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2,153,416

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TREATMENT OF ANIMAL AND VEGETABLE FIBERS

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5 Claims. (Cl. 8—109)

This invention relates to the treatment of animal fibers such, for example, as rabbit hair, wool, tussah silk and vegetable fibers such, for example, as ramie, jute, flax and the like, and is particularly directed to an improved method for treating such fibers to bleach the same. The invention is applicable to the treatment of the raw materials as well as to yarns and woven and knitted fabrics made therefrom.

In the bleaching of some fibers by prior methods entirely satisfactory results have not been attained in that the pigment, carbon, melanin and other materials contained in these fibers are not removed and a white material has not been attained. In addition in the treatment of some fibers these prior methods weaken, break or rupture the sheath or filament of the fibers.

Generally speaking, the present invention provides an improved process wherein in the case of animal fibers, such as hair and wool, for instance, I dilate the fibers being treated and purge the interior of the same so as to remove the contents thereof, the bleaching materials then being able to enter the fibers through the ends thereof as well as to penetrate the fibers from the outside. In the case of other fibers, such as silk and vegetable fibers, for instance, I obtain a swelling action which promotes entry into the fibers of the various chemicals I employ, whereby a much improved bleaching action is obtained.

In the following description of my improved process where I refer to proportions, temperatures, bath periods, etc., it is to be understood that these may all vary due to atmospheric conditions, the type of fiber being treated, the water used with reference to its calcium content and also whether the treatment is in open or closed vats or whether treatment is carried out in vacuum tanks under vacuum and pressure.

It will be appreciated by those skilled in this art that the condition of the fibers being treated must also be taken into consideration, that is to say, whether the fibers are in the form of loose fibers, yarn or a fabric. In the former case a slightly lesser percentage of the compounds employed may be used as compared with the proportions employed in the latter cases.

Generally speaking, the fibers under consideration are first subjected to a bath of water and calcium hydroxide or other suitable alkali, this bath constricting the mucous of the pigment of the fibers.

The liquor is then drawn off and the stock is subjected to a second bath. This second bath is composed of water, lactic acid, hexyl alcohol, hexamethylenetetramine, glycerin, hydrogen peroxide, sodium pyrophosphate and a detergent comprising an oil and having one or more chlorinated compounds and an emulsifying agent.

The lactic acid of this second bath is employed for dilating the sheath or swelling the fibers and for dissolving any calcium hydroxide that may be left in the fibers from the first bath. The hexyl alcohol, which is also known as a good penetrator, is employed for strengthening the fibers. The hexamethylenetetramine dissolves the uric acid of the fibers and acts as a buffer to maintain the pH of the solution on the alkaline side thereby extending the bleaching period and making the bleaching action less severe on the fibers. The glycerin insures a smooth fiber and also insures a better bleaching action through preventing excessive local action of the bleaching agent. The hydrogen peroxide is of course a bleaching agent and sodium pyrophosphate of course is a catalyst. The detergent acts as a cleanser.

The stock after the liquor of the second bath has been drawn off is given a third bath having all of the ingredients of the second bath with the exception of hexyl alcohol and hexamethylenetetramine. In this third bath ammonia water may be used in substitution of the sodium pyrophosphate.

My invention may be practiced under vacuum or I may employ a Kier, that is to say, the invention may be employed in a closed vessel under pressure, the vessel being equipped with agitators; or I may practice my method in an autoclave, or in a closed vessel with no agitators or pressure. In the specific example which I am about to set out a vacuum will be employed and it is to be understood that where a Kier or an autoclave is used or should the process be carried out in an open vat then the proportions of chemicals of the various baths will be increased.

In the practice of my improved process I may proceed as follows: The fibers to be treated are placed in a vacuum tank and after the maximum vacuum has been drawn on the tank I inject a bath consisting of approximately three percent by weight of the stock being treated of calcium hydroxide and water, the volume of water employed being, for example, four times that of the stock. A pressure say of twenty-five to thirty pounds per square inch is then built up on the stock and the stock is left immersed in this bath under these conditions for

from one-half hour to one hour. The liquor of this bath is then withdrawn and the mass being treated is again subjected to the maximum vacuum, after which a second bath is injected at about 45° F. This second bath is made up of the following materials:

	Per cent by weight of the stock
Glycerin	3
Lactic acid	3
Hexyl alcohol	2
Hexamethylenetetramine	3
Detergent	5
Hydrogen peroxide, one hundred volume, 26° content	5
Sodium pyrophosphate	3
Water about four times the weight of the stock	

A pressure is built up, say of twenty-five pounds per square inch, and after the stock has been in this bath ten or fifteen minutes at 45° F., I raise the temperature thereof to between 150 and 175° F. With the temperature held at 150 to 175° F. the mass is subjected to this treatment for at least an hour. The temperature is then allowed to drop and pressure on the material increased to about fifty to sixty pounds and the flush or waste valve opened, discharging the liquor which at this time will show a brown coloring due to the removal of part of the pigments from the fibers. This fifty to sixty pounds pressure is maintained until the fluid is all passed out of the tank. As above mentioned, the liquor is brown, the fibers at this time are tan to cream in color.

