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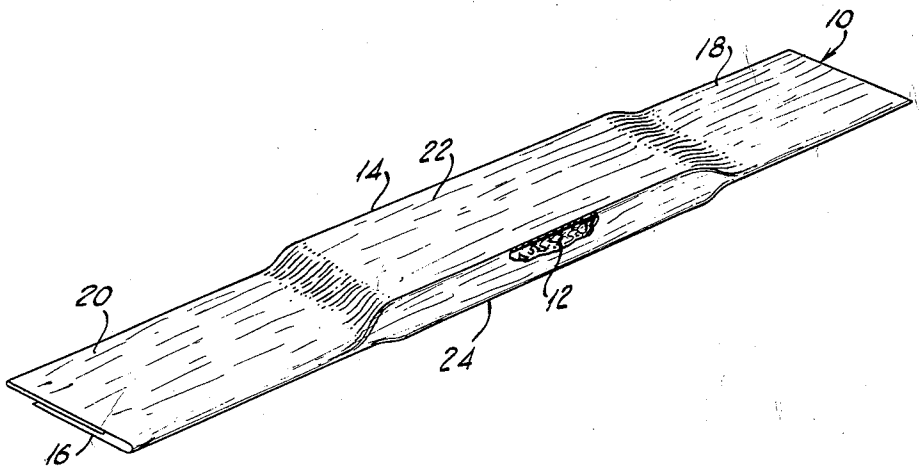

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ABSORBENT PAD AND WRAPPER THEREFOR

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The present invention relates to absorbent products and to methods of making the same, and is more particularly concerned with absorbent products comprising disposable, fibrous, absorbent pads and porous textile covers, such as exemplified by sanitary napkins, surgical dressings, antiseptic bandages and compresses, disposable diapers and diaper liners, incontinent pads, hospital underpads, and other products designed to absorb body secretions and other fluids.

Products designed to absorb fluids generally contain as a principal component thereof an absorbent pad or core to receive, absorb and retain such fluids. These pads or cores are normally made of or contain a considerable amount of carded or air-laid cotton or rayon fibers, air-laid cotton linters, comminuted wood pulp fluff, or like materials which are highly absorbent, fluffy and porous.

Of these types of absorbent materials, comminuted wood pulp fluff and cotton linters are primarily of interest to the present invention, in view of their outstanding absorbency characteristics, particularly when modified according to treatments set forth in my copending patent application, Serial No. 587,015, filed May 24, 1956, now Patent No. 3,017,304. Fibers used in such pads are very short and usually average less than one-quarter of an inch. In addition, there is always present a certain amount of so-called "fines," i.e., fiber fractions of dust-like character.

Analysis of typical samples of wood pulp fluff applicable to the present invention indicates the following ranges of constituents: whole fibers ranging from about 4.5 mm. to about 2.5 mm. constitute from about 75 to about 85 percent by weight; fiber fragments ranging from about 1 mm. to about 2.5 mm. constitute from about 4 to about 22 percent by weight, and fines which are less than about 1 mm. constitute from about 3 percent to about 11 percent by weight. Unfortunately, therefore, it is unavoidable that absorbent pads made from such comminuted fibers possess a serious disadvantage in that some of the more or less powder-like fibers or fines of less than 1 mm. size escape through the textile cover when the article is handled. This is particularly true when the short-fibered layer is placed directly below and in contact with a porous cover or wrapper of relatively open construction.

Additionally, these pads, and for that matter, substantially all absorbent pads, do not intimately cling to the textile covers which they contact. As a result, they separate into laminations when handled or flexed. This creates an air space or gap between the pad and the cover which interrupts and retards the flow of fluid into the absorbent pad when used and causes fluid to spread over the cover. At the same time, the flexing causes the cover to pucker and form surface creases or ridges which rub against and irritate the portions of the body which they contact.

One effort to overcome such disadvantages is the use of a paper sheet or other dust-proof material which is positioned between the absorbent pad and the textile cover. Such efforts reduce the dusting tendencies, but the resulting product is harder, harsher and more irritating. This method, moreover, retards the absorption of fluid and causes the latter to spread and wick within the paper cover. This spreading and wicking near the surface of

the pad is a serious, functional disadvantage as it enlarges the contact area between the wet zone of the product and the skin of the wearer. This, of course, creates a rather uncomfortable feeling. Disadvantages of this type are avoided in constructions where the comminuted fiber web is placed in direct contact with the textile cover, since the spreading and wicking tendencies are minimized in fibrous bodies of that type.

