

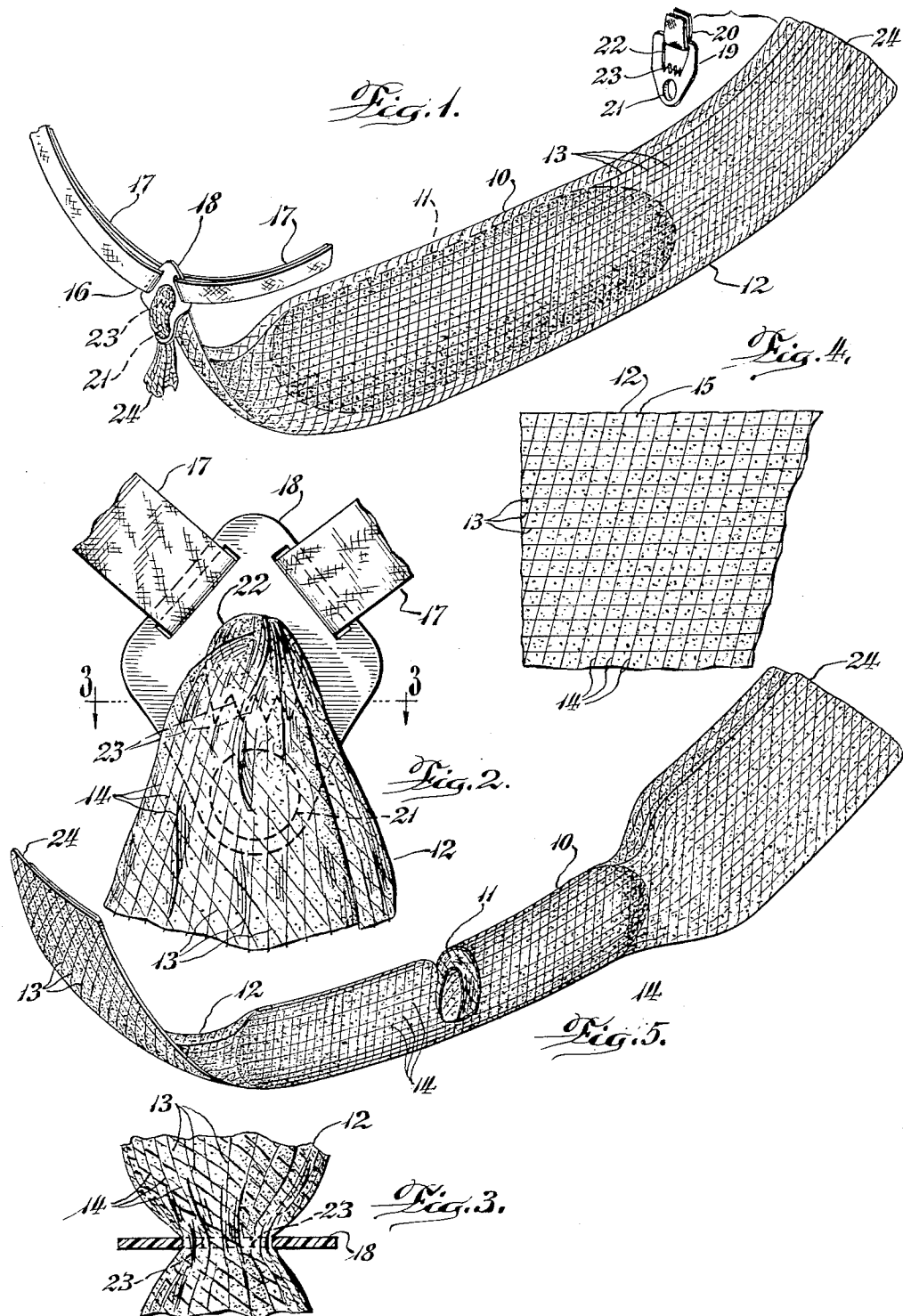
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NON-WOVEN WRAPPER FOR SANITARY NAPKINS

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The present invention relates to cellulosic products and more particularly is concerned with an improvement in sanitary napkins which have a cover or wrapper of pervious non-woven material.