The mass is then subjected to a third bath which is the final bleaching step. This bath is made up of:

	Per cent by weight of the stock being treated
Glycerin	4
Lactic acid	2
Detergent	8
Hydrogen peroxide, one hundred volume 26° content	10
Ammonia water, one hundred volume 26° content	3
Water—— Four times the weight of the stock	

The treatment in this last bath is the same as in the bath preceding, that is to say, a vacuum is first drawn on the stock, then the ingredients of the bath introduced and a pressure say of twenty-five pounds to the square inch is built up on the stock and held for from two to three hours, with the bath heated to from 150° F. to 175° F. Heating is then stopped and pressure increased to fifty to sixty pounds per square inch, and the flush or drain valve opened, this pressure being maintained until all of the liquor is discharged out of the tank.

As above mentioned, the proportions of chemicals employed vary somewhat depending upon the fiber being treated, less chemicals being employed, for example, in the treatment of fawn colored animal fibers than would be employed with gray fibers such as rabbit's hair, for instance.

It will be understood that chemicals other than those specifically mentioned above may be employed in the practice of my invention. For example, instead of employing lactic acid I may substitute lactic acid derivatives such as alphydroxypropine, etc. I have found also that with vegetable fibers I may employ sodium bicarbonate instead of lactic acid. Other organic or synthetic alcohols or other solvents which are soluble to an appreciable extent in the compounds comprising the bath for bleaching to strengthen the Keratin or fibrous matter of the fibers may be substituted for the hexyl alcohol above mentioned as, for example, octyl alcohol, propyl alcohol and isopropyl alcohol, or their groups. Glycol derivatives may be used in substitution of the glycerin, such as alcohol glycol, ethylene glycol, diethylene glycol, triethylene glycol and propine glycol, etc. For the hexamethylenetetramine, urea or its derivatives may be substituted.

In addition to the procedure set out above, I have found it desirable in the case of certain fibers, such as tussah silk or yellow silk which contains a persistent pigment to subject the same to an additional bath. The fibers may be subjected to this additional bath either in the final stage of the process or at any intermediate stage. This bath is made up of cold water, for example, 168% by weight of the stock being treated; 30% by weight of the stock being treated of hexyl alcohol or the like, and 2% by weight of the stock being treated of muriatic acid or sulphuric acid employed as a souring agent. The stock is left in this bath for about four hours in an open tank or vat.

In some instances, particularly when treating animal fibers, it is desirable, after the first bath, to treat the fibers in a bath of hexamethylenetetramine and water, employing 5% by weight of the stock being treated of hexamethylenetetramine, water, three times the volume of stock being treated, at 150° F. for say about two hours, for the purpose of removing any urine with which the fibers may be stained.

What I claim is:

1. In the bleaching of fibers the method which comprises treating the fibers with a solution of hexamethylenetetramine, hydrogen peroxide and a catalyst.

2. In the bleaching of fibers the method which comprises treating the fibers with a solution of hexamethylenetetramine, hydrogen peroxide, a catalyst, and a detergent comprising an oil having one or more chlorinated compounds and an emulsifying agent.

3. In the bleaching of fibers the method which comprises pre-treating the fibers in a calcium-hydroxide solution and thereafter subjecting the fibers first to a bath comprising hexamethylenetetramine, hydrogen peroxide and a catalyst, and then in a bath comprising urea, ammonia, and hydrogen peroxide.

4. In the bleaching of fibers the method which comprises subjecting the fibers first to a bath comprising hexamethylenetetramine, sodium pyrophosphate, and hydrogen peroxide, and then in a bath comprising urea, ammonia and hydrogen peroxide.

5. In the bleaching of fibers the method which comprises subjecting the fibers first to a bath comprising an aliphatic alcohol miscible with water, hexamethylenetetramine, sodium pyrophosphate, and hydrogen peroxide, and then in a bath comprising urea, ammonia and hydrogen peroxide.

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