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METHOD OF BLEACHING FIBERS OF VEGETABLE ORIGIN

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6 Claims. (Cl. 8-111)

5 The present invention relates to a method of bleaching fibers of vegetable origin and more particularly to a rapid and efficient method of bleaching goods of this type with peroxide generating compounds.

10 Heretofore it has been suggested to bleach fibers of vegetable origin with a high ratio of liquor to goods, either by the so-called single or double boil process. The first method was carried out by boiling the goods with an alkali and then heating them with an alkaline hydrogen peroxide solution. In the second method the goods were heated at least twice in an alkaline peroxide solution in order to obtain the desired degree of white. In bleaching fibers of vegetable origin by means of these alkaline peroxide treatments, the ratio of bleaching liquor to goods was always high as the liquor must be circulated over and through the goods to be bleached.

15 20 It has also been proposed to bleach this type of fiber in the damp condition at low temperatures by employing a low liquor ratio in a cold steep. In this type of bleaching the concentration or content of the peroxide generating agent recommended for the bleaching solution was generally relatively high. The bleaching procedure was generally performed at low temperatures. In carrying out the latter process it has been found that considerable quantities of unused peroxide remain in the goods after the same have been bleached. This unused peroxide was washed out with the rinse water and lost. Where lesser quantities of peroxide were incorporated in the bleach bath, a good white was not obtained.

25 30 35 In accordance with the procedure of the present invention a substantially continuous bleaching procedure for fibers of vegetable origin is afforded and a procedure that can be carried out with a minimum amount of special equipment.

40 45 The present invention also provides a bleaching method giving enhanced results and producing goods of better quality than can be produced by means of the cold steep, described above as heretofore used, with a consumption of considerably less hydrogen peroxide.

50 55 A further advantage of the present invention resides in the fact that there is provided a bleaching method adapted to remove moths and shives with the production of bleached goods of excellent quality by the employment of but one solution.

Other advantages of the invention will become

apparent hereafter and will be pointed out with particularity in the claims.

5 The invention is adapted for the treatment of goods that have not been boiled, that is, goods that have not been treated with strong alkalies. The goods may however have been desized, washed or scoured and a portion of the catalysts decomposing hydrogen peroxide removed.

10 15 20 The unboiled goods, whether in the raw state, as yarn, or as woven or knitted goods, are treated with a bleaching solution containing a peroxide generating material and a concentration of alkali in excess of that normally employed when treating goods of this type with circulating solutions. Sufficient of this bleaching solution is incorporated in the goods to render the same damp, and, in general, about 50 to 150% of bleaching solution, by weight based upon dry goods, is sufficient to produce the desired damp condition.

25 30 35 40 45 The goods may be dampened in any convenient fashion, although it will be found most practical to immerse the goods in the bleaching solution and eliminate the excess thereof by squeezer rolls or by hydroextraction in a centrifuge. The goods, dampened with the bleaching solution, are then stacked, piled, or rolled up, in accordance with the present invention, in such fashion as to maintain the goods in the damp condition while bleaching. The goods are then permitted to bleach while merely dampened with the bleaching solution and with this low liquor ratio (0.5 to 1.5). The bleaching can be carried out to any desired extent depending upon the concentration of peroxide and the time of bleach. Any considerable amount of evaporation of water from the dampened goods is prevented by covering the stacked or piled goods with a damp cloth. By piling or stacking the goods in the manner outlined above so as to prevent evaporation of moisture, local increase in concentration of alkali and other chemicals to such a degree as to damage the goods, is prevented.

50 55 After the goods have stood in the damp condition, moistened with the bleaching solution so that the moths and shives have been loosened, partially bleached and substantially eliminated, the goods, still in the damp condition and still moistened with the bleaching solution, are treated further and at an elevated temperature to obtain the desired white and additional effects. This latter treatment is carried out under such conditions that drying out of the goods is prevented. In general, the amount of solution on

the weight of the goods should not fall greatly below 50%.

To effect the final treatment at elevated temperatures, the goods, without rinsing or further intermediate treatment, are heated until finished. A suggested procedure, and one that has been found effective in use, is to employ steam in contact with the goods as the heating element. This operation is carried out in any convenient fashion and in any convenient form of apparatus, although a closed chamber preventing vapor and heat losses has been found to be a preferred form of apparatus in which to carry out the steaming or finishing while maintaining the goods at the desired temperature for the desired period of time.

