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[54] **FLUSHABLE WEB CONTAINING
FLUSHABILITY INDICATOR, AND
ABSORBENT PADS WRAPPED
THEREWITH**

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[58] Field of Search **128/284, 285, 286, 287, 290,
128/296, 156**

[56] **References Cited**

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[57] ABSTRACT

A means for indicating when a sanitary napkin or diaper wrapped with a web bonded with a spaced pattern of water-dispersible adhesive is in condition for flushing away after it is dropped in a toilet for disposal. The indicating means is provided by including a water-soluble coloring agent or dye in the water-dispersible adhesive composition. As the water disperses the adhesive, the dye migrates into the non-bonded area of the web or is diluted in the excess water, and the adhesive pattern substantially disappears, thus indicating that the adhesive has become softened sufficiently to permit the wrapper to be broken up readily by the flushing action of the water.

16 Claims, No Drawings

FLUSHABLE WEB CONTAINING FLUSHABILITY INDICATOR, AND ABSORBENT PADS WRAPPED THEREWITH

BACKGROUND OF THE INVENTION

During recent years much emphasis has been placed upon developing sanitary napkins and diapers and other single-use absorbent pads with a completely flushable structure, so that they may be disposed of in conventional toilets. The major problem encountered in rendering these absorbent devices flushable has been to develop an outer, fluid-permeable wrap which is strong enough to remain whole while it is subjected to the normal stress, strain, and moist conditions encountered during use, and yet which will break up readily when deposited in the water of a toilet and flushed away. One type of wrapper employed for such purposes is a non-woven web bonded by spaced lines or patterns of water-dispersible adhesive. However, in order to make such webs strong enough to hold together in the moist environment encountered during use, it has been found necessary to apply the adhesive in amounts such that the adhesive will not dissolve in water instantaneously, or to modify the adhesive in some way to slow down its solubility rate. When these practices are used the adhesive disperses readily only after it has been immersed in water for a short period of time. Ideally, therefore, it would be desirable if the person who deposits the product in water could be provided with some easily discernible signal which would inform the user when the adhesive has been immersed in the water for a sufficient time to insure that the wrapper will disperse completely at the first flushing.

The main object of this invention therefore is to provide a water-dispersible wrapper for absorbent pads with a means for indicating when the adhesive binder in the wrapper is dissolved sufficiently to permit ready dispersion of the wrapper in water.

SUMMARY OF THE INVENTION

This invention is directed to a means for indicating when a sanitary napkin or diaper wrapped with a non-woven web bonded with a spaced pattern of water-dispersible adhesive is in condition for disposal by flushing after it is dropped in a toilet. The indicating means is provided by including a small percentage of water-soluble coloring agent or dye in the water-dispersible adhesive which is normally used to bond flushable wrappers. When a pad wrapped in a fluid-permeable web bonded with such a color-containing water-dispersible adhesive is deposited in water, the color or dye gradually diffuses out of the adhesive and spreads to the rest of the web and is diluted by the excess water whereby the adhesive pattern substantially disappears. The change from sharply defined adhesive pattern to an overall faded color in the web is clearly visible to the eye, and as the color fades by diffusing into the surrounding web and by water dilution, the user is made visually aware of the fact that the adhesive is softened by the water to a degree sufficient to destroy its bonding power and to permit the wrapper to readily disintegrate during the flushing action and thereby release the contained pad so that it, too, will disintegrate and flush away.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In making up a suitable wrapper in accordance with this invention, rayon fibers of 1.5 denier and 1-9/16 inch staple length were carded to form a non-woven fiber web weighing approximately 14 grams per square yard. The carded web was overprinted with a pattern of a water-soluble adhesive containing a compatible water-soluble red dye. The pattern comprised two sets of spaced parallel lines of adhesive. One set extended diagonally of the web in one direction at an angle of about 45° while the other set extended diagonally in the opposite direction and also at a 45° angle. The sets of adhesive lines intersected to provide an overall closed diamond pattern. This diamond style bonding pattern is one of many commonly used for binding non-woven webs. In this instance, the lines were about one-sixteenth inch wide and spaced about one-quarter inch from each other. The adhesive was applied in the form of a 10 percent solution and in the amount of about 1 gram per square yard in the finished material.

