

UNITED STATES PATENT OFFICE.

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PROCESS OF BLEACHING CELLULOSIC MATERIAL.

No Drawing.

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The object of this invention is to effect the bleaching of cellulosic material in such way as to produce a stronger pulp of the desired color more free from oxycellulose and foreign substances, such as resin compounds, than heretofore produced. In the ordinary bleaching of cellulose material, such, for example, as chemical wood pulp and more particularly sulphite pulp, it is customary to subject the pulp to the action of a bleach liquor, such as calcium or sodium hypochlorite in solution. During the bleaching operation although the initial liquor may be alkaline, there is usually in the final stages of the operation a tendency toward an acid condition in the mass, with the result that an acidic oxidation occurs, resulting in the formation of oxycellulose. Consequently, the bleached pulp, because of the presence of oxycellulose, contains a lesser proportion of alpha cellulose, or cellulose resistant to caustic potash, than the original unbleached pulp. For many purposes, particularly for the manufacture of nitrocellulose products, it is particularly desirable that the pulp should be of high color and contain a higher percentage of alpha cellulose and at the same time be relatively free from resinous or other ligneous compounds.

We have discovered that when unbleached pulp is subjected to the bleaching action of sodium or calcium hypochlorite in the presence of an alkali of the nature of caustic soda, caustic potash, or sodium carbonate, it is possible to preserve a distinctly alkaline condition throughout the entire bleaching operation and to produce a pulp notably high in alpha cellulose and relatively free from resinous or ligneous compounds, and that such pulp has a high or bright color so that it is adapted for use not only in the manufacture of nitrocellulose and other cellulose esters, but also in the manufacture of relatively strong and yet soft paper.

Only a very small proportion of alkali is needed in the bleaching operation which is carried out otherwise under normal conditions. We have found that, by adding to a, say, 10% stock mixture, 0.05% to 0.5% caustic soda based on the liquor or 0.45% to 4.5% based on the weight of the fiber, and by adding calcium hypochlorite solution containing the equivalent of 10% to 12% bleach powder based on the weight of the fiber and

upon bleach powder containing 35% available chlorine, a product such as hereinbefore described may be produced. The action of the alkali under these conditions retards the bleaching action of the calcium hypochlorite, causing a less intense bleaching and preventing a local overbleaching of the stock. Any excess of alkali is likewise effective in exerting a solvent action on the so-called non-resistant celluloses which may be present in the pulp. Where it is desirable to carry on the bleaching operation in the time ordinarily required therefore according to previous processes, it is necessary to carry the operation out at a somewhat higher temperature, say an increase in temperature of ten degrees. For example, where the ordinary bleaching operation is carried on in a given time at a temperature of 80° F., it is desirable when the additional alkali is employed to carry on the operation at a temperature of 90° F. These temperatures refer to the bleaching of a 10% stock suspension. If a more dilute stock suspension is employed, the temperatures in each case are somewhat higher.

As indicating the difference in results which are secured by carrying on a bleaching operation in accordance with our process as compared with the ordinary bleaching operation, the following comparison may be made. Whereas bleached sulphite pulp produced by treating a fiber in 10% stock suspension with say 12% of bleach powder based on the weight of fiber and on bleach powder containing 35% available chlorine, may have a pop test of 125, and a copper number of 3.5 to 4, and usually contains about 86% resistant cellulose, a corresponding pulp bleached by the process herein described has a pop test of 125, a copper number of 2.2 to 3, and contains about 89% resistant cellulose. (Either of two well-known methods may be employed for determining the proportion of resistant cellulose, but the proportional increase in the resistant cellulose is substantially the same when determined by either method.)

A bleached pulp produced in accordance with our process is able to withstand a harsher beating treatment without material loss of strength than the ordinary bleached pulp, and paper produced therefrom is softer and gives a higher tear test, approaching

the characteristics of paper made from cotton or cotton rags. The process has further advantages in that it enables a more accurate and careful control of the bleaching operation during the summer months, and obviates the necessity of refrigeration in hot weather, especially where a highly concentrated stock suspension is being bleached. Furthermore, the presence of free caustic in the bleach liquor results in the saponification as well as the oxidation of some of the resinous specks and thereby produces a cleaner pulp.

The addition of the caustic to the bleach liquor may be made either at the beginning of the bleaching operation or from time to time in suitable portions before there is any tendency towards an acid condition in the mass. After the bleaching operation has been carried on, the pulp is subjected to the usual washing operation and then antichlor such as bisulphite liquor is added. This has the effect of neutralizing any residual bleach liquor and free caustic that may remain after the washing operation.

While we have described the process more particularly in the bleaching of sulphite pulp, yet it should be understood that it may be practiced in the bleaching of other cellulosic material, such, for example, as sulphate or soda pulp or pulp produced from cotton or cotton linters. Also in lieu of sodium or calcium hypochlorite as the bleaching agent, we may employ other pulp bleaching substances, such, for example, as sodium permanganate.

What we claim is:

1. A process of bleaching wood pulp to produce a product high in resistant or alpha cellulose, which consists in subjecting such pulp to the action of a bleaching liquor in the presence of an alkali sufficient in amount to maintain a distinctly alkaline condition in the pulp throughout the bleaching operation.

2. A process of bleaching wood pulp to produce a product high in resistant or alpha cellulose, which consists in subjecting such pulp to the action of a bleaching liquor in

the presence of caustic soda sufficient in amount to maintain a distinctly alkaline condition in the pulp throughout the bleaching operation.

3. A process of bleaching wood pulp to produce a product high in resistant or alpha cellulose, which consists in subjecting such pulp to the action of a hypochlorite bleaching liquor in the presence of an alkali sufficient in amount to maintain a distinctly alkaline condition in the pulp throughout the bleaching operation.

4. A process of bleaching wood pulp to produce a product high in resistant or alpha cellulose, which consists in subjecting such pulp to the action of a hypochlorite bleaching liquor in the presence of caustic soda sufficient in amount to maintain a distinctly alkaline condition in the pulp throughout the bleaching operation.

5. A process of bleaching wood pulp to produce a product high in resistant or alpha cellulose, which consists in subjecting such pulp to the action of a calcium hypochlorite bleaching liquor in the presence of an alkali sufficient in amount to maintain a distinctly alkaline condition in the pulp throughout the bleaching operation.

6. A process of bleaching wood pulp to produce a product high in resistant or alpha cellulose, which consists in subjecting such pulp to the action of calcium hypochlorite bleach liquor in the presence of caustic soda sufficient in amount to maintain a distinctly alkaline condition in the pulp throughout the bleaching operation.

7. A process of bleaching wood pulp, which comprises subjecting about a 10% stock suspension of such pulp in a bleach liquor containing about 10% to 12% calcium hypochlorite and from 0.45% to 4.5% caustic soda, based on the weight of pulp, thereby maintaining the alkalinity of the mass during the entire bleaching operation.

In testimony whereof we have affixed our signatures.

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