Sanitary napkins usually comprise a core of a highly absorbent material such as cellulose fluff or cellulose wadding enclosed in a wrapper. The wrapper in addition to holding the core together provides an end supporting means or tab for the napkin by which it can be attached or secured to a belt. Napkin wrappers were formerly almost exclusively made of a woven gauze. Such wrappers have certain disadvantages particularly with respect to uniformity, softness, and comfort of the wearer. These gauze wrappers have therefore been widely replaced in recent years by non-woven type wrappers in which the threads or the fibers comprising the wrapper are bonded together by adhesive rather than by weaving. A typical non-woven sanitary wrapper material may consist of warp threads with the woof threads cross laid thereon at an angle of ninety degrees with the warp threads and adhesively bonded thereto. A fine appliqué of fibers may then be distributed on the cross laid warp and woof threads and adhesively bonded thereto.

While such wrappers have a very attractive appearance and offer an improved performance, particularly with respect to softness, certain problems are involved in their use. One of the problems involved in employing conventional cross laid non-woven materials as napkin wrappers is the tendency of some of these fabrics to tear at the point where the fabric engages the belt buckle. Many sanitary napkins having non-woven wrappers have therefore incorporated into the napkin a strip of gauze web substantially the length of the napkin wrapper, so that the gauze constitutes the longitudinal reinforcement for the wrapper. This reinforcing strip is effective in decreasing the tendency of the napkin wrapper to tear at the intersection of the wrapper and the belt buckle. However, such gauge reinforced napkin wrappers tend to be less comfortable because of the gauze web's tendency to distort, bunch or rope in use. In addition, the gauze reinforcing strip adds to the expense of the napkin both because of the material cost and the cost of insertion. Other similar efforts to strengthen the tab ends of non-woven cross-laid napkin wrappers have also been relatively unsuccessful.

The second problem involved in the use of cross-laid non-woven wrapper material for sanitary napkins has been that of obtaining adequate transverse strength in the wrapper without having an excessive loss of conformability of the wrapper to the core of the pad. Sanitary napkins are normally folded in use so that the cross section of the napkin forms an inverted U. This folding of the napkin places a considerable stress on the woof or cross threads of the napkin wrapper. Since this stress is applied in the direction of the cross threads and the cross threads are not particularly elastic this stress tends to distort the napkin wrapper and thus decrease the conformability of the wrapper to the napkin pad. Attempts have been made to avoid this difficulty by omitting the cross threads entirely from the wrapper depending upon the adhesive bonds to maintain the cross structure of the napkin wrapper. These attempts, however, have resulted in a substantial loss of cross sectional strength of the wrapper.

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It has been found that these and other disadvantages of such sanitary napkins can be avoided by providing in accordance with the present invention napkins with a non-woven material wrapper having cross threads which meet the warp thread at an angle between about fifteen and seventy-five degrees. The employment in sanitary napkins of a non-woven fabric wrapper having diagonal cross laid threads provides a zone of contact between the belt buckle and the sanitary napkin wrapper such that the stress from the buckle to the napkin is transmitted to a substantially greater number of the cross-laid threads than is the case with conventional cross-laid fabrics thus greatly increasing the tearing resistance of the tab ends of the napkins. Furthermore, the use of diagonally cross-laid threads in the wrapper provides a conformability in the wrapper without loss of strength not attainable with conventional cross-laid thread wrappers.

The general nature of the invention will be more fully understood by reference to the accompanying drawings which illustrate a perfect embodiment.

In the drawings:

FIGURE 1 is a perspective view of a sanitary napkin embodying a preferred wrapper and illustrating a method of engagement of the napkin with a conventional napkin belt buckle.

FIGURE 2 is an enlarged elevation illustrating the engagement of the napkin wrapper with a front buckle of a napkin belt.

FIGURE 3 is a cross section on line 3—3 of FIGURE 2.

FIGURE 4 is an enlarged plan view of a portion of a preferred embodiment of the napkin wrapper.

FIGURE 5 is a perspective view of a sanitary napkin bent to substantially the shape it takes when worn, the napkin being partially broken away to illustrate the core thereof.

In the embodiment of the invention illustrated in the drawings, a napkin 10 is comprised of a highly absorbent core 11 enclosed in a previous, non-woven material wrapper 12.

The core is usually comprised of highly absorbent cellulosic materials such as cellulose wadding, wood fluff, cotton fibers, or the like and may consist of one or more layers of these materials. Additional elements such as side strips, baffles, etc., having specialized purposes, may also be incorporated into the core.