It has now been found that these disadvantages may be overcome by preparing an absorbent product comprising an absorbent pad of finely divided, cellulosic fibers from wood pulp fluff or from cotton linters which have an average fiber length of less than one-quarter of an inch and which contain fines by applying a binding agent either to the surface of the absorbent pad or the textile cover and then directly contacting the two over substantially their entire surfaces before the binding agent has hardened or lost its tackiness. The absorbent product is then exposed to a light pressure again over substantially its entire surface which brings the cover and the pad into direct intimate contact throughout whereby the binding agent encases the surface of the pad and adheres it to the cover. In this way, dusting of the pad is minimized and the formation of air spaces between the pad and the cover is avoided. At the same time, it is noted that sharp creases and ridges do not appear in the product when flexed, due most likely to the intimate support afforded to the cover by the pad.

In the accompanying drawing and following specification, I have illustrated and described a preferred design of the article embodying my invention, as well as preferred methods of manufacturing the same. It is to be understood, however, that my invention is not to be considered limited to the construction disclosed or the manufacturing methods described, except as determined by the scope of the appended claims. The present invention may be employed in the manufacture of various forms of absorbent products as referred to previously. However, for convenience only, the invention will be described and illustrated in connection with sanitary napkins. With reference to the accompanying drawing:

The FIGURE is a partially cut-away perspective view of one form of my improved sanitary napkin.

In the embodiment of the invention shown in the drawing, the sanitary napkin 10 of the present invention comprises an absorbent pad 12 which is encased within a textile wrapper or cover 14 of open construction which is overlapped as indicated at 16. The cover 14 extends beyond the ends of the absorbent pad of the sanitary napkin whereby pinning strips 18 and 20 are formed to secure the sanitary napkin in position during use. As noted in the FIGURE, the absorbent pad is in direct contact with the upper part 22 of the textile cover. This would comprise a so-called "one-way" sanitary napkin which must be worn with the upper side contacting the fluid source. A second absorbent pad placed in direct contact with the lower part 24 of the textile cover would create a so-called "two-way" sanitary napkin which is worn with either side contacting the fluid source.

As indicated above, the absorbent pad is made of very short or finely divided fibers having an average fiber length of less than one-quarter of an inch, and in some cases, less than one-eighth of an inch. Specific ranges of typical samples have been referred to previously. Representative of such fibers are cotton linters or those obtained from the disintegration of wood pulp. Such fibers are, of course, not cardable by standard textile machinery. Fibers possessing amounts of fines less than 3% by weight or having a greater fiber length, say, one-half of an inch or greater, do not present the dusting problem described herein. Representative of such fibers is cotton which, of course, is cardable by standard textile machinery.

The textile material which is employed as a cover or wrapping for the absorbent pad is of open construction, highly porous and permeable, and may be knitted, woven (such as gauze), netted, or non-woven. Such fabricated materials are in direct contact with the absorbent pad containing the very short, non-cardable cotton linters or wood pulp fibers. The materials from which these textile covers are fabricated may be selected from a wide group of natural or synthetic fibers and filaments or mixtures of the same. Such fibers would include cotton, rayon, silk, acetate, nylon, "Vinyon," or mixtures thereof.

The binding agent or adhesive material may be selected from a wide variety of readily wettable binders of a water-soluble or insoluble nature. Among the preferred materials are the soft, water-soluble or water-dispersible high polymeric natural and synthetic resins or gums such as starches and dextrines and other materials of good adhesiveness such as polyvinyl alcohol, polyvinyl acetate, polyvinyl chloride, polyvinylidene chloride, vinyl chloride-vinyl acetate copolymer, the sodium salts of carboxymethyl cellulose, carboxyethyl cellulose, hydroxyethyl cellulose, carboxymethyl hydroxyethyl cellulose; dispersions of cellulose esters such as cellulose acetate and cellulose acetate butyrate; acrylic esters such as methyl methacrylate and ethyl acrylate; the various derivatives of polyacrylic acid, polyester resins and elastomers, natural gums and resins, etc. In the event that the particular binder selected is not readily wettable, it is preferred to incorporate an adequate amount of a surface-active agent into the adhesive composition in order to facilitate the subsequent take-up of fluid in the resin-bonded region.