The water-soluble adhesive used in this example comprised polyvinyl alcohol of a type which was about 79-82 percent hydrolyzed, had a viscosity of 22 cps (4 percent water solution at 20° C.) and was readily soluble in water.

The compatible water soluble dye was present in the polyvinyl alcohol in the amount of about 1.0 percent by weight based on the polyvinyl alcohol. In this instance the dye was of a dark red color sold under the name EASTACRYL — dark red — LA by Eastman Kodak Company.

The above-described bonded webs were used to construct sanitary napkins by wrapping the webs around conventional absorbent pads made up from layers of cellulose wadding and wood pulp fluff in the conventional manner, leaving the customary fastening tabs extend beyond each end of the pads.

The napkins comprising pads wrapped with the above-described web were then dropped into the water of a toilet bowl. Shortly after the pad immersed itself in the water there was a noticeable migration of the color from the adhesive lines into the adjoining areas of the web. As this migration took place the color in the lines of the adhesive faded rapidly. In about 30 seconds the pattern was no longer discernible, and the coloring matter had distributed itself uniformly throughout the web. When the toilet was flushed at this time, the web broke up immediately, releasing the internal pad components and permitting the entire structure to disintegrate into small pieces and individual fibers which passed through the pipe lines of the disposal system without difficulty. The pipe lines carrying the flushed material were made of transparent material so that the condition of the materials as they were carried therethrough was readily observable.

Another pad of the same structure was dropped in the water and flushed immediately without waiting for any color change. In this case when no time was allowed for the adhesive to dissolve, the wrapper did not break up and it was observed that the whole structure traveled down the drain and did not break up to any extent until it had been carried a considerable distance down the transparent pipe-line and around several bends therein.

As indicated above, the diffusion of the water-soluble dye or coloring matter out of the adhesive and into the water and adjacent areas of the web causes the originally sharp outline of the colored adhesive pattern to substantially disappear. The color itself takes on an overall lighter hue, thus providing a visual signal to the user that the pad is ready for flushing, and also assuring the user that the flushed pad will not travel through the pipe-line for any distance in its bulky, undisintegrated form.

In addition to the dye described in the specific example, any water-soluble dye or coloring agent which is compatible with the particular adhesive employed may be used. It is understood of course that the dye be non-toxic and non-irritating in contact with the skin.

Other specific dyes which were found suitable for use with polyvinyl alcohol are Pontamine Turquoise 8 GLP and Rhodamine B Extra, both sold by the E. I. DuPont Company.

Amounts of coloring agent in the adhesive in the range of from about 0.5 percent to about 1.5 percent by weight have been found useful. A wide range of colors may be employed to identify various types of napkins or the like. The coloring agent should be non-pigmented and may be either an acid, a basic or a direct dye. Vegetable dyes and water-soluble food colors may be used.

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 adhesive pattern used may be in the form of straight or wavy parallel lines which are transversely or diagonally disposed, as well as other patterns including circles, squares, dots and the like. The lines in the patterns may be continuous or discontinuous.

The amount of polyvinyl alcohol used can also vary in the range of about 5 to about 15 percent by weight, but should be regulated to provide a suitable strength as well as softness and drape. Excessive amounts should be avoided as they are inclined to become sticky in use, which is undesirable.

While only polyvinyl alcohol is described in the specific example, and 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. The dye or coloring matter used should of course be compatible with the particular adhesive selected.

The binder need not be completely water-soluble, but must be water-dispersible, i.e., sufficiently water sensitive that after a short time immersion in water the binder loses its binding power thus permitting the web to disintegrate. Since the loss of binding power takes longer when the binder is water-dispersible rather than when it is completely water-soluble binder, the use of a dye or coloring agent to serve as a visual dispersibility signal is especially appropriate.

