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CONTINUOUS SCOURING AND BLEACHING OF GRAY GOODS

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This invention relates to a process for the continuous peroxide bleaching of gray, woven, cotton textile goods, and more particularly it relates to a commercially satisfactory process for the continuous bleaching of such goods with a single continuous storage stage.

Many attempts have been made over a period of almost twenty years to continuously alkalize and bleach gray, woven, cotton textile goods by a peroxide bleaching process comprising a single continuous storage stage, such as by the use of a single J-box. Such previous attempts have never, heretofore, been commercially satisfactory and as a consequence have never been adopted for commercial use. All previously known commercial processes for the continuous peroxide bleaching of gray, woven, cotton goods required the use of at least two continuous storage stages comprising at least one caustic scouring stage with cloth heating means and storage at high temperature in a J-box and at least one bleaching stage with cloth heating means and storage in a second J-box. Bleaching systems employing three or four continuous storage stages are not uncommon. Each continuous storage and operating stage necessitates the use of a J-box, saturators, washers, auxiliary mixing devices, and power and control equipment. Such previously used multi-stage units were not only very expensive to install but expensive to maintain and require an operator for each continuous stage, and require the subjecting of fabric to numerous chemical treatments and an excessive amount of mechanical handling.

It is an object of this invention to provide a method for the continuous caustic treatment and peroxide bleaching of gray, cotton, woven goods employing a single continuous storage stage.

It is another object of this invention to provide a method for the continuous caustic treatment and peroxide bleaching of gray, cotton, woven goods employing a single continuous storage stage by which cloth having a high degree of whiteness may be obtained with minimum fabric degradation at low apparatus installation and operating cost.

Other objects of this invention will appear hereinafter.

The objects of this invention may be accomplished by employing critical amounts of certain bleaching ingredients whereby temperatures may be employed to alkalize and bleach the goods quickly and uniformly with a single continuous storage stage as hereinafter set forth.

By the term "single continuous storage stage" is meant a single stage in a continuous cloth forwarding operation in which the cloth is temporarily held up for delayed treatment. This is universally accomplished in continuous processes by continuously delivering the fabric, either in rope form or in flat form, to one end of a J-box or similar storage conveyor into which it is piled in layers and is continuously withdrawn from the other end at substantially the same speed as the delivery speed. The fabric very slowly moves through the J-box so that it is

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stored in the J-box for a period of three-quarters to one and one-half hours even though the delivery and removal speeds may be from 50 to 400 yards per minute.

In accordance with the present invention gray, woven, cotton fabrics, either in rope or flat form, wetted out and substantially free from textile sizes and finishes, are continuously scoured and bleached by passing the goods through an aqueous peroxide bleaching bath containing, by weight, 1.25% to 2.0% hydrogen peroxide, 1.5% to 3.0% silicate of soda having an $\text{Na}_2\text{O}:\text{SiO}_2$ ratio of 1:2 to 1:4, 0.3% to 0.8% caustic soda, a water-soluble boron salt equivalent to 0.25% to 2.0% borax, reducing the bleach solution content of the goods to within 75% to 150% by weight of the goods, heating the goods containing such bleach solution content in the presence of steam to a temperature between 200° F. and 212° F. and maintaining said goods at a temperature between 180° F. and 212 F. for a period of three-quarters to one and one-half hours. The content of hydrogen peroxide in the bath must be sufficiently high, within the limits specified, that the goods will retain at least 15% residual hydrogen peroxide of the amount contained therein at the initiation of the heating step. The goods are bleached under the above conditions during passage continuously through a continuous storage stage and the bleaching solution is then washed from the goods.

Before subjecting the gray goods to the alkalizing and bleaching operation of this invention they should be wetted out and should be substantially free from textile sizes and finishes. This may be accomplished by any one of the usual pretreatment methods, for example, they may be treated with an aqueous solution containing a wetting agent such as Turkey red oil, or sulfonates and sulfates of high alcohols; an aqueous solution of a desizing enzyme; or with an aqueous acidic substance such as sulfuric or phosphoric acid.

The peroxide bleaching bath of this invention must contain a high percentage of hydrogen peroxide, i. e., between 1.25% to 2.0%. A smaller quantity than 1.25% will fail to impart a commercially satisfactory degree of whiteness to the fabric and will not destroy moles and shives, and a larger quantity than 2.0% will cause excessive fabric degradation as evidenced by fabric fluidity tests. The hydrogen peroxide need not be added as such but may be produced in situ by the addition of sodium peroxide, sodium perborate, sodium percarbonate, or similar per compounds.

