

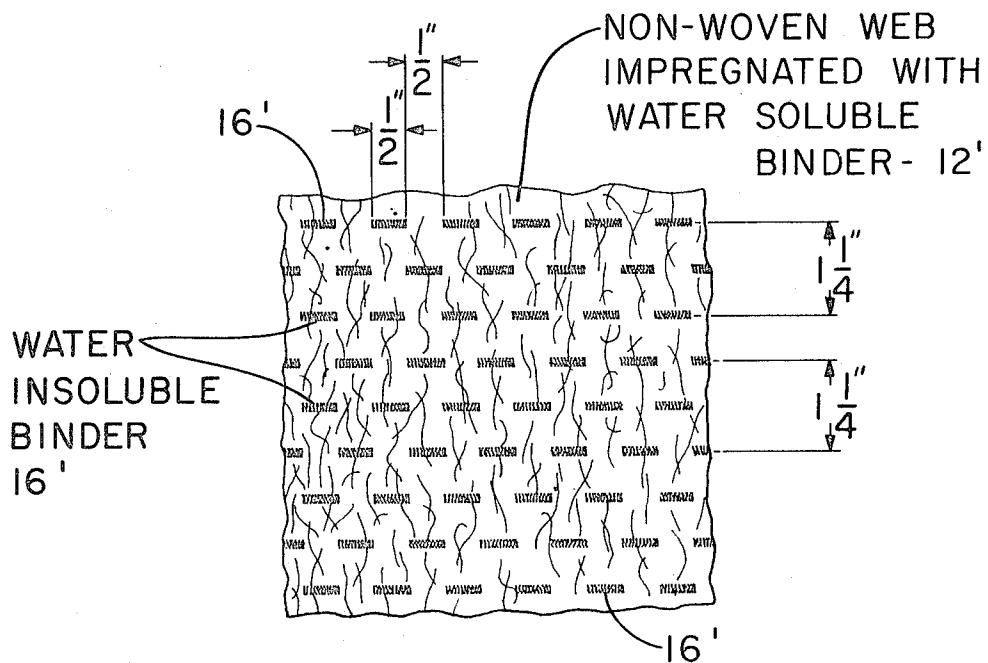
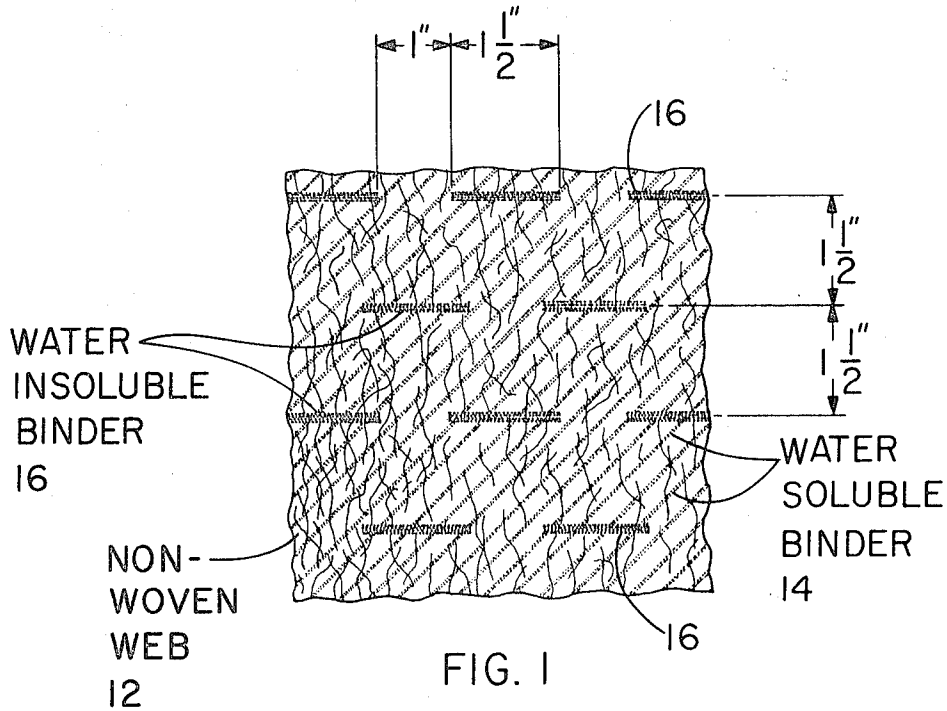
Nov. 2, 1971

J. F. CHAMPAIGNE, JR., ET AL

3,616,797

FLUSHABLE WRAPPER FOR ABSORBENT PADS

Filed Feb. 6, 1970



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FLUSHABLE WRAPPER FOR ABSORBENT PADS
John F. Champaigne, Jr., Neenah, and Howard A. Whitehead, Appleton, Wis., assignors to Kimberly-Clark Corporation, Neenah, Wis.

