Fig. 1

Fig. 2

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ABSTRACT OF THE DISCLOSURE

A process of preventing undesirable loosening or matting of fibers in cellulose fibrous sheet material, containing hydrophilic, flat, ribbon-like, regenerated, cellulose fibers of the generally collapsed multi-cellular form, during normal use of sanitary products made therefrom, and the improved cellulose fibrous sheet material and sanitary products utilizing the same and having high dry strength, wet hang and dispersible properties when agitated in a large excess of water. The process comprises impregnating a wet web of the sheet material during manufacture thereof and while the web contains a substantial amount of moisture of at least 60% with a high molecular weight water soluble polymer that enhances bonding of the fibers of the finished sheet without adversely affecting the dispersible properties so that it is resistant to loosening or matting of the fibers during normal use.

This invention relates to a novel process for preventing undesirable loosening and matting on the surface of paper products when subjected to friction. More particularly, the invention relates to the utilization of this process in the manufacture of a special type of paper for use in diapers, sanitary napkins, bandages, nursing pads, etc., which are collectively designated hereinafter as "Sanitary Products." Loosening and matting of fibers on the surface of such products, as they become moistened with body fluids during use, causes these fibers to stick to the body of the wearer, and more particularly in the case of sanitary napkins to entangle in the pubic hair of the wearer, resulting in discomfort and unsightly appearance. The process of the present invention overcomes this problem.

An especially advantageous use of the process resulting paper product of the present invention is in connection with the disposable cellulose products disclosed and claimed in Estes and Hervey U.S. Patent No. 3,171,773, patented Mar. 2, 1965, and assigned to the same assignee as the present application. The cellulose products covered by that patent include diapers, diaper pads, sanitary napkins and other sanitary products that may be safely and reliably disposed of by flushing in an ordinary water closet. Those products are characterized by having the necessary strength to prevent disintegration or damage during normal use, the necessary high water absorbency and other physical properties when in use, and finally the property of disintegrating quickly and easily when agitated in a large excess of water, such as in a water closet, whereby they may be easily flushed away without danger of clogging the fixture.

The described products of Patent No. 3,171,773 constituted a marked advance over prior so-called "dispposable" products which were not truly "flushable" in the ordinary water closet without clogging the fixture. The products disclosed in the above Patent No. 3,171,773 were composed entirely or predominantly of a material made from a special form of regenerated cellulose fibers. These fibers are disclosed in U.S. Patent No. 3,156,605, issued Nov. 10, 1964, as hydrophilic, flat, ribbon-like, aerated, regenerated cellulose fibers of the generally collapsed multi-cellular form having large flat surfaces which have natural bonding characteristics when placed in contact with each other during the papermaking process.

The material made from these special fibers has relatively good dry strength, good wet "hang" and dispersibility properties that are required to produce the satisfactory flushable product covered by said Patent No. 3,171,773. Reference to this Patent No. 3,171,773 may be had for a further more detailed description of the special fibers and their properties.

An important feature of the present invention is to eliminate or avoid the above described loosening and matting characteristic of the material made from the above special fibers, without adversely affecting the important properties of high dry strength and ease of dispersibility, above described, that renders the products unsatisfactory.

Some of the features of this invention having been stated, other features will appear as the description proceeds, when taken in conjunction with the accompanying drawings, in which—

FIGURE 1 is a reduced perspective view of a sanitary napkin utilizing the improved paper of this invention; and

FIGURE 2 is a reduced perspective view of a diaper pad utilizing the improved paper of this invention and illustrated as being held in a holder for application to a baby.

In accordance with the present invention it has been discovered that the special regenerated cellulose fibers of the Patent No. 3,156,605 may be so treated during the process of manufacture of a paper sheet comprising these fibers, to eliminate the tendency of the fibers in said paper to loosen or mat when subjected to friction or slight abrasion. This process comprises in essence a novel treatment of the paper web during its manufacture on the paper machine such as, for example, a Fourdriner paper machine as disclosed in G. L. Bedwell Patent No. 2,488,700, issued Nov. 22, 1949.