This invention is also applicable to webs in which combinations of water-soluble and water-insoluble binders are employed. One example of such structure may be found in assignee's copending application, Ser. No. 9,261 to J. F. Champaigne, Jr. and H. A. Whitehead

filed Feb. 6, 1970 and now U.S. Pat. No. 3,616,797. In that patent the wrapper comprises a non-woven fiber web bonded primarily by a water-soluble adhesive and overprinted with a water-insoluble adhesive, the latter being disposed in a predetermined pattern of spaced segments. In such instances the water-soluble adhesive should comprise the spaced pattern which contains the coloring agent, since it is the eventual dissolution of the water-soluble binder which provides flushability.

It will also be seen that instead of having all the adhesive contain the coloring agent or dye, only certain designated portions may contain it and still serve as the visual signal area. Small spots of the adhesive-dye combination in strategically located areas may be used.

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 1-9/16 inch, fiber lengths in the usual staple lengths of 1/2 inch to about 3 inches are useful. The longer fibers are, of course, less desirable because they will not disperse as readily.

While a carded web is specified in the examples, other known means of forming the web such as air-forming and drafting of fibrous material may also be employed.

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. Included among these are wood pulp, cotton fibers, absorbent rayon and regenerated cellulose fibers, multiple plies of cellulose wadding and the like or combinations thereof.

While the specific examples described above are directed to sanitary napkins it is understood that the invention is applicable to other absorbent pads such as diapers and the like, and that the entire pad need not be wrapped with the web since in some cases only the body-contacting portion requires a covering web of the nature described.

What is claimed is:

1. In a flushable web comprising a fluid-permeable fibrous web bonded at least in part by a pattern of water-dispersible adhesive, the improvement wherein at least a portion of said adhesive contains a water-activatable flushability indicator, said indicator comprising a water-soluble coloring agent dispersed in said adhesive, said coloring agent being compatible with said adhesive, whereby when said web is immersed in water and as said adhesive is dispersed by said water said coloring agent migrates from said adhesive into said water and adjacent non-bonded portions of said web causing said pattern to substantially disappear.

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

3. The web of claim 1, in which said web comprises a non-woven web of staple length fibers.

4. The web of claim 3 wherein the fibers in said web are rayon fibers.

5. The web of claim 1 in which said web is bonded primarily with a water-soluble adhesive and overprinted with a water-insoluble adhesive, and said coloring agent is dispersed in said water-soluble adhesive.

6. The web of claim 5 in which both said adhesives are in the form of spaced adhesive patterns.

7. The web of claim 1 in which at least part of said adhesive is selected from the group consisting of polyvinyl alcohol, polyvinyl methylether, glycol cellulose, cellulose glycolate, and methyl cellulose.

8. In a flushable absorbent pad comprising an absorbent water-disintegratable core having at least its body-contacting surface covered with a fluid-permeable fibrous web bonded at least in part by a pattern of water-dispersible adhesive, the improvement wherein at least a portion of said adhesive contains a water-activatable flushability indicator, said indicator comprising a water-soluble coloring agent dispersed in said adhesive, said coloring agent being compatible with said adhesive, whereby when said pad is immersed in water and as said adhesive is dispersed by said water said coloring agent migrates from said adhesive into said water and adjacent non-bonded portions of said web causing said pattern to substantially disappear.

9. The pad of claim 8 in which said web comprises a non-woven web of staple length fibers.

10. The pad of claim 8 in which said adhesive binding said web is water-soluble.

11. The pad of claim 9 wherein the fibers in said web are rayon fibers.

12. The pad of claim 8 in which said web is bonded primarily with a water-soluble adhesive and overprinted with a water-insoluble adhesive, and said coloring agent is dispersed in said water-soluble adhesive.

13. The pad of claim 12 in which both said adhesives are in the form of spaced adhesive patterns.

14. The pad of claim 8 in which at least a part of said adhesive is selected from the group consisting of polyvinyl alcohol, polyvinyl methylether, glycol cellulose, cellulose glycolate, and methyl cellulose.

15. The pad of claim 8 in which said pad is a sanitary napkin.

16. The pad of claim 8 in which said pad is a diaper.

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