Filed Feb. 6, 1970, Ser. No. 9,261
Int. Cl. A61f 13/16, 13/18

U.S. Cl. 128—290

9 Claims

ABSTRACT OF THE DISCLOSURE

A flushable wrapper for sanitary napkins, disposable diapers and other absorbent pads. The wrapper comprises a non-woven fiber web bonded by a water-soluble adhesive and overprinted with another binder comprising a spaced pattern of water-insoluble adhesive. The pattern of the latter adhesive is arranged so as to permit the web to be broken up into pieces approximating the size of a postage stamp when the web is soaked in excess water.

BACKGROUND OF THE INVENTION

In the recently developed art directed toward solving the problem of producing sanitary napkins and disposable diapers which are flushable and made for disposal by deposition in the toilet, emphasis has been placed on developing a wrapper material which is strong enough to remain intact in the moist environment encountered during use, yet which will disintegrate readily when deposited in excess water, as in modern sewerage systems. Most of the work has been pointed towards the use of non-woven webs bonded by a binder which is basically water-soluble, or which can be converted from an insoluble to water-soluble stage by some simple expedient. In doing this work, it was found that most binders which provided a non-woven web with sufficient dry strength and which met the objective of dissolving rapidly to permit the web to disintegrate when soaked in water, did not give the web sufficient wet strength to successfully survive exposure to the moist conditions encountered in actual use. As a result, critical areas of such webs often failed when suspended from a conventional supporting device such as a sanitary belt.

It was also believed that in order for a non-woven web to be considered completely flushable, it had to be capable of being broken down to its individual fibers after a reasonable period of soaking in the conventional sewerage disposal system. It has now been determined that the latter condition is not necessarily required for adequate disposal, and that if a web is devised which breaks up into small, postage stamp size pieces after soaking, the pieces easily pass through conventional disposal systems including septic tanks without causing problems. This invention is directed to such a web.

SUMMARY OF THE INVENTION

In accordance with this invention a light weight array of initially unbonded fibers in the form of a non-woven web such as conventional carded web is first bonded overall with a water-soluble adhesive such as by impregnating or spraying, or by printing with closely spaced, and broken or continuous, parallel lines. This web with its primary bonding of water-soluble adhesive is then overprinted with a pattern of a flexible water-insoluble adhesive arranged in a predetermined spacing. The pattern of the latter adhesive is spaced with respect to the average length of the fibers in a manner to permit the web to be broken up into small pieces or patches approximating the size of

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a postage stamp, i.e. up to about 1" by 2" in dimension, upon subjecting the bonded web to the dissolving action of excess water.

Accordingly it is the object of the present invention to provide a flushable wrapper with improved functional strength in use, but which is still capable of being broken up into flushable size upon disposal thereof in a toilet.

Another object is to provide sanitary napkins and similar disposable pads with the new, improved wrapper whereby the entire product becomes flushable.

Still another object is to provide a process for fabricating an improved non-woven web having flushable properties.

These and other objects will become apparent by reference to the following specification and drawings wherein there are described various selected embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a slightly reduced plan view of a portion of a non-woven web made in accordance with the invention.

FIG. 2 is a similar plan view of a portion of another non-woven web embodying the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the preferred embodiments of the present inventive concept as shown in the drawings, a portion of a carded, non-woven web 12 of textile fibers is illustrated in FIG. 1, wherein closely spaced parallel lines of water-soluble binder 14 extend generally diagonally across the width of web 12. Printed over this primary water-soluble binder 14 is a spaced pattern of a secondary binder in the form of elongate segments 16 of a flexible water-insoluble binder.

The web employed in this embodiment comprised a carded web of 1.5 denier $1\frac{1}{16}$ " staple length rayon fibers, the said web weighing about 14 grams per square yard. The water-soluble binder comprised a polyvinyl alcohol adhesive of a type which was about 79–82% hydrolyzed, had a viscosity of about 22 cps. (4% water solution at 20° C.) and was readily soluble in water. The polyvinyl alcohol was applied in an amount of about 10 percent by weight based on the web weight. The parallel lines of adhesive were spaced about $\frac{1}{4}$ " apart.

