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[54] **SANITARY NAPKIN AND DISPOSABLE WRAPPER THEREFOR**
23 Claims, No Drawing

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ABSTRACT: A sanitary napkin wrapper made from fibers which are normally insoluble in water but which can be converted to a water soluble form in an aqueous environment by introduction into the environment of a suitable chemical. Particularly suitable water-insoluble fibers may be made from alginic acid and the insoluble salts thereof. Such fibers can be converted to water-soluble alginate by ion exchange with a weak base. Sanitary napkins enclosed in such a wrapper may be easily flushed away after the wrapper is dissolved.

SANITARY NAPKIN AND DISPOSABLE WRAPPER THEREFOR

BACKGROUND OF THE INVENTION

In this age of disposables, considerable interest is being shown in the development of a fully flushable sanitary napkin. The principal goal in this area is to provide a fluid-pervious wrapper for the absorbent core, which wrapper will rapidly disintegrate when dropped into water, such as in a toilet, while having sufficient strength to retain its integrity during use without tearing or scuffing. It has been proposed that a suitable wrapper for this purpose would be a light weight nonwoven web of natural or synthetic fibers, bonded by a water-soluble binder, such as polyvinyl alcohol, sodium carboxymethylcellulose or the like. However, a satisfactory balance in dry strength and wet strength for such materials is difficult to achieve. If sufficient water-soluble binder is used to give the nonwoven web enough strength to maintain its integrity in the presence of body fluids during use, the binder must be applied to the web in such quantities that even though the binder may be water soluble in nature, it does not completely dissolve in excess water without intensive agitation. In such cases, when disposed of in a toilet, the fibers in the wrapper tend to rope together to further inhibit complete disintegration and the pad will often remain intact so that there is a tendency for it to plug sewer lines, septic tanks, and the like.

If the amount of binder applied to the web is limited so that it will disintegrate easily in the toilet, the nonwoven wrapper does not have sufficient strength to stand up in use without rupturing.

The present invention uses a different approach to overcome these disadvantages.

SUMMARY OF THE INVENTION

As disclosed herein a wrapper for sanitary napkins is made up of threads or fibers which are normally insoluble in water. These fibers are unaffected by body fluids and retain sufficient strength while the napkin is worn. Then when the soiled napkin is discarded in the toilet after use, a chemical is added to the water which changes the fibers to a soluble form by ion exchange, whereby the threads or fibers will dissolve almost instantaneously.

Suitable fibers for this use may be obtained from alginic acid and insoluble salts thereof. Alginic acid is a polymannuronic acid obtained from seaweed. Alginic acid fibers may be made by spinning a solution of the sodium salt of alginic acid into an acid bath. Calcium alginate fibers, which are also insoluble, may be made by spinning sodium alginate solutions into a coagulating bath containing calcium salts. The alginic acid and calcium alginate fibers thus obtained are quite stable in water and aqueous fluids. Aluminum alginate fibers are also of such nature.

A pervious wrapper fabric for sanitary napkins may be made from these fibers in the form of knit yarns, in the form of woven or nonwoven continuous filaments or yarns, or in the form of a mat of fibers bonded by a suitable permanent binder. While such fabrics, when made from these fibers, lose some strength in the presence of moisture they retain sufficient strength to maintain their integrity in use. However, when discarded into a toilet they may be completely dissolved by simply adding to the water a small amount of weak alkali such as sodium carbonate or an alkaline soap. A tablespoonful of sodium carbonate, for example, is sufficient to change the insoluble calcium alginate fibers present in a normal size sanitary wrapper to soluble sodium alginate and the fibers will dissolve almost instantly in water.

The basic salt, or other ion-exchange chemical, may be provided in bulk, in a bottle, in a dispensing shaker, or the like, or it may be enclosed in a packet of water soluble film, which packet may be attached to the napkins or packaged separately.

Accordingly, it is an object of the present invention to provide an improved flushable sanitary napkin construction.

Another object is to provide a wrapper for sanitary napkins comprised of water-insoluble fibers which are easily converted to water-soluble form in an aqueous environment.

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

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Calcium alginate fiber yarns of about 100 denier, formed or 40 filaments of about 2.5 denier, 2.5 inch staple, were knit into a continuous sleeve having $\frac{1}{4}$ -inch loops. The sleeve was cut into lengths sufficient to enclose absorbent cores taken from conventional sanitary napkins, and to extend beyond the end of the cores to serve as fastening tabs.

These complete pads were dropped into a container of water. A tablespoonful of sodium carbonate was added to the water, and the solution mildly agitated. The alginate fibers visibly swelled almost immediately after the addition of the carbonate and then dissolved rapidly to release the absorbent core, whereupon the napkin core was easily dispersed into its component fibers by the agitation.

In another example, calcium alginate yarn as previously described was formed into a crosslaid thread fabric of 18×14 construction in which a set of spaced parallel threads were disposed, on one side of, and substantially perpendicular to, another set of spaced parallel threads. The thread assembly was adhesively attached at the crossover points by a flexible thermoplastic adhesive; i.e. plasticized polyvinyl acetate. A nonwoven facing of combed cotton fibers was airlaid onto the crosslaid threads and fastened thereto by calendering which aided in bonding the fibers to the adhesive by embedment therein.