An economical and convenient method of applying the bonding agents is by way of spraying, although other methods involving the use of rollers, pads, wicks, baths, etc. are feasible. The adhesive preferably covers all parts of the surface from which escape of fiber particles in the form of dust is to be prevented. This would apply specifically to the upper and lower faces of the pad, and if desired, to the sides.

The adhesive composition is preferably applied to the surface of the absorbent pad. The textile cover is then brought into contact therewith while the binder is still tacky. A light pressure is then applied to bind or adhere the textile cover substantially throughout its area to the absorbent pad. The adhesive may also be applied to the surface of the textile cover which is intended to contact the absorbent pad. Light pressure is also used throughout in such a case. If desired, both the surface of the absorbent pad and the inner surface of the textile cover may be coated with the adhesive binder. If desired, the product may be formed in its final shape and the adhesive sprayed on the outside surface of the porous textile material, provided it is sufficiently fluid, and in an amount to provide an adhesive bond between itself and the absorbent pad which lies directly below its surface.

After the binder has been applied, it is dried at the temperature required for the specific binding agent. Moderate pressure may be applied to the full surface of the product in the initial stage of drying. Heat may be used to accelerate the evaporation of solvents and other volatile materials.

The amount of adhesive to be applied will vary within wide ranges, depending upon the nature and characteristics of the textile cover and the absorbent pad, the purpose for which the product will ultimately be used, etc. Satisfactory results have been obtained by applying as little as 0.0001 gram of adhesive solids per square centimeter of surface. Increased amounts of up to 0.005 gram per square centimeter or more may be employed. For best economy, it is desirable to keep the applied amounts low so as to restrict the penetration of the binder into the interior of the absorbent structure. This is accomplished according to well-known methods by appropriate adjustments in concentration, temperature and the viscosity of the binding solution or dispersion.

The particular wetting agents used to accelerate the

action of the binding agents may be selected from a wide group of cationic, anionic and non-ionic agents. The following are illustrative of such surface-active agents: fatty acid soaps, rosin acid soaps, sulfonated oils, sulfated alcohols, esters, acids, amides and olefins, alkyl and petroleum sulfonates, alkylaryl sulfonates, alkyl naphthalene sulfonates, fatty amines, alkyl dialkylaryl quaternary ammonium salts, alkylamidoalkyl dialkylaryl quaternary ammonium salts, polyalkylene oxide condensation products with alcohols and phenols, etc.

The particular adhesive agent and the wetting agent employed must be non-toxic and preferably should be odorless and colorless. It should have the characteristics of tackiness, low viscosity and stability at the elevated temperatures to which it is heated during application, non-tackiness, flexibility and stability at ordinary or room temperatures of use, sufficient bonding strength to form a strong bond between the absorbent pad and the textile cover, ready solidification on cooling, and low cost. For those uses of a finished product requiring that it be sterilized at relatively high temperatures, such as 250° F. and higher, the materials selected and used should have a flow point which is higher than the sterilizing temperature.

The invention will be further described by reference to the following specific examples. It is to be pointed out, however, that the inventive concept is not to be construed as limited to the particular chemical compounds and compositions set forth therein nor to the manufacturing processes described. It is to be pointed out that these examples are illustrative and not limitative.

Example I

A sheet of bleached wood pulp is shredded into whole fibers, fiber fragments and fines (about 5–6% by weight) and formed into a bat. The latter forms the top layer in the internal assembly of a gauze-covered dressing. The fibers forming the top face of the wood pulp bat are then firmly bonded to each other and laminated to a gauze cover by spraying the latter with a dispersion containing:

	Grams
RHoplex WN80 (a commercial acrylic resin dispersion, 40% solids)	10
Triton 770 (a sodium salt of alkylphenoxypolyether sulfate; a commercial wetting agent)	1
Water	89

Approximately 0.004 milliliter is deposited per square centimeter of gauze surface. Slight pressure is applied in the initial stage of drying at 110° C. before the binding agent has solidified or become non-tacky, in order to provide uniform contact throughout the gauze and the wood pulp bat. A firmly bonded, rapidly absorbing and substantially dustless structure is obtained. Flexing of the structure does not produce any sharp creases or ridges capable of creating irritation.