The water-insoluble adhesive was a plastisol resin comprising 100 parts polyvinyl chloride resin dispersed in 75 parts by weight of dioctyl phthalate. The adhesive was applied in the form of a multiplicity of parallel lines broken up into spaced segments about $\frac{1}{16}$ " wide and $1\frac{1}{2}$ " long with about 1" spaces between the segments in each line. These segmented lines were disposed parallel to each other at spacings of approximately $1\frac{1}{2}$ " between lines. The $\frac{1}{2}$ " spacing and $1\frac{1}{2}$ " long segments of adjacent lines were disposed alternately with respect to each other providing an open arrangement resembling courses of bricks. Since the average fiber length was $1\frac{1}{16}$ ", a number of the fibers were therefore long enough to span the distance between these adhesive lines where the brick-like segments overlapped. The amount of plastisol applied amounted to about 0.50 gm./sq. yd. based on the weight of the fibers. The plastisol was then fused and cured at a temperature of about 325° F.

In the embodiment shown in FIG. 2 a 14 gram web similar to that used in the FIG. 1 embodiment was bonded with a polyvinyl alcohol sprayed on to the web in an amount to provide a uniform bonding of the fibers. The sprayed web had a solids pickup about 10 percent by weight. This bonded web is indicated at 12'. After spraying, the web was dried and then overprinted with a dis-

continuous pattern of a flexible water insoluble binder 16'.

The polyvinyl alcohol adhesive used was the same as described for the FIG. 1 embodiment, and the water-insoluble adhesive used was the same plastisol as described for FIG. 1, applied in about the same amount. However, the $\frac{1}{16}$ " wide segments in each of the spaced lines of water-insoluble adhesive were about $\frac{1}{2}$ " long and spaced $\frac{1}{2}$ " apart. This segment spacing in each of the parallel lines was arranged so that the segments in one line were adjacent the spaces in the closest neighboring line. In this way there was no overlapping of the segment edges in one line with the segment edges of the adjacent line, as distinguished from the FIG. 1 arrangement. The spaces between lines were about $\frac{3}{8}$ ", so that the unattached or free span of the fibers between the binder segments in every other line was therefore about $\frac{1}{4}$ ". Since the average fiber length is $1\frac{1}{16}$ ", the dimension between segments measured in the predominant fiber direction (i.e. vertically in the drawing), is less than the average length of the fibers which make up the web. In this case that dimension is slightly more than about $\frac{3}{4}$ of the average fiber length, and a greater number of fibers would therefore be positively bonded on both ends than in the FIG. 1 arrangement.

Each of these webs was used for covering sanitary napkins and tested in use. It was found that they displayed improved functional strength over webs employing water-soluble binders alone and in all cases the wrapper held up well in use. In addition, when the used napkins covered with these wrappers were disposed of in a toilet, it was found that the wrappers broke up into small pieces after a short period of soaking and that the entire napkins structure was dispersed by the conventional flushing practice.

Referring again to FIGS. 1 and 2 and the accompanying description, it is noted once more that there is apparently some critical relationship to the spacing of the water-insoluble adhesive and the fiber length. In FIG. 1, the segments 16 in one line overlap the segments in the next adjacent line, so that if the average fiber length in the web is $1\frac{1}{16}$ " long, and the predominant direction of the fiber lay is in the vertical direction, as viewed in the drawings, a number of the fibers are sufficiently long to span the $\frac{1}{2}$ " vertical or longitudinal distance between the segmented lines and be bound on both ends. This bonding of the fiber ends by the spaced water-insoluble binder segments provides areas of permanent strength in the web which areas are unaffected by high moisture conditions. Thus, while such moisture may weaken or dissolve portions of the primary water soluble binder, the web remains strong by virtue of these supplementary permanent bonds. However, when the web is soaked in excess water and the water-soluble areas completely dissolve in a short time, the web breaks apart between these permanently bonded segments into pieces, or patches, of postage stamp size which are easily flushed away.

When various other webs were made in which the spacing between segments was varied, it was found that for fibers of $1\frac{1}{16}$ " length, the dimension of the unbonded area between binder segments in adjacent lines, when measured in the predominant fiber direction, should range from a little less than the average fiber length, i.e. about $1\frac{1}{2}$ ", to about three-fourths of the fiber length, i.e. close to about $1\frac{1}{8}$ ". Under such conditions, the web will still break up into patch size pieces in water while retaining sufficient tensile strength to be useful. These spacings, of course, are measured in the predominant fiber direction, as found in the machine direction of carded webs, and which is in the vertical direction in the drawings, FIGS. 1 and 2 show two useful embodiments within these ranges.

