

UNITED STATES PATENT OFFICE

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PULP WEB OF HIGH ABSORPTIVITY AND METHOD OF MAKING SAME

No Drawing.

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In the manufacture of impregnated products using sheeted fibrous material as the base or foundation which is being impregnated, it is frequently desired that the base be of high absorptivity and so capable of absorbing a large amount of impregnating material. For instance in manufacturing artificial leather by impregnating a felted fibrous web with rubber in the form of a rubber-benzine solution, rubber latex or an artificial rubber dispersion in water, it is desirable that the web be capable of absorbing sufficient rubber to impart the necessary body, strength and elasticity of artificial leather. So too, in the manufacture of prepared roofings, shoe stiffeners, or the like, using a felted fibrous web, it is desirable that the web be capable of absorbing sufficient asphalt, wax, or other waterproofing material to render the fibrous base resistant to the deteriorating effects of moisture and weathering.

It has been found that if cellulose pulp is felted into a web on a paper machine and dewatered and dried without the application of substantial pressures, the resulting web is highly absorptive. Such a method may be utilized to advantage especially when the pulp used as a raw material is of a highly absorbent character, such as cotton or rag fiber, or wood pulp refined to high alpha cellulose content. In carrying out a method such as described, the pulp employed as a raw material is preferably felted in unbeaten or lightly beaten condition as beating tends to reduce the size of the fibers of the pulp and results in a web of closer or denser formation and lower absorptivity. When substantially unbeaten pulp is felted and dried on a papermaking machine without being subjected to substantial pressures, the resulting web is composed of fibers of original length in a loosely felted substantially uncompacted condition. A pulp web thus made, while highly absorptive has the disadvantage of being difficult to handle without tearing. This trouble renders the absorptive web unsuitable for use as a raw material in a process which places it under stress, as it tends to break even under comparatively low tensions.

I have found that if a relatively small

amount of gelatinized cellulose is mixed with the unbeaten pulp prior to its felting and the mixture sheeted and dried, as hereinbefore described, the resulting web is materially improved in its physical characteristics while its absorbency is substantially unaffected. The gelatinized cellulose apparently bonds together the loosely felted substantially uncompacted fibers of original length without, however, materially affecting its absorptivity and penetrability. By forming a web in accordance with the present invention, it may be drawn through a bath of liquid saturant satisfactorily, the resulting product containing a maximum amount of saturant due to its high absorptive character. For instance, by passing the web through a rubber-containing bath, e. g. rubber benzine solution, rubber latex or aqueous dispersion of rubber, a product having a very high rubber content and possessing excellent characteristics for use as an artificial leather is produced. The strengthened web also lends itself well to coating or saturation with thermoplastic materials, such as asphalt or waxes such as Montan and carnauba, with varnishes or lacquers of the nitrocellulose type, and with other materials.

In practicing the method of the present invention, pulp of any suitable origin, for instance sulphite or kraft pulp, may be employed as a raw material, but if a high grade absorbent web suitable for use as a filter sheet or medical gauze is desired, cotton or rag fiber or wood fiber which has been refined to high alpha cellulose content is preferably employed. The pulp is preferably subjected to little beating, as it is desired to preserve the original length of the fibers and to produce a web of open or loose formation with such fibers. In some cases it is preferable to employ only the long fiber portion of the pulp as this portion not only results in a sheet of high strength and tear resistance, but also of very great absorptivity. The separation of the long fiber portion from the rest of the pulp may be effected as by passing the pulp through an apparatus of the type described in application Serial No. 206,477, filed July 18, 1927, by Robert A. Webber. The use of

only the long fiber portion is especially advantageous in the case of a high grade pulp, such as cotton fiber or wood fiber refined to high alpha cellulose content, intended for the manufacture of a web of high purity and permanence, and suitable for use as a filter sheet or in making surgical dressings. It has been found that the long fiber portion of pulp of this character is much whiter and cleaner than the pulp as a whole, for the short fiber portion, including the fibrillae, fiber fragments and colloidal cellulose, is usually associated with most of the resins, coloring matter, and other impurities which cause a yellowing of the pulp under the action of heat, air and light.

