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Method for artificial "aging" and bleaching denim cloth.

A method for artificial aging and bleaching of denim fabric by means of granular material and a bleaching agent, which produces a 'weathered' look.

The fabric, after having been desized, washed and spun-dried, is put in a container together with a certain amount of sand mixed with a bleaching agent. The fabric and the sand with the bleach are tumbled inside the container for a pre-set length of time, until the fabric reaches the required state of aging and bleaching, following which the fabric is soaked in a bleach neutralizing bath.

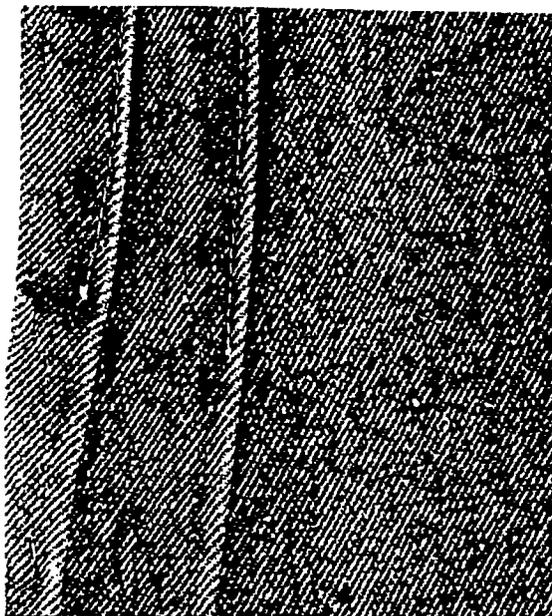


Fig. 2

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Method for artificial "aging" and bleaching denim cloth.

This invention refers to a method for artificial aging and bleaching of fabric in general, especially denim fabric and the like, which can produce a "weathered" look, that is to say light and dark areas finely interspersed evenly over all the fabric. The invention also pertains to the fabric processed according to the invention and to the granular agent or mix of granular agents with a bleaching agent to be used in the method claimed.

As is well known, denim fabric is sometimes aged artificially and bleached by washing the original fabric for a prolonged period of time together with pumice, which is sometimes impregnated with a bleaching agent.

According to one of the existing methods, the fabric is aged and bleached by actually wearing it out by washing it for at least an hour with pieces of pumice, with a cloth-pumice ratio of 1:1 or 1:2 by weight. The final result is a slight, even bleaching of the fabric.

A second method, basically similar to the first, consists of washing the fabric for up to three hours, which also bleaches the fabric evenly, although of course resulting in a lighter colour.

In other existing methods the fabric is aged and bleached by large spots by tumbling the fabric with pieces of pumice impregnated with a bleaching agent, such as sodium hypochlorite, potassium permanganate or other suitable compound. The pumice is soaked in the bleach for a while and is then left to drip dry for several hours, after which it is air or spin dried. The process ends with a neutralizing bath. The pumice releases the bleach as it wears off due to friction, thus aging and bleaching the fabric at the points where the pumice is in more frequent contact with it.

The cloth-pumice ratio is around 1:1 or 1:2 in these cases also. The fabric is tumbled together with the pumice for about one or two hours.

All the methods mentioned above require a considerable amount of time. Furthermore, those methods use pumice, which is relatively expensive and which must be replaced as it rapidly wears out during washing. Furthermore, in the known methods mentioned lastly, the pumice's pre-treatment and its high rate of absorption entail long processing times and considerable expense due to the high cost of the pumice and the bleaching agent. Furthermore, since the pumice is in chunks, more bleach is required than what would be strictly necessary to bleach the fabric and problems may arise since the pumice's porousness is irregular and certain chunks may hold in their recesses or empty spaces excessive bleach that can damage or even make holes in the fabric that is being processed.

An object of this invention is to provide a method for bleaching and artificially aging fabric in general, especially denim fabric, as mentioned previously, that requires less time to treat the fabric, entails lower consumption of bleaching agent and allows re-cycling of the granular material.

Another object of this invention is to provide a method as defined above to produce a bleaching result different from that obtainable through the existing methods, that is to say light areas interspersed evenly on the fabric. This, for the purpose of this description, will be referred to as "weathered look".