The wrapper 12 is comprised of a cross-laid non-woven material and is superposed upon the core in such a manner that the longitudinal threads or warp threads of the wrapper material are parallel to the longitudinal axis of the core. The warp threads may be of any material commonly used in sanitary napkin wrappers either natural or synthetic. Preferable threads are the new synthetic fibers such as nylon, "Dacron," "Dynel," "Orlon," etc. If filament warp threads are used they should be about twenty to one hundred and fifty deniers whereas spun warp threads are preferably in the range of about thirty to eighty cotton count. While the warp thread count is preferably about seven to ten threads per inch, five to fifteen threads per inch may suitably be used. The cross-laid or woof threads may be of the same or of a different fiber from that of the warp threads but the denier and thread count should be approximately within the ranges mentioned above for the warp threads. The woof threads are for the purpose of the present invention applied to the warp threads so that they make an acute angle with the warp threads of approximately fifteen to seventy-five degrees and preferably about thirty to sixty degrees. The woof threads should be substantially parallel as are the warp threads.

The warp and the woof threads should be bonded together by a suitable bonding agent. The adhesive should

be flexible, non-irritating, colorless, odorless and resistant to aging. Suitable adhesives include the polyvinyl acetates, polyvinyl chlorides, acrylics, synthetic and natural rubbers and similar adhesives. A particular suitable bonding agent is an aqueous polyvinyl acetate suspension plasticized with twenty percent of dibutylphthalate. Another suitable bonding agent consists of polyvinyl chloride emulsion with forty to fifty percent resin solids and plasticized with thirty-five percent dibutylphthalate.

The method of forming the thread web does not comprise a part of the present invention and any suitable method of forming cross-laid webs having diagonal woof threads may be employed. One commercial method of forming such webs is that described in U.S. Patent 2,696,244, December 7, 1954, Web Reinforcing Method and Apparatus, Jackson.

While it is not essential to the strength or function of the web, the appearance and softness of the web may be in some cases improved by applying a fiber applique to the cross-laid web. The fibers may be air laid or carded cotton, rayon, flax, or other similar absorbent fibers. The fibers may be uniformly distributed with random orientation or a preferred orientation may be given to them. The fibers are normally bound to the web with the same types of adhesives which are used to bind the cross-laid threads.

The wrapper is applied to the napkin core by wrapping it around the napkin core so that the longitudinal threads of the wrapper material are parallel to the longitudinal axis of the sanitary napkin core. In a typical sanitary napkin the core may be eight and three-fourths inches by two and five-eighths inches and the wrapper a rectangular piece of material eighteen inches by eight inches. The overlap of the wrapper material upon itself in a transverse direction in this napkin is approximately one and three-eighths inches.

The method of attaching the sanitary napkin to a typical sanitary napkin belt 16 is illustrated in FIGURES 1, 2 and 3. As shown in FIGURE 1, the belt consists of a body portion 17 (only partially shown), a front buckle 18 and a back buckle 19 attached to the body portion of the belt by a strap member 20. The buckle is provided with a pair of vertically aligned spaced openings 21 and 22 respectively, the lower of which is bounded with a smooth edge. The upper opening 22 is provided with smooth top and side edges but has teeth such as indicated at 23 formed in its lower edge so as to project upwardly therefrom.

The sanitary napkin in use has its tab end 24 drawn through the upper buckle opening 22 and impaled on the teeth 23. The tab is then downwardly extended rearwardly through the lower opening 21. Now in conventional sanitary napkins employing non-woven wrappers having the cross threads at right angles to the longitudinal threads it is readily apparent that all of the teeth 23 of the upper opening 22 will in all likelihood engage a single cross thread. Furthermore, since this engaged cross thread is at right angles to the longitudinal threads the stress placed upon this cross thread will be concentrated in a line across the longitudinal axis and perpendicular thereto, of the wrapper so that all of the stress placed upon the thread by the teeth will be concentrated within the tooth section of the upper opening. In napkins employing the improved wrapper of the present invention, however, since the cross threads make an acute angle with the longitudinal threads it will be apparent that each tooth of the upper opening will engage a separate and distinct cross thread, in each layer of wrapper fabric impaled on the toothed section. Thus, in a typical sanitary belt buckle having three teeth as shown in the illustration, at least nine separate cross threads will be engaged by the individual teeth; three cross threads in the portion of the wrapper adjacent to the outer face of the napkin and three cross threads in each of the overlapped portions of the wrapper adjacent to the inner napkin face. Furthermore, since the cross threads form an acute angle with