Various amounts of gelatinized cellulose may be mixed with the unbeaten fiber employed as the raw material, but in any event the amount is comparatively small. The following table gives the characteristics of webs made from refined unbeaten wood pulp of high alpha cellulose content, beginning with no gel and then mixing therewith 5%, 8% and 12% gel based on the air-dry weight of pulp.

	No gel	5 per-cent gel	8 per-cent gel	12 per-cent gel
30 Basic weight (24×36—480).....	49.6	48.8	48.0	48.8
Thickness (in inches).....	0.0210	0.0193	0.0176	0.0177
Compactness.....	24	25	27	28
Strength (Mullen).....	20	24	26	31
Tear resistance (machine direction).....	143	147	183	193
Tear resistance (across web).....	141	148	165	175
Stretch (machine direction).....	8.20	9.40	9.80	11.30
Stretch (across web).....	5.95	6.25	10.90	10.90
35 *Breaking length (machine direction).....	309	820	1085	1260
*Breaking length (across web).....	214	530	800	914
Absorbency (water 5 min.).....	580	530	520	530

* Breaking length is the length of paper which if freely suspended would break as a result of its own weight.

All the webs were made substantially under the same conditions, the stock furnish being run off on a paper machine into a web which was dewatered and dried without being subjected to substantial pressures. The comparative values given, while associated with the use of a particular type of fiber as a raw material, are illustrative to a greater or less extent of the comparative values obtained when using other types of fibers.

The compactness value, hereinbefore given, was obtained by dividing the basic weight by the thickness and multiplying by the factor 10^{-2} . The absorptivity was ascertained by noting the water crawl up a strip, the values given denoting hundredths inches crawl on the strip in 5 minutes. It is to be observed that the strength, tear resistance and breaking length of the web is materially higher when gel is employed in the pulp furnish. The improvement in these characteristics is of much more significance than the values indicate, for it means satisfactory use of the web in many processes in which it could not heretofore be employed as a raw material

owing to breakage. It is to be further observed that the improvement in physical characteristics of the web was effected with but little change in its absorptivity.

Having thus described certain embodiments of this invention, it is evident to those skilled in the art that various changes or modifications might be made therein without departing from the spirit or scope of the invention as set forth in the appended claims.

I claim:—

1. A cellulose pulp web comprising gelatinized cellulose and loosely felted substantially uncompacted fibers in an unbeaten condition.

2. A cellulose pulp web comprising gelatinized cellulose and loosely felted substantially uncompacted fibers of original length and of high alpha cellulose content.

3. A cellulose pulp web comprising loosely felted substantially uncompacted fibers of original length and of high alpha cellulose content, bonded together with a comparatively small amount of gelatinized cellulose.

4. A cellulose pulp web comprising the long fiber portion of a pulp in a loosely felted and substantially uncompacted condition and bonded together with gelatinized cellulose.

5. A cellulose pulp web comprising the unbeaten long fiber portion of a pulp of high alpha cellulose content in a loosely felted and substantially uncompacted condition and bonded together with a comparatively small amount of gelatinized cellulose.

6. A method which comprises mixing unbeaten cellulose pulp with gelatinized cellulose, and forming the mixture into a loosely felted uncompacted web.

7. A method which comprises mixing substantially unbeaten cellulose pulp with gelatinized cellulose, and felting and drying the mixture without subjecting it to substantial pressures.

8. A method which comprises separating the long fiber portion of cellulose pulp from the short fiber portion, including fibrillae, fiber fragments and colloidal cellulose, mixing gelatinized cellulose with the separated long fibers, and forming the mixture into a loosely felted uncompacted web.

9. A method which comprises mixing a comparatively small amount of gelatinized cellulose with unbeaten pulp freed from its short fiber portion, including fibrillae, fiber fragments and colloidal cellulose, and forming the mixture into a loosely felted uncompacted web.

10. A cellulose pulp web comprising loosely felted, substantially uncompacted fibers in an unbeaten condition, bonded together by mechanically gelatinized cellulose.

In testimony whereof I have affixed my signature.

GEORGE A. RICHTER.