According to this invention, the fabric, after being desized and possibly washed with detergent and softener, is processed using a granular material, such as natural or artificial sand or salt that has been impregnated with a bleaching agent.

The granular material, which acts as a means of delivery of the bleach onto the fabric, and which is preferably abrasive and will therefore have a slightly abrasive effect on the fabric, is mixed in advance with an oxidizing or chlorine-based bleaching agent. The granular material and bleaching agent can be mixed either separately or in the same container in which the fabric will later be processed.

The percentage by weight of bleaching agent to be mixed with every kilogram of sand or granular material can vary depending on the extent to which the fabric is to be aged and bleached, the bleaching agent being used, and the size of the grains being used. Generally the quantity of pure bleaching agent, by weight, can vary from 0.1 to 5 % of the weight of the granular material being used, and should preferably stay within about 0.1 and 2 %. When using potassium permanganate as bleaching agent, or other chemical substance, it is best to use 2 to 4 grams of sodium permanganate for each kilogram of granular material.

The granular material, which should be perfectly clean and dry, is mixed for about a minute with the bleaching agent until all the grains are evenly soaked, and is then dampened with water, preferably warmed to a temperature between 50 C and about 100 C, and mixed for another minute, before it is used. The quantity of water to be added should be such as to avoid high concentrations of bleach that could damage the fabric or diluting the bleach excessively, reducing its effectiveness. Excellent results can be obtained by keeping an 8 to 15 % residual humidity level in the sand or granular material.

As mentioned previously, the granular material, especially sand, can have any size ranging from

0.3 to 8 mm. The granular material may be homogeneous or heterogeneous in size, in quantities and percentages that vary depending on the size of the grains and their use. Preferably, the composition of the granular material should vary within the ranges shown in the table below.

5 to 15 % of grains between 0.03 and 0.09 mm
 20 to 40 % of grains between 1.00 and 2.00 mm
 20 to 40 % of grains between 2.00 and 5.00 mm
 10 to 30 % of grains between 5.00 and 8.00 mm.

The sand or other granular material used for each aging process can have the same basic average grain size, with grains whose size varies relatively little, or be made up of small and large grains both, in any combination shown in the table above, so as to achieve different "weathered" or bleaching effects.

The granular material used in the method according to this invention can be of any type and, depending on its characteristics, can be impregnated with a different bleaching agent, whether of the oxidizing or chlorine-based type. The following are examples of bleaching agents that can be used:

sodium hydrosulphite
 decolorant chlorides
 sodium hypochlorite and lithium hypochlorite
 chloramine
 hydrogen peroxyde
 sodium peroxyde
 sodium perborate
 chlorinated cyanuric acid
 potassium permanganate
 sodium chlorite
 sulfurous acid
 1.3 dichloro - 5.5 dimethyldantoin in chlorine at 60 %.
 sodium persulfate

Bleaching agents other than those listed above may possibly be used. For instance, excellent aging and bleaching results can be obtained by using volcanic sand treated or impregnated with potassium permanganate or sodium hypochlorite as bleaching agent, using a bleach solution-to-sand ratio of 2 to 4 grams and 50 to 70 grams, respectively, per kilogram of sand, and in general between 0.1 and 20% of the weight of pure bleaching agent relative to the granular material.

It is also possible to use other types of sand, such as: quartz or silicon sand, micaceous, feldspathic, calcareous, chloritic, magnesian, titanitic, stannic, ferrous, copper and all other sands used to make abrasive material or glass, including construction mortar sands, stream, lake and sea bed sand, quarry sand and rock powder, clay-free sand used in smelting properly washed and cleaned, or other types of abrasive synthetic resin granular materials that are suitable for the purpose of the

method. The abrasive material may be partially substituted or complemented by a certain amount of granular absorbent material, impregnated with a bleaching solution at a specific concentration that is compatible with it.