The bleaching bath must contain at least 0.3% caustic soda but not to exceed 0.8% thereof. Such limited quantity of caustic soda is critical as well as the relatively high content of hydrogen peroxide. Such limited range of caustic soda content is essential to permit the use of high temperatures in the bleaching operation despite the high proportion of H_2O_2 . The use of 0.25% to 2.0% boron salt, calculated as borax, is also essential in the process of this invention. It has been found that in the absence of such an amount of a boron salt some fabrics, depending upon their source or the pretreatment to which they are subjected, will contain pin holes. The boron may be supplied by the addition to the bath of borax or other water-soluble boron compound, i. e., soluble to the extent of at least 0.25% by weight in water. If desired, the necessary quantity of boron and H_2O_2 may be supplied by the use of sodium perborate providing that the other essential bath ingredients will be present within the above-mentioned critical ranges.

After saturation of the fabric with the bleach solution, the fabric is subjected to an operation for the removal of excess bleach solution to reduce the bleach solution content to 75% to 150% by weight of the goods. This may be conveniently done by passing the goods between wring-

er or squeeze rolls, but any other commonly used method of removing liquid from fabric may be employed.

The fabric containing such quantity of bleach solution is then heated to a high bleaching temperature, i. e., between 200° F. and 212° F. This is carried out most conveniently by contacting the continuously moving fabric with steam. If desired, the fabric may, at this point, be maintained under pressure and steam under pressure employed to raise the temperature of the goods to as high as 216° F. The goods must be maintained at a relatively high temperature, i. e., a temperature of 180° F. to 212° F. for a period of three-quarters to one and one-half hours. This is customarily done on-the-run by the use of a J-box of the necessary size into which the freshly heated goods are continuously piled in one end thereof and continuously removed from the other end of the box, the piled fabric moving very slowly through the box. The box may be insulated to the desired degree to maintain the temperature of the goods to within the temperature range above specified.

As above indicated, the fabric must retain at least 15% of the hydrogen peroxide contained therein at the initiation of the hot bleaching operation. Preferably, the goods will contain at least 20% of residual H_2O_2 . This is important to avoid first bleaching and then darkening of the fabric. Such darkening has been found to occur if the residual peroxide is allowed to fall below 15%. The bleaching period and the content of H_2O_2 in the bath will necessarily be adjusted to retain in the goods the 15% of residual H_2O_2 .

Immediately after the completion of the bleaching operation, the goods are washed to remove the bleaching liquid remaining in the goods. This step is necessary to prevent darkening of the goods by the remaining alkali content and lowering of the residual peroxide in the goods.

The following examples are given to illustrate, in detail, the process of this invention.

Example I

More than one million yards of cotton flannel has been successfully bleached by the following process.

The cloth is first wet out in an open width padder at a temperature of 140° F. to 160° F., using an aqueous solution containing, by weight,

3% "Neozyme" L—a mixture of amylolytic and proteolytic enzymes,
2% "Triton" 770—an alkyl aryl polyether sulfate, and
0.1% cetyl betaine.

It is then stored in a bin for several hours or overnight, then washed free of sizing material with hot water.

The desized cloth is next saturated at 70° F. to 80° F. with the following scouring and bleaching solution containing, by weight,

1.5% hydrogen peroxide,
2.5% sodium silicate 42° Bé.,
0.6% caustic soda,
0.5% borax, and
0.1% "Triton" X-100, an alkoxylated aryl polyether alcohol.

After saturation with the bleach solution, the cloth is squeezed to 100% moisture, plus or minus 10%, steamed to 210° F. to 212° F., and continuously passed through a J-box at such a rate that it is maintained under storage conditions for one and one-half hours at a temperature of 205° F. to 210° F.

After bleaching, the cloth is washed twice with water at 120° F., run through a hot water mangle, and dried on a clip tenter frame.

Example II

A series of fabrics, including cotton broadcloth, pink-dyed Oxford cloth, blue chambray, and gray seersucker have been successfully bleached by the following process.

The fabric is first washed with water at 120° F. and then saturated at 140° F. with the following aqueous solution containing, by weight,

3% "Neozyme" L—a mixture of amylolytic and proteolytic enzymes,
2% "Triton" 770—an alkyl aryl polyether sulfate, and
0.1% cetyl betaine.

The saturated fabric is squeezed to about 100% moisture content and is then stored for one hour at 160° F. It is next washed free of sizing material by washing with hot water at about 120° F.

The desized cloth is then saturated with the following scouring and bleaching solution having a temperature of 70° F. to 80° F. and containing, by weight,

1.5% hydrogen peroxide,
2.5% sodium silicate 42° Bé.,
0.6% caustic soda,
0.5% borax, and
0.1% "Triton" X-100, an alkoxylated aryl polyether alcohol.

After saturation in the bleach solution, the cloth is squeezed to 100% moisture, plus or minus 10%, steamed to 210° F. to 212° F., and stored for one and one-quarter hours at a temperature of 205° F. to 210° F. by passing the same through a storage J-box.

The cloth, after bleaching, is passed from the J-box through two hot washes (120° F.), then through a hot water mangle, and finally dried on a clip tenter frame.

Example III

Corduroys of varying weights have been successfully bleached by the following process.