Example II

A gauze-covered dressing is prepared substantially as set forth in Example I with the exception that a softer structure is obtained by using the following composition:

	Grams
RHoplex FRN (a commercial acrylic resin dispersion, 40% solids)	20
Triton X100 (a polyethylene glycol alkyl acryl ether, a commercial wetting agent)	1
Water	79

Example III

In the construction of a sanitary napkin, a wood pulp bat of the type described in Example I (fines are 5–6% by weight) forms the top layer of the internal assembly in direct contact with a gauze cover. The surface of the

wood pulp bat is sprayed with 0.004 milliliter per square centimeter of the following bonding composition:

	Grams
Sodium carboxymethyl hydroxyethyl cellulose	0.5
Triton GR5 (a sulfonated alkyl ester, a commercial wetting agent)	0.025
Glycerol	0.1
Water	99.375

The internal assembly, immediately after spraying and while the bonding agent is still tacky, is wrapped in the gauze cover of 14 x 10 threads per square inch construction. In the initial stage of subsequent drying at 110° C., slight pressure is applied in order to secure a strong, uniform and substantially dustless bond between the top layer of the internal assembly and the gauze cover. No sharp creases or ridges are formed when the napkin is folded and bent as in use.

Example IV

A structure similar to that of Example III is prepared by applying to the wood pulp bat 0.004 milliliter per square centimeter of the following adhesive composition:

	Grams
RHoplex ER (an emulsion of polymerized acrylic acid ester)	10
RHotex 200 (sodium salt of a polymerized resin, a commercial softening agent)	2
Triton GR5	0.5
Water	87.5

A firmly bonded, rapidly absorbing and substantially dustless structure is obtained by applying slight pressure during the initial stage of the drying at 110° C.

Example IV–A

The procedures set forth in Example IV are followed substantially as set forth therein with the exception that 0.002 milliliter per square centimeter of adhesive composition is applied to the wood pulp bat and an equal quantity to the gauze cover. The structure is substantially dustless when handled and the bond between the pad and the gauze cover is firm. The rate of absorbency of the product is excellent. No sharp creasing is noted when the article is folded and flexed.

Example V

A structure similar to that of Example III is prepared with a cover of a commercial absorbent non-woven fabric weighing 200 grains per square yard. A firm, soft and substantially dustless bond between the cover and the pulp bat is obtained by spraying the latter with 0.003 milliliter per square centimeter of the following dispersion:

	Grams
Elvacet 81–900 (a commercial polyvinyl acetate dispersion, 55% solids)	18.2
Dibutoxy ethyl phthalate	3.3
Triton GR5	1.0
Water	77.5

The laminated structure is assembled immediately after spraying, while the polyvinyl acetate dispersion is still tacky, and slight pressure is applied to bond the components.

A characteristic feature of this structure is the substantially complete elimination of air gaps or spaces between the cover and the internal assembly. There is also a reduced tendency of the cover to form sharp creases in bending the structure. The path of imbibition is much better controlled than in a corresponding article of prior art.

While I have shown and described what I believe to be a preferred embodiment of the invention in the matter of simplicity of construction, ease of utilization, etc., it will be appreciated that the details of such construction may be more or less modified within the scope of the claims without departure from the principles of construction or material sacrifice of the advantages of the preferred design.

I claim:

1. An absorbent product comprising an absorbent fibrous pad of short, finely divided fibers containing at least about 3% by weight of fines, a porous textile cover on said pad, the surface of said pad being bonded substantially throughout in direct and intimate contact with said cover, said bond being a liquid pervious bond, the said contact between said pad and said cover being such as to minimize dusting of said pad and to eliminate the formation of air spaces between said pad surface and said cover.

2. An absorbent product comprising an absorbent fibrous pad of short, finely divided fibers containing at least about 3% by weight of fines, a porous textile cover on said pad, at least one liquid absorbing surface of said pad being bonded substantially throughout in direct and intimate contact with the adjacent portion of said cover, said bond being a liquid pervious bond, the said contact between said pad and said cover being such as to minimize dusting of said pad and to eliminate the formation of air spaces between said pad surface and said cover.

