid in the length direction before substantial sideways transfer of fluid to the fluff occurs.

The channels between the folded layers in the pleated pad provide considerably larger channels than those usually provided by the crepes in flat multi-ply creped wadding structures now commonly used in pads. These larger channels are instrumental in providing better capillary migration within the pad, especially when the absorbed fluids have the high viscosity usually associated with menstrual fluids, blood and other fluid discharges from the body.

The pleated structure also has more stability against collapse under compression when wet due to the vertical arrangement of the cellulose wadding plies between folds, and the anchoring of a stabilizing sheet to the pleats at the bottom of the pad. Such anchoring prevents the pleats from spreading transversely under compressive load.

In the embodiments illustrated in FIGS. 3 and 4, the stabilizing sheet 17 comprises an impervious film, which also acts as a baffle along the bottom and side-edges to prevent fluid leakage at these points. The use of plastic film for baffle purposes in absorbent pad constructions is, of course, well-known in the art.

In FIGS. 5 and 6 the stabilizing sheet 26 and 26a respectively comprises a fluid pervious material, since other absorbent elements are disposed below the pleated element, and it is desirable for the fluid absorbed by elements 25 and 25a to eventually transfer to these other elements.

In the modified sanitary napkin construction shown in FIG. 5, pleated element 25 is used as one component in a multi-component pad, and therefore need not be as thick as element 21 in the FIG. 4 embodiment. Anchoring sheet 26 to which the bottom folds of the element 25 pleats are attached to is a pervious absorbent material such as cellulose wadding, gauze, or the like, to permit accepted fluids in the pleated element to transfer downward still further into a more conventional absorbent body 27 which may comprise fluff or multiple layers of cellulose wadding or the like. Fluff, of course, is preferred as the major fibrous component in element 27 because of its low cost. However, minor amounts of other longer fibers, either natural or synthetic, may be used to give the batt better integrity and resilience. Below absorbent body 27 there is disposed an impervious bottom layer 28 of thin polyethylene film or the like to act as a baffle. The multi-component pad is wrapped by the usual fluid-pervious wrapper 29. In this multi-component embodiment, the pleated element 25 is used to provide the pad with a firmer structural body, as well as to provide more efficient fluid distribution, as previously described.

FIG. 6 shows another modification wherein the pleated element 25a, stabilized by anchoring sheet 26a, is of less width than the main absorbent pad 27a, and preferably is also of less length. As in FIG. 5, anchoring sheet 26a in this embodiment is again a fluid pervious material. Also as in FIG. 5, the conventional fluid impervious film or baffle 28a is again located under main absorbent component 27a but is shown as extending up the sides of pad 27a to further protect against

leakage. The entire multi-component pad is enclosed in fluid-pervious wrapper 29a. The combination of the pleated element on the top of the main absorbent structure in this embodiment helps confine fluids to the central area of the pad while the soft edges of pad 27a add to wearing comfort.

In the previous description of the assembly making up the pleated element, the fluff layer is defined as being about 0.2" thick while in unloaded condition. Under loads of 1.2 lbs. per square inch this layer 0.2" thick will normally compress to about 0.1" thickness. Unloaded thicknesses of from 0.15" to about 0.3" may be used with equally satisfactory results. However, if the layer is made much thinner, the advantage of using a major portion of the less expensive fluff fiber diminishes, while the pleated element becomes too stiff for best comfort due to the stiffening effect of a larger number of vertically disposed wadding layers per unit width. If the layer is made too thick, the ability to pleat without excess compression is hampered, the resulting pad would have fewer pleats per unit of width, and the capacity for capillary flow in the length direction would be diminished because of fewer vertically disposed wadding layers per unit width.

The fluff mentioned may be typified by loose or separated fibers obtained from chemical type pulps, and especially bleached sulphite and sulphate pulps preferably made from wood such as spruce, balsam, and other conifers, although other woods and vegetable fiber sources may be used. Chemical pulp fiber of these types usually has an average length of about .18 inch and a range in lengths of from about .003 inch to .36 inch. Also encompassed in the term fluff are cotton linters consisting of fibers seldom exceeding 3/16 of an inch in length and ranging down to 1/32 of an inch. Viscose rayon and other absorbent synthetic fibers may also be used in the short lengths mentioned, but present costs make these excessively expensive.