The corduroy goods are desized in open-width by steaming for one minute at 212° F. with a solution containing, by weight,

1.75% "Rapidase," a mixture of amylolytic and proteolytic enzymes,
0.5% sodium chloride, and
0.1–1.0% "Penetrator" 40X, an alkyl aryl sulfonic acid.

After desizing, the fabric is washed three times, dried, cut, dry brushed, wet brushed, water scoured, wet brushed, dried, and dry brushed.

The fabric is then wet out with an aqueous solution containing, by weight,

0.1%–0.2% "Naccanol" DB., a sodium alkyl aryl sulfonate, and
0.5%–0.7% "Penetrator" 40X, an alkyl aryl sulfonic acid.

The wet-out fabric is then saturated with the following scouring and bleaching solution having a temperature of 80° F. to 90° F. and containing, by weight,

1.9% hydrogen peroxide,
2.2% sodium silicate 42° Bé.,
0.6% caustic soda,
0.36% borax.

After saturation, the cloth is squeezed to about 100% moisture content, steamed to 210° F. to 212° F., then stored for one and one-quarter hours at 205° F. to 210° F. by passing the same through a storage J-box. It is then washed, dried, and dyed or finished.

Example IV

The processes of Examples I, II and III were duplicated with the exception that borax was omitted from the bleaching and scouring solution. The fabric was found to be entirely unsatisfactory because of the presence of pin-holes.

Example V

The processes of Examples I, II and III, upon duplication with the use of 1.94% caustic soda in the bleach, produce unsatisfactory fabrics because of undesirable brittleness.

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Throughout the specification and claims, any reference to parts, proportions and percentages refers to parts, proportions and percentages by weight unless otherwise specified.

Since it is obvious that many changes and modifications can be made in the above-described details without departing from the nature and spirit of the invention, it is to be understood that the invention is not to be limited to said details except as set forth in the appended claims.

I claim:

1. The continuous process of scouring and bleaching gray, woven, cotton textile goods with a single continuous storage stage which comprises continuously passing said goods wetted out and substantially free from sizes and finishes through an aqueous peroxide bleaching bath containing, by weight, 1.25% to 2.0% H_2O_2 , 1.5% to 3.0% silicate of soda having a ratio of $Na_2O:SiO_2$ of 1:2 to 1:4, 0.3% to 0.8% caustic soda, and a water-soluble boron salt equivalent to 0.25% to 2.0% borax, reducing the bleach solution content of the goods to within 75% to 150% by weight of the goods, heating the goods containing the bleach solution in the presence of steam to a temperature between 200° F. and 212° F. and maintaining said goods at a temperature between 180° F. and 212° F. for a period of three-quarters to one and one-half hours such that further treatment is avoided when there remains in the goods only 15% residual hydrogen peroxide of the amount contained therein at the initiation of said heating step, and washing the bleaching solution from said goods.

2. The continuous process of scouring and bleaching gray, woven, cotton textile goods with a single continuous storage stage which comprises continuously passing said goods wetted out and substantially free from sizes and finishes through an aqueous peroxide bleaching bath containing, by weight, 1.25% to 2.0% H_2O_2 , 1.5% to 3.0% silicate of soda having a ratio of $Na_2O:SiO_2$ of 1:2 to 1:4, 0.3% to 0.8% caustic soda, and a water-soluble boron

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salt equivalent to 0.25% to 2.0% borax, reducing the bleach solution content of the goods to within 75% to 150% by weight of the goods, heating the goods containing the bleach solution in the presence of steam to a temperature between 200° F. and 212° F. and maintaining said goods at a temperature between 180° F. and 212° F. for a period of three-quarters to one and one-half hours, such periods being limited to retain in the goods about 20% residual hydrogen peroxide of the amount contained therein at the initiation of said heating step, and washing the bleaching solution from said goods.

3. The continuous process of scouring and bleaching gray, woven, cotton textile goods with a single continuous storage stage which comprises continuously passing said goods wetted out and substantially free from sizes and finishes through an aqueous peroxide bleaching bath containing, by weight, 1.25% to 2.0% H_2O_2 , 1.5% to 3.0% silicate of soda having a ratio of $Na_2O:SiO_2$ of 1:2 to 1:4, 0.3% to 0.8% caustic soda, a water-soluble boron salt equivalent to 0.25% to 2.0% borax, reducing the bleach solution content of the goods to within 75% to 150% by weight of the goods, heating the goods containing the bleach solution in the presence of steam to a temperature between 200° F. and 216° F. and maintaining said goods at a temperature between 180° F. and 212° F. for a period of three-quarters to one and one-half hours, such period being limited to retain in the goods 15% to 20% residual hydrogen peroxide of the amount contained therein at the initiation of said heating step, and washing the bleaching solution from said goods.

References Cited in the file of this patent

UNITED STATES PATENTS

2,029,985	Clark et al.	Feb. 4, 1936
2,231,426	Kauffmann	Feb. 11, 1941
2,257,716	Kauffmann	Sept. 30, 1941
2,334,066	Campbell et al.	Nov. 9, 1943