While a carded rayon web is described in the specific example cited above, other fibers including both natural and synthetic may be used in the base web. However, cellulose fibers or fibers of cellulosic derivation are preferred because they are biodegradable. Also, while the

fiber lengths in the specific example are $1\frac{1}{16}$ ", fiber lengths in the usual staple lengths of $\frac{1}{2}$ " to about 3" are useful. The longer fibers are, of course, less desirable because they do not disperse as well.

Also, while a carded web is specified in the examples, other means of forming the web may also be employed.

In addition to the specific polyvinyl alcohol mentioned above, other cold-water soluble polyvinyl alcohols may be used. For example, polyvinyl alcohols having a percent hydrolysis in the range of about 79 to about 98 are generally cold-water soluble and are suitable for the described use. Viscosities of about 21 to about 28 are preferred. The polyvinyl alcohol may be applied by spraying, impregnating, printing or the like. However, a printing application can be better controlled and gives better strengths for equivalent amounts. When printing is employed the adhesives may be in the form of straight or wavy parallel lines which are continuous or discontinuous.

The amount of polyvinyl alcohol used can also vary in the range of about 5 to 15 percent by weight, but should be regulated to provide a suitable softness and drape. Excessive amounts also are inclined to become sticky in use, and are thus not as desirable.

While polyvinyl alcohol is preferred as the water-soluble binder, other water-soluble adhesives may be used, including such materials as polyvinyl methylether, glycol cellulose, cellulose glycolate, methyl cellulose and the like.

In addition to the polyvinyl chloride adhesive mentioned in the specific example, other flexible adhesives may be used for the water-insoluble binders. Other plastisols such as copolymers of vinyl chlorides with other vinyl resins may be used and be plasticized by organic sebacates or adipates, as well as phthalates. Other water-insoluble flexible resins, both thermoplastic and thermosetting may be used including such things as polyolefins, polyamides, cellulose acetates and acrylates, as well as elastomeric latices including natural rubbers, butadiene styrenes, butadiene acrylonitriles and the like, and various well known combinations thereof. However, for the purpose set forth herein, these adhesives should have the necessary flexibility and softness to be suitable for direct body contact.

While the water-insoluble binder is shown and described as being applied in straight segmented lines, a variety of shapes and sizes are feasible, an important criterion being the spacing of the binder segments with respect to fiber lengths as set forth herein.

The structure of the absorbent pad itself is not critical as long as it is made up of the usual absorbent materials which break up and disintegrate easily in excess water. Among these are wood pulp fluff, cotton fibers, absorbent rayon and regenerated cellulose fibers, multiple plies of cellulose wadding and the like or combinations thereof.

What is claimed is:

1. A flushable web, especially for use with sanitary napkins, disposable diapers and the like, comprising a non-woven web of staple length fibers bonded primarily with a water-soluble adhesive and overprinted with a water-insoluble adhesive disposed in a predetermined pattern of spaced segments.

2. The web of claim 1 in which said water-soluble adhesive is impregnated throughout said web.

3. The web of claim 1 in which said water-soluble adhesive comprises a plurality of spaced parallel lines extending substantially transverse of the fibers.

4. The web of claim 3 in which the space between said lines is less than the average length of said fibers.

5. The web of claim 1 wherein the unbonded span of the spaces between segments measured in the direction coincident with the direction of the predominant fiber lay ranges from slightly less than the average length of said fibers to about three-fourths of the length of said fibers.

6. The web of claim 1 wherein the water-soluble adhesive is polyvinyl alcohol and the water-insoluble adhesive is a plastisol.

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7. The web of claim 6 wherein the plastisol is polyvinyl chloride.

8. A sanitary napkin comprising an absorbent pad enclosed in a wrapper of the type defined in claim 1.

9. A method for the manufacture of a flushable non-woven web which comprises bonding together an initially unbonded array of staple length fibers with a water-soluble adhesive and overprinting said bonded fiber web with a water-insoluble adhesive applied in the form of a predetermined pattern of spaced segments.

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ROBERT F. BURNETT, Primary Examiner

J. J. BELL, Assistant Examiner

U.S. Cl. X.R.

117—38, 45, 140 A; 128—284; 161—148, 170, 410