The active bleaching ingredient recommended for employment in the bleaching solution is hydrogen peroxide, although those substances may be employed which generate hydrogen peroxide, or solutions equivalent thereto. As examples of these materials may be mentioned the alkali and alkali earth metal peroxides, other metal peroxides, the soluble salts of the percompounds, such as the perborates, persilicates, percarbonates, and simiar compounds, as well as addition compounds of hydrogen peroxide, as for instance the combination of hydrogen peroxide with urea, all classed with hydrogen peroxide herein as percompounds.

The quantity of hydrogen peroxide employed will depend upon the type of goods, and the extent of bleaching desired in the goods. The quantity of hydrogen peroxide found generally applicable will be from about 2 to 50 ml. of 100-volume hydrogen peroxide in a liter of solution, and in general about 5-40 ml. per liter of solution will be effective. Naturally peroxide of a strength other than that specified can be employed in preparing the bleaching solution by making proper correction. When employing materials other than hydrogen peroxide, it will be understood of course that quantities equivalent to the amount of hydrogen peroxide above set forth will be employed. That is to say, the volume concentration of the bleaching solution in terms of hydrogen peroxide should be from about one-fifth volume to about five volume, with a two to four volume bath being the volume concentration of greatest applicability. It will be understood that lower volume concentrations may be used upon goods that do not require a full bleach as contrasted with the volume concentration required to obtain a full bleach upon the same type of goods, for instance, where the goods are to be subsequently dyed rather than sold as white goods.

In addition to the oxidizing ingredient, the bleaching solution contains alkali, preferably caustic soda, although caustic potash, trisodium phosphate, sodium carbonate, and other suitable alkalies may be employed. The concentration of alkali in the bleaching solution is considerably greater than that presently employed in bleaching solutions that are to be circulated around and through the goods. The range of alkali concentration may be varied to a considerable degree depending upon the type of goods treated. Thus, higher concentrations of alkali are required for the treatment of gray goods containing considerable amounts of impurities, both natural and added, than are necessary for goods made from combed yarn, for instance. In general, the total quantity of alkali per liter of solution may be from about 5 to about 50 grams, calculated as

sodium hydroxide with a preferred concentration of about 10 to 30 grams per liter.

The bleaching solution, in addition to alkali and peroxide generating material, will also contain a peroxide stabilizing agent for controlling and regulating the bleaching action of the peroxide. As an example of an efficient and preferred stabilizer, sodium silicate may be mentioned. However, other peroxide stabilizing agents may be substituted in whole or in part for the silicate, for instance, magnesium salts, tin salts, pyrophosphates, and the like. The quantity of stabilizer and the type of stabilizer employed will be dictated by the type of goods and the quality desired in the finished goods. In any event, the quantity employed will be such as to prevent rapid decomposition of the hydrogen peroxide, or peroxide generating agent, into substances which do not contribute to the bleaching effect and which may be harmful. As the usual stabilizer employed is a soluble silicate and normally sodium silicate, it may be mentioned that 5 to 50 ml. of 40 to 42° Bé. silicate per liter is suitable.

The bleaching solution may contain bleaching assistants, as, for instance, sulfonated castor oil, sulfonated fatty acids, esters, and the like, as well as soap or wetting-out agents. The addition of such compounds and the quantity employed will be dictated by the type of goods being treated and by the type of goods desired as the finished product.

As outlined above the preferred alkali employed in the bath is caustic soda. By incorporating about 100% of such a bleaching solution in the unboiled goods, the high alkali content probably attacks the waxes and fats protecting the cellulose fiber and conditions them for bleaching. In any event, whatever the action of the highly alkaline solution may be, it is unnecessary to subject the goods to the usual caustic boil prior to treatment by the proposed procedure. When the goods, dampened with the highly caustic bleaching solution, are heated for only a few minutes, the white obtained is equivalent to that produced by many hours heating with circulating caustic followed by treatment with hot alkaline peroxide.

As a typical example of a bleaching solution suitable for use in the procedure of the present invention, the following formulation is set forth as being illustrative of the quantity and range of materials employed in preparation of a liter of the aqueous solution:

Sodium hydroxide	-----grams	5 to 50
Hydrogen peroxide (100-vol.)	-----	
-----cubic centimeters	2 to 50	55
Silicate (40° Bé.)	-----do	5 to 50

The goods dampened with the bleaching solution in the manner above described and to the extent indicated, are stacked in the damp condition and permitted to bleach. In general, the goods will be permitted to remain in the damp condition for from two hours to 16 hours at room temperatures, that is temperatures ranging up to about 125° F. At the end of this period the goods are subjected to the second stage of the bleaching operation by treating them at elevated temperatures under conditions preventing substantial evaporation of water from the goods. The goods are heated at a temperature of about 160° F. or higher for a period of a few minutes to thirty minutes, more or less. After subjecting the goods to the second stage in the bleach at the elevated temperatures, substantially all notes and shives will have been removed from the goods

and the required white obtained. The goods are then washed and finished.