The fabric, after being desized and possibly washed with detergent and spin dried, is placed, either still damp or dry, in a rotating container such as a drum tumbler, with no apertures, or in the basket of a worm screw device, mixed with a pre-established quantity of sand or other granular material impregnated with a bleaching agent. The ratio between the weight of the fabric and granular material placed inside the container basically varies between 1:1 and 1:4 depending on the extent to which the fabric is to be bleached and aged. Additionally, according to the claimed method, the fabric and the granular material are rotated for a variable but extremely short amount of time, ranging between 5 and 25 minutes.

Following the abovementioned treatment, the fabric is separated from the granular material, which is used again in a successive cycle with very small additions of material every two or three cycles. The processed fabric is put in the washer for a reducing or antichlorine bath to neutralize the bleaching agent, with a rinse cycle that lasts between 10 and 15 minutes.

If the granular material is impregnated with potassium permanganate, the neutralizing bath should contain 3 to 10 grams of bisulphite or metabisulphite and 0.3 to 1 gram of acetic acid per liter of water. If, on the other hand, the granular material is impregnated with sodium hypochlorite or a similar chemical, it is best to use a neutralizing bath that contains an antichlorine substance, such as 3 to 10 grams of bisulphite and 0.5 to 1.5 grams of hydrogen peroxyde.

Following the neutralizing bath, the fabric is rinsed, and possibly washed and softened in the conventional manner.

Tumbling the fabric with granular material facilitates the action of the bleaching agent over all the fabric and speeds up the aging and bleaching process even in hard to reach places, without damaging the fabric or its fibers. This tumbling, instead of being carried out in a drum tumbler or completely closed container, can be carried out in a washer's basket, as long as the fabric and granular material are put in a suitable sack.

Tests have been carried out using volcanic sand, which achieved excellent results. Some examples are shown below for explicative purposes:

EXAMPLE I

Volcanic sand with average grain size of 4 to 5 mm in diameter was used. The volcanic sand was impregnated with 2 grams of potassium permanganate per kilogram of sand and 10% of water, at 60 C, and used at a ratio of 2 Kg per kilogram of denim fabric. Ten kilograms of impregnated sand and 5 Kg of damp (spun) denim trousers were placed in a drum tumbler which rotated at a fixed velocity of 45 rpm for 10 minutes. After the process the fabric was well worn and evenly bleached, lighter or 'weathered' on the smooth portions, while darker near seams and pockets.

EXAMPLE II

The volcanic sand, consisting of grains varying between 0.03 and 8 mm, was impregnated with 5 grams of sodium hypochlorite at 14 baumè, per kg of sand, and 5% water by weight, at 40 C, and used at a ratio of 2 Kg per kilogram of denim fabric. Ten kilograms of impregnated sand and 5 Kg of damp (spun) denim trousers were placed in a drum tumbler which rotated at a fixed velocity of 40 rpm for 15 minutes. After the process, the fabric was well worn and evenly bleached, lighter, with a yellowish tint, and 'weathered' on the smooth portions, while darker near seams and pockets.

EXAMPLE III

Quartz sand consisting of grains ranging from 3 to 5 mm in diameter was used. The sand was impregnated with 4 grams of potassium permanganate per Kg of sand and 12% water by weight, at 60 C, and used at a ratio of 2 Kg of sand per kilogram of denim fabric. Ten kilograms of quartz sand and 5 Kg of damp (spun) denim trousers were placed in a drum tumbler which rotated at a fixed velocity of 35 rpm for 15 minutes. The result, while displaying characteristics similar to that of example I, was even more evident.

The advantages granted by the method according to this invention consist mainly in an aging and bleaching result not achievable with existing processes, obtained in a shorter amount of time, which in some cases can be as little as a few minutes and rarely exceeds ten minutes, compared to existing processes that can take hours. Since the abrasive granular material used, such as sand or other such material, can be re-cycled, its consumption, and therefore processing costs, are reduced. Furthermore, given lesser absorption of the abrasive granular material according to this invention, compared to pumice used in existing processes,

the amount of bleaching agent used is decreased substantially. Lastly, all the operations in the processing of the fabric use abrasive material that does not deteriorate and can be easily removed, thus resulting in diminished wear of the equipment being used.

Figures 1 and 2 of the enclosed drawings, show, for explicative purposes, a portion of denim fabric that has been simply washed but not yet bleached (figure 1) in which the cloth is still uniformly dark, and the same portion of denim fabric after being aged and bleached (figure 2) through the method of this invention, after only 10 minutes of processing with volcanic sand.