3. An absorbent product comprising an absorbent fibrous pad of short, finely divided fibers containing at least about 3% by weight of fines, a porous textile cover on said pad, a surface of said pad being bonded substantially throughout in direct and intimate contact with the adjacent portion of said cover, said bond being a liquid pervious bond, the said contact between said pad and said cover being such as to minimize dusting of said pad and to eliminate the formation of air spaces between said pad surface and said cover.

4. An absorbent product comprising an absorbent fibrous pad of short, finely divided fibers containing at least about 3% by weight of fines, a porous textile cover on said pad, at least one liquid absorbing surface of said pad being bonded substantially throughout in direct and intimate contact with the adjacent portion of said cover, said bond being a liquid pervious bond, the fibers on said surface of said pad also being bonded together, the said contact between said pad and said cover and the bonding of the fibers on said pad surface being such as to minimize dusting of said pad and to eliminate the formation of air spaces between said pad surface and said cover.

5. An absorbent product comprising an absorbent fibrous pad of short, finely divided fibers having an average fiber length of less than one-quarter of an inch, a porous textile cover on said pad, a surface of said pad being bonded substantially throughout in direct and intimate contact with the adjacent portion of said cover, said bond being a liquid pervious bond, the said contact between said pad and said cover being such as to minimize dusting of said pad and to eliminate the formation of air spaces between said pad surface and said cover.

6. An absorbent product comprising an absorbent fibrous pad of short, finely divided cellulosic fibers having an average fiber length of less than one-quarter of an inch, a porous textile cover on said pad, a surface of said pad being bonded substantially throughout in direct and intimate contact with the adjacent portion of said cover, said bond being a liquid pervious bond, the said contact between said pad and said cover being such as to minimize dusting of said pad and to eliminate the formation of air spaces between said pad surface and said cover.

7. An absorbent product comprising an absorbent fibrous pad of short, finely divided wood pulp fibers having an average fiber length of less than one-quarter of an inch, a porous textile cover on said pad, a surface of said pad being bonded substantially throughout in direct and intimate contact with the adjacent portion of said

cover, said bond being a liquid pervious bond, the said contact between said pad and said cover being such as to minimize dusting of said pad and to eliminate the formation of air spaces between said pad surface and said cover.

8. An absorbent product comprising an absorbent fibrous pad of short, finely divided cotton linters having an average fiber length of less than one-quarter of an inch, a porous textile cover on said pad, a surface of said pad being bonded substantially throughout in direct and intimate contact with the adjacent portion of said cover, said bond being a liquid pervious bond, the said contact between said pad and said cover being such as to minimize dusting of said pad and to eliminate the formation of air spaces between said pad surface and said cover.

9. An absorbent product comprising an absorbent fibrous pad of short, finely divided fibers containing at least about 3% by weight of fines, a porous gauze cover on said pad, a surface of said pad being bonded substantially throughout in direct and intimate contact with the adjacent portion of said cover, said bond being a liquid pervious bond, the fibers on said surface of said pad also being bonded together, the said contact between said pad and said cover and the bonding of the fibers on said surface being such as to minimize dusting of said pad and to eliminate the formation of air spaces between said pad surface and said cover.

10. An absorbent product comprising an absorbent fibrous pad of short, finely divided fibers containing at least about 3% by weight of fines, a porous, non-woven fabric cover on said pad, a surface of said pad being bonded substantially throughout in direct and intimate contact with the adjacent portion of said cover, said bond being a liquid pervious bond, the said contact between said pad and said cover being such as to minimize dusting of said pad and to eliminate the formation of air spaces between said pad surface and said cover.

11. A sanitary napkin comprising an absorbent fibrous pad of short, finely divided cellulosic fibers containing at least about 3% by weight of fines, a porous textile cover on said pad, a surface of said pad being bonded substantially throughout in direct and intimate contact with the adjacent portion of said cover, said bond being a liquid pervious bond, the said contact between said pad and said cover being such as to minimize dusting of said pad and to eliminate the formation of air spaces between said pad surface and said cover.

12. A sanitary napkin comprising an absorbent fibrous pad of short, finely divided wood pulp fibers having an average fiber length of less than one-quarter of an inch, a porous textile cover on said pad, at least one liquid absorbing surface of said pad being bonded substantially throughout in direct and intimate contact with the adjacent portion of said cover, said bond being a liquid pervious bond, the said contact between said pad and said cover being such as to minimize dusting of said pad and to eliminate the formation of air spaces between said pad surface and said cover.

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