It is important to effect the treating process while the paper web still contains a relatively high amount of moisture, such as, for example, 60% by weight, before drying of the paper web is completed on the paper machine. In practice, it has been found advantageous to treat the paper web on the paper machine after it passes the wet press section of the machine and at or just prior to the first dryer on the machine where the wet web will contain at least the desired 60% moisture. The treating process comprises applying to the wet paper web a certain chemical or chemicals which have been found effective for the purpose of this invention and described further below. Although these chemicals could be introduced in the papermaking process at an earlier stage such as in the paper furnish, or at the head box, or on the Fourdriner wire prior to the wet section of the paper machine, such application would be wasteful of the chemical or chemicals used. When the chemicals are applied to the paper web just prior to the dryer section of the machine, undue waste is avoided and the treating process is practical from a cost standpoint.

As above indicated, the chemicals which are added to the wet paper web are not for the purpose of effecting flushability of the paper products produced from the ultimate paper sheet because the paper made from the fibers of the above patent already possesses that property, but instead serve the purpose of preventing the fibers of the paper products from loosening or matting and this without adversely affecting the flushability of the product.

The suitable chemicals for accomplishing the above described purpose of the present invention fall within the class of high molecular weight water soluble polymers
and illustrative, but non-limiting, specific examples of same are methylcellulose, ethylcellulose, gelatin, soluble starches, dextrin, water soluble gums, polyvinyl alcohol and polyvinylpyrrolidone, preferably of as high solution viscosity as possible but allowing a dilute solution of the chemical to be sprayed on the wet web.

The amount of chemical to be added to the paper may vary substantially but in actual practice it has been found that amounts of about 0.2% to 5% based on the weight of the dry paper, may be used. A typical amount which has been found to give very good results is 2%. These chemicals have the property of increasing the cohesiveness or bonding together of the fibers of the cellulose sheet material so that in the normal use of the end products, the fibers of the paper material will not loosen or mat to any appreciable extent. This is in marked contrast to the products produced from material using the same fibers without the benefit of the process of the present invention and which have been found to loosen or mat considerably during normal use.

The chemical or chemicals used in the process of the present invention may be applied to the wet paper sheet, as above described, by spraying, dipping, immersing, kiss roll application, or other conventional means and methods, preferably by spraying.

The cellulose web or paper sheet produced in accordance with the present invention may be used in whole or in part in a variety of ways in the manufacture of the sanitary products above described or for other similar products which may be worn in contact with the human skin.

In commercial manufacture of sanitary products utilizing the cellulose fibrous sheet material of this invention, it has been found particularly desirable to use the improved sheet material as a wrapper or cover material for enclosing and holding therein an interior pad of dispersible fibrous absorbent material which is adapted to absorb the bulk of the body fluids of the wearer. This interior pad may comprise an improved fluffed wood pulp, as disclosed in copending application, Ser. No. 593,094, filed Nov. 9, 1966, assigned to the same assignee as the present invention, in cut layers, folded layers, shaped masses, etc., with or without creped wadding or creped tissue folded or formed therewith. When the improved fibrous cellulose sheet material of this invention is used as a wrapper or cover material in combination with a cheaper interior pad of dispersible fibrous absorbent material, the overall cost of the sanitary products may be substantially decreased.

In the formation of a sanitary napkin, as illustrated in FIGURE 1, utilizing the improved cellulose fibrous sheet material of this invention, the improved material would be utilized as a wrapper or cover 10 for completely enclosing a layered, folded or otherwise formed pad 12 of improved dispersible fibrous absorbent material, as more particularly described in the above copending application. This wrapper or cover would be manufactured in the usual configuration and secured around the pad to form attachment tabs on either side of the interior pad for attachment to the normal belt or holding means when utilized by the wearer. For particular details of the construction of the pad 12, reference may be had to above copending application.