This web was used to overwrap a conventional sanitary napkin core as in the previous example. Sample napkins were dropped into a toilet bowl and sodium carbonate added as before. The crosslaid threads swelled and dissolved rapidly and disappeared completely, leaving only the absorbent core to be flushed down the toilet without difficulty.

In still another example, calcium alginate fibers of 2.5 denier and about 2.5 inches in length were carded and formed into a web weighing approximately 14 grams per square yard. This web was temporarily bonded by impregnation with polyvinyl alcohol and then printed with a spaced bricklike pattern of hot melt adhesive, i.e. polyethylene. The pattern of adhesive covered about 20 to 40 percent of the web surface. The polyvinyl alcohol was then washed out and the web dried.

Sanitary napkin cores were then overwrapped with this wrapper providing a finished pad with suitable suspension tabs.

The finished napkin was dropped into a toilet and sodium carbonate added as before. The alginate fibers swelled and dissolved rapidly and disappeared completely, again leaving only the absorbent core to be flushed away without trouble.

Some of the above-described napkins were constructed as before except that the sodium carbonate was placed in a small packet fabricated from water-soluble polyvinyl alcohol film, which packet was then attached to the bottom of the napkin. This construction was dropped into a large beaker of water and stirred. The polyvinyl alcohol packet dissolved, releasing the carbonate which in turn caused the alginate fibers to dissolve.

In addition to sodium carbonate other weak bases such as potassium carbonate, mildly alkaline soap, Calgon (sodium hexametaphosphate), and trisodium phosphate have been found suitable for solubilizing the fiber.

In addition to the wrapper structures described above, woven gauze structures of alginate fibers may also be used, as well as other nonwoven structures. Other variations and changes may also be made in the above structures while retaining the advantages and principles described.

I claim:

1. A sanitary napkin wrapper comprised of normally water insoluble fibers, said fibers being characterized by a capability of being converted to water-soluble form in an aqueous environment by the addition to said aqueous environment of a reactive chemical for the fibers.
2. The sanitary napkin wrapper of claim 1 in which said fibers are selected from the group consisting of alginic acid and the water insoluble salts thereof, and said chemical is a weak base.
3. The sanitary napkin wrapper of claim 2 in which said base is selected from the group consisting of sodium carbonate, potassium carbonate, sodium hexametaphosphate, trisodium phosphate, and alkaline soap.
4. The sanitary napkin wrapper of claim 2 in which said wrapper comprises a knit sleeve.
5. The sanitary napkin wrapper of claim 2 in which said wrapper is comprised of nonwoven crosslaid yarns adhesively bonded at the yarn intersections.
6. The sanitary napkin wrapper of claim 2 in which said wrapper comprises a nonwoven web of fibers bonded by a spaced pattern of flexible adhesive.
7. The sanitary napkin wrapper of claim 4 in which said yarn is calcium alginate.
8. The sanitary napkin wrapper of claim 5 in which said yarn is calcium alginate.
9. The sanitary napkin wrapper of claim 6 in which said fibers are calcium alginate.
10. In a sanitary napkin construction comprising an elongate absorbent core of water-dispersible fibrous material enclosed in a fluid-pervious wrapper, the improvement wherein said wrapper is comprised of normally water-insoluble fibers, said fibers being characterized by a capability of being converted to water-soluble form in an aqueous environment by the introduction into said environment of a suitable reactive chemical for the fibers.
11. The napkin construction of claim 10 in which said fibers are selected from the group consisting of alginic acid and the water insoluble salts thereof, and said chemical is a weak base.

12. The napkin construction of claim 11 in which said base is selected from the group consisting of sodium carbonate, potassium carbonate, sodium hexametaphosphate, trisodium phosphate, and alkaline soap.

13. The napkin construction of claim 11 in which said wrapper comprises a knit sleeve of yarn.

14. The napkin construction of claim 11 in which said wrapper is comprised of nonwoven crosslaid yarns adhesively bonded at the yarn intersections.

15. The napkin construction of claim 11 in which said wrapper comprises a nonwoven web of fibers bonded by a special pattern of flexible adhesive.

16. The napkin construction of claim 13 in which said yarn is calcium alginate.

17. The napkin construction of claim 14 in which said yarn is calcium alginate.

18. The napkin construction of claim 15 in which said fibers are calcium alginate.

19. A sanitary napkin comprising an elongate absorbent core of water dispersible fibrous material enclosed in a fluid-pervious wrapper, said wrapper being comprised of normally water-insoluble fibers characterized by a capability of being converted to water-soluble form in an aqueous environment by an ion-exchange chemical, and a packet containing said ion-exchange chemical being incorporated in said pad, said packet being fabricated of water-soluble film.

20. The napkin of claim 19 wherein the fibers in said fibers are selected from the group consisting of alginic acid and the water insoluble salts thereof, and the ion-exchange chemical is a weak base.

21. The napkin of claim 20 wherein said weak base is selected from the group consisting of sodium carbonate, potassium carbonate, sodium hexametaphosphate, trisodium phosphate, and alkaline soap.

22. The napkin of claim 19 wherein said film is polyvinyl alcohol.

23. The napkin of claim 19 wherein said packet is attached to the lower face of said napkin.

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