As a specific example of the invention, gray cotton piece goods were immersed in a bleaching solution containing per liter:

5	Sodium hydroxide-----grams--	15
	Hydrogen peroxide (100-vol.)	
	-----cubic centimeters--	30
10	Silicate of soda (40° Bé.)-----do----	30

The goods, after being thoroughly wet with the bleaching solution, were passed through squeezer rolls and the excess bleaching solution eliminated, producing goods containing 100% solution based on the dry weight of the goods. The goods were stacked for nine hours and then steamed for fifteen minutes in an atmosphere of live steam. The goods were rinsed thoroughly and finished and found to be of excellent white and entirely free of motes and shives.

In order to obtain the same type of goods in a cold steep, the concentration of hydrogen peroxide required in the bleaching solution will be about 50% greater than that employed in the procedure of the present invention, as it has been found that at the completion of the bleach carried out entirely by the cold bleach procedure, approximately 40% of the initial active oxygen still remains in the goods and is apparently necessary in order to carry the bleach to completion. By finishing off the goods in the damp condition at elevated temperature and therefore, after the concentration of peroxide has decreased by about 60% from the initial concentration, this residual peroxide is used for bleaching, and elevated temperatures can be employed without damaging the goods. It will thus be seen that by the employment of the present invention a considerable saving in peroxide is effected with the production of goods of at least equal white and equal quality.

The present invention is particularly advantageous for use in bleaching cotton goods and other goods of vegetable fiber in the open width. By means of the older processes, where goods were heated with bleaching solutions and a high liquor ratio employed, the goods were placed in containers in the so-called rope form and great care had to be taken to get even penetration of the heated solution throughout the goods. When treating in rope form, spots and unevenness are often obtained. By employing the present invention the goods are wetted evenly and uniformly and subjected to a constant bleaching environment.

We claim:

1. The method of bleaching goods composed of fibers of vegetable origin which comprises dampening the goods with an alkaline bleaching solution comprising a percompound, permitting the goods partially to bleach in the damp condi-

tion, the goods retaining a portion of unused percompound at the end of the partial bleach, and thereafter heating the goods containing the unused percompound while preventing substantial evaporation of moisture therefrom.

2. The method of bleaching goods composed of fibers of vegetable origin which comprises dampening the goods with an alkaline bleaching solution comprising a percompound, permitting the goods partially to bleach in the damp condition, the goods retaining a portion of unused percompound at the end of the partial bleach, and thereafter subjecting the goods to the action of steam.

3. The method of bleaching goods composed of fibers of vegetable origin which comprises dampening the goods with an alkaline bleaching solution comprising a percompound, permitting the goods partially to bleach in the damp condition, the goods retaining a portion of unused percompound at the end of the partial bleach, and thereafter heating the goods to a temperature above about 160° F. while preventing substantial evaporation of moisture therefrom until an additional bleaching effect is obtained.

4. The method of bleaching goods composed of fibers of vegetable origin which comprises dampening the goods with an alkaline bleaching solution comprising a percompound and at least 5 grams of total alkali per liter calculated as NaOH, permitting the goods partially to bleach in the damp condition, the goods retaining a portion of unused percompound at the end of the partial bleach, and thereafter heating the goods while preventing substantial evaporation of moisture therefrom to obtain an additional bleaching effect.

5. The method of bleaching goods composed of fibers of vegetable origin which comprises incorporating in the goods 50 to 150% (based on the weight of the goods) of an alkaline bleaching solution, permitting the goods partially to bleach in the damp condition, the goods retaining a portion of unused bleaching substance at the end of the partial bleach, and thereafter heating the goods to a temperature above about 160° F. while preventing substantial evaporation of moisture therefrom to obtain an additional bleaching effect.

6. The method of bleaching goods composed of fibers of vegetable origin which comprises dampening the goods with an alkaline bleaching solution including a percompound, stacking the goods in the damp condition and permitting the goods partially to bleach in the damp condition without consuming all the percompound and thereafter heating the goods while preventing substantial evaporation of moisture therefrom.

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