The facing for the fluff layer preferably is cellulose wadding of light basis weight. Creped wadding with a drier basis weight of about 4.5 to 9.0 pounds per standard ream of 480 sheets and a crepe ratio of from about 1.25 to 3.0 is suitable. When sheets in the lighter weight range are used, two plies on each side of the fluff may be employed. When sheets of the heavier weight range are used, one ply is preferred. Other absorbent facing materials with good capillary transfer values such as lightweight non-wovens and bonded webs may also be used.

While as indicated previously it is preferred that the main fibrous material in the pleated element be short-fibered cellulose, small amounts of other longer fibers may be added to give the batt more integrity and resilience. These longer fibers may be natural or synthetic and may be absorbent or non-absorbent. Many such combinations are known.

The laminated batt may be given additional stability before pleating by attaching the outer layers of cellulose wadding to the fluff layer by a multiplicity of small spaced embossings, with or without supplementary adhesive. Such embossings not only help prevent the fluff from shifting out of position during pleating but also provide some additional larger channels to aid fluid flow in the pleated element.

In addition to providing better structural form and improved fluid transfer, it was found that the pleated structure also permits sidewise compression in the width direction when worn, which is an important comfort feature. Anchoring the pleats on only one side also permits flexing in the lengthwise direction for better conformability to the body.

The absorbent element structures disclosed herein provide gross folds in the longitudinal direction which minimize the transverse spread of absorbed fluid and reduce the possibility of side stains and wide surface stains. The structure also facilitates the transfer of absorbed fluid away from the pad surface into the interior via the deep grooves, thus keeping the top surface of the pad relatively drier for the comfort of the wearer.

The multiplicity of folds also gives the pad good lateral resilience. As a result, sanitary napkins including a pleated element as disclosed herein tend to conform readily to the

perineal dimensions in the space between the thighs as this space varies with the activity of the wearer. The greater structural stability in the vertical dimension also maintains the thickness and bulk of the pad without the physical weightiness required in conventional sandwich pads.

While several preferred embodiments of the invention are shown and described herein, it will be appreciated that the details may be more or less modified without departure from the principles and scope of the invention as defined in the appended claims.

We claim:

1. An absorbent element for use in disposable absorbent devices, said element having an upper surface of a width greater than the thickness of said element and comprising an elongated assembly of absorbent cellulosic fiber material folded back and forth on itself in the shape of an accordion-pleated pad with the pleats in substantially vertical alignment, the upper and lower surface of said pad being defined by a plurality of parallel folds formed by said pleats with said folds extending longitudinally of the pad, a backing sheet spanning the folds on one surface of said pad and secured to the peaks of said folds to stabilize the vertical alignment of said pleats, the cellulosic fiber material in said assembly comprising a thin tenuous layer of short absorbent fibers faced on both surfaces with a light-weight, fluid permeable, self-sustaining web.

2. The element of claim 1 in which said short fibers comprise comminuted wood pulp.

3. The element of claim 1 in which said short fibers comprise cotton linters.

4. The element of claim 1 in which the facing webs in said assembly comprise cellulose wadding.

5. The element of claim 4 in which said cellulose wadding

is physically attached to said tenuous layer by a multiplicity of small spaced embossed areas.

6. The element of claim 1 in which said facing webs are physically attached to said tenuous layer by a multiplicity of small spaced embossed areas.

7. The element of claim 1 in which said layer of short fibers is reinforced with a minor amount of longer fibers.

8. The element of claim 1 in which said backing sheet comprises thin thermoplastic film.

9. The element of claim 8 in which said thermoplastic film is fused to the peaks of said folds.

10. The element of claim 1 in which said backing sheet is fluid permeable.

11. The element of claim 10 in which said backing sheet is cellulose wadding.

12. The element of claim 10 in which said backing sheet is gauze.

13. The element of claim 10 in which said backing sheet is a non-woven web.

14. The element of claim 1 enclosed in a fluid pervious wrapper providing a sanitary napkin structure.

15. The combination of the element of claim 1 with an underlying absorbent pad, the combination being enclosed in a fluid pervious wrapper providing a sanitary napkin structure.

16. The combination of claim 15 in which the underlying absorbent pad comprises wood pulp fluff.

17. The combination of claim 15 in which said element is substantially shorter and narrower than said underlying absorbent pad.

18. The combination of claim 17 in which the underlying absorbent pad comprises wood pulp fluff.

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