the longitudinal threads the stress placed upon the cross threads will not be concentrated in the buckle area as in conventional cross-laid materials but the stress will be extended by each thread from the tab end of the wrapper down into the portion of the wrapper covering the core. The improved distribution of stress from the buckles to the wrapper of the napkin makes for a napkin which has exceptional resistance to tearing or dislocation from the buckle.

Now in addition to the improved resistance to tearing which the present wrapper imparts to the napkin the use of the bias laid cross threads also makes for a much more conformable napkin. The conformability of the wrapper in comparison to the conventional wrapper apparently arises from two sources. One source is the distribution of stresses along diagonal lines from the portion of the wrapper engaged by the teeth section of the buckles. This stress from the buckle, transmitted to the core section of the napkin by the diagonal threads tends to draw the wrapper more uniformly about the core of the napkin.

A second source arises from the way in which napkins are transversely folded in use as illustrated in FIGURE 5. This transverse folding of the napkin places a large stress on the cross threads of the wrapper. In wrappers having the cross threads at right angles to the longitudinal threads this stress can only be dissipated by stretching of the cross threads and this method of dissipation of stress is, of course, limited. The folding of napkins employing non-woven wrappers having the cross threads at a ninety degree angle to the longitudinal threads may therefore result in wrinkling of the wrapper and a general lack of conformability of the wrapper to the pad. Now in sanitary napkins employing the present wrapper having the cross-laid threads at an acute angle to the longitudinal threads the stress applied by transverse folding of the napkin to the cross-laid threads may be partially dissipated by the elongation of the parallelograms formed by the longitudinal and cross-laid threads. Dissipation of stress in this manner makes for a much more conformable wrapper and one which tends to adjust itself better to the stresses to which it is subjected.

A typical sanitary napkin illustrative of the present invention has a core two and three-fourths inches wide by eight and three-fourth inches long made up of layers of absorbent cellulose wadding and wood pulp fluff. The weight of the core is twelve grams. The wrapper is comprised of a rectangularly shaped non-woven cross-laid material eight and three-fourths inches wide by nineteen inches long. The warp threads are fifty denier nylon filament and the woof threads fifty denier rayon filament. The thread count is nine by nine. The threads are coated with a plasticized polyvinyl acetate adhesive in an amount equivalent to 1.6 grams of adhesive solids per square yard of material. The wrapper has an applique of cotton comber noils randomly applied to the woof thread side in an amount of five grams per square yard. The woof threads are substantially parallel and are cross-laid on the warp threads at an angle of approximately thirty-five degrees with the warp threads.

The above described sanitary napkin is quite simple in construction and the improved performance with respect to strength and conformability can be obtained without any increase in material used or substantial changes in the methods of manufacture. Obviously, certain changes may be made in the described structure without departing from the spirit of the invention as defined in the appended claims.

What is claimed is:

1. A sanitary napkin comprising an absorbent core and a separate non-woven material enveloping said core and having longitudinal threads parallel to the axis of the core and cross-laid threads which make an acute angle with the longitudinal threads of between about fifteen

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and seventy-five degrees, said cross laid threads being bonded to said longitudinal threads at the cross over points thereof.

2. The sanitary napkin of claim 1 in which the cross-laid threads of the non-woven material make an acute angle with the longitudinal threads of between about thirty and sixty degrees.

3. A sanitary napkin comprising an elongate absorbent core and a wrapper of non-woven material enveloping said core and extending from opposite ends thereof to form tab ends, said non-woven material comprising a set of warp threads extending longitudinally of and in parallel relation with the major axis of the core and a set of woof threads disposed obliquely of said warp threads at an angle of between 15 and 75°, the threads

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in each said set being spaced apart in parallel relation at a distance of between about $\frac{1}{15}$ to $\frac{1}{8}$ of an inch, and means bonding said warp and woof threads together at the points of cross over therebetween.

4. The napkin of claim 3 in which the non-woven material has a fiber applique adhesively bonded to the warp and woof threads thereof.

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