Likewise, in the formation of a diaper pad, as illustrated in FIGURE 2, the improved cellulose fibrous sheet material of the chemical to be utilized as a wrapper or cover 20 for enclosing a bulky absorbent dispersible fibrous pad 22, the wrapper or cover material being formed into the desired generally rectangular configuration and secured around the pad for use as a diaper pad to be inserted within a holder 24 for placing in position on the body of the wearer. The pad 22 is preferably formed of the improved fluffed wood pulp of the above copending application and reference may be had thereto for specific details of the pad construction.

Various modifications and changes may be effected in the foregoing description without departing from the scope of this invention as defined in the appended claims.

What is claimed is:

1. The process of preventing undesirable loosening or matting of fibers in cellulose fibrous sheet material, having high dry strength, wet hang and dispersible properties when agitated in a large excess of water, during normal use of said material in sanitary products or the like, said process comprising:

   (a) providing a web of hydrophilic, flat, ribbon-like, aerated, regenerated cellulose fibers of the generally collapsed multicellular form having natural bonding characteristics; and

   (b) impregnating said web of fibers throughout during the manufacture thereof and while the web contains a substantial amount of moisture of at least 60% with a high molecular weight water soluble polymer composition that enhances the natural bonding of the fibers of the finished sheet and in which no parts of said composition adversely affects the dispersible properties of said material so that said material is resistant to loosening or matting of the fibers during normal use of said material and retains the dispersible properties when agitated in a large excess of water.

2. A process as defined in claim 1 and in which the impregnating chemical is selected from the group consisting of methylcellulose, ethylcellulose, gelatin, soluble starches, dextrin, water soluble gums, polyvinyl alcohol and polyvinylpyrrolidone.

3. A process as defined in claim 1 in which the amount of the impregnating water soluble polymer added to the wet web is approximately 0.2% to 5% based on the weight of the dry sheet material.

4. A process as defined in claim 1 and in which the impregnating water soluble polymer is approximately 2% polyvinyl alcohol based on the weight of the dry sheet material.

5. A fluffable sanitary product comprising:

   (a) an interior pad of dispersible fibrous absorbent material adapted to absorb body fluids; and

   (b) a fluid permeable wrapper of cellulose fibrous sheet material enclosing said interior pad and which is resistant to loosening or matting of the fibers and which has high dry strength, wet hang, and dispersibility when agitated in a large excess of water, said material comprising:

   (1) hydrophilic, flat, ribbon-like, aerated, regenerated cellulose fibers of the generally collapsed multi-cellular form having natural bonding characteristics; and

   (2) a high molecular weight water soluble polymer composition impregnated throughout said sheet material and applied during the manufacture thereof while said sheet material contained at least 60% moisture, said composition enhancing the natural bonding of the fibers of said material and no parts of said composition adversely affecting the dispersibility of said sheet material so that said sheet material is resistant to loosening or matting of the fibers when used in the normal manner in sanitary products and is dispersible when agitated in a large excess of water.

6. A fluffable sanitary product, as defined in claim 5, in which said product is a sanitary napkin.

7. A fluffable sanitary product, as set forth in claim 5, in which said sanitary product is a diaper pad.

8. A cellulose fibrous sheet material which is resistant to loosening or matting of the fibers and which has high dry strength, wet hang and dispersibility when agitated in a large excess of water, said material comprising:
(a) hydrophilic, flat, ribbon-like, aerated, regenerated cellulose fibers of the generally collapsed multi-cellular form having natural bonding characteristics; and (b) a high molecular weight water soluble polymer composition impregnated throughout said sheet material and applied during the manufacture thereof while said sheet material contained at least 60% moisture, said composition enhancing the natural bonding of the fibers of said material and no parts of said composition adversely affecting the dispersibility of said sheet material so that said sheet material is resistant to loosening or matting of the fibers when used in the normal manner in sanitary products and is dispersible when agitated in a large excess of water.

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