Figure 2 shows the typical light - dark color interspersed over the fabric, known as "weathered look", according to this invention.

The invention, lastly, concerns the granular material with grain sizes mentioned previously, which is impregnated with suitable amounts of bleaching agent, varying between 0.1 and 20% of the sand's weight in pure bleach, which can be sold and used to boost or to complement granular material that has been partially used-up in previous processing of fabric.

Claims

1. Method for bleaching and artificial aging of fabrics in general, and denim fabrics in particular, in which the fabric is tumbled together with abrasive material and a bleaching agent, characterized by the fact that the fabric is tumbled with a metered amount of an abrasive granular material that has been previously mixed with the bleaching agent.

2. A method as claimed in claim 1 further characterized by the fact that the fabric mixed with the granular material and the bleaching agent is kept tumbling for a pre-set amount of time, that the granular material is then separated from the fabric and that the latter is rinsed in a bleach neutralizing bath.

3. A method as claimed in claim 1 characterized by the fact that the fabric is processed in a dry condition.

4. A method as claimed in claim 1 characterized by the fact that the fabric is processed in a damp condition.

5. A method as claimed in claim 1 characterized by the fact that the weight ratio between fabric and granular material is between 1:1 and 1:4.

6. A method as claimed in claim 1 characterized by the fact that the granular material includes grains having average sizes between 0.03 and 8 mm.

7. A method as claimed in claim 1 characterized by the fact that the granular material includes grains having basically the same average size.

8. A method as claimed in claim 1 characterized by the fact that the granular material includes grains having differing average sizes.

9. A method as claimed in claim 8 characterized by the fact that the granular material includes grains with average sizes as per any of the combinations and percentages listed below:

- 5 to 15 % of grains between 0.03 and 0.09 mm
- 20 to 40 % of grains between 1.00 and 2.00 mm
- 20 to 40 % of grains between 2.00 and 5.00 mm
- 10 to 30 % of grains between 5.00 and 8.00 mm.

10. A method as claimed in one or more preceding claims, characterized by the fact that the granular material consists of sand.

11. A method as claimed in claim 10 characterized by the fact that the granular material is chosen among the following types of sand: volcanic or lava sand, silicone or quartz sand, micaceous sand, feldspathic sand, calcareous sand, chloritic sand, magnesian sand, titanitic sand, stannic sand, ferrous sand, copper sand and all types of sand used to make abrasive materials or glass, including sands used in construction mortars, sand from streams, beaches and lakes, quarry sand and rock powder, clay-free smelting sand, or other types of synthetic resin-based abrasive granular materials.

12. A method as claimed in claim 1 characterized by the fact that the granular material is impregnated with a bleaching agent comprising: potassium permanganate, or sodium hypochlorite, or equivalent oxidizing or chlorine-based substance.

13. A method as claimed in claim 11 characterized by the fact that the granular material is impregnated with between 0.1% and 5% of the granular material's weight in pure bleaching agent.

14. A method as claimed in any preceding claim, characterized by the fact that the abrasive granular material is partially mixed with absorbent material.

15. A method as claimed in claim 1 further characterized by the fact that the fabric is rinsed in a bleach neutralizing bath.

16. A method as claimed in claims 12 and 15 characterized by the fact that the fabric is put through a bisulphite and acetic acid-based or bisulphite and hydrogen peroxyde-based neutralizing bath.

17. A method as claimed in claim 1 characterized by the fact that the fabric mixed with the abrasive granular material, is tumbled for a length of time between 5 and 25 minutes.

18. A fabric, especially a denim fabric, artificially aged and bleached by tumbling it with abrasive granular material, mixed with a bleaching agent according to a method claimed in one or more of the preceding claims.

19. A granular material, especially sand, impregnated with a bleaching agent, suitable for use for aging and bleaching of fabric according to a method claimed in one or more of the preceding claims, characterized by the fact that it is pre-mixed in the amount between 0.1 and 20% in weight of bleaching agent compared to the the granular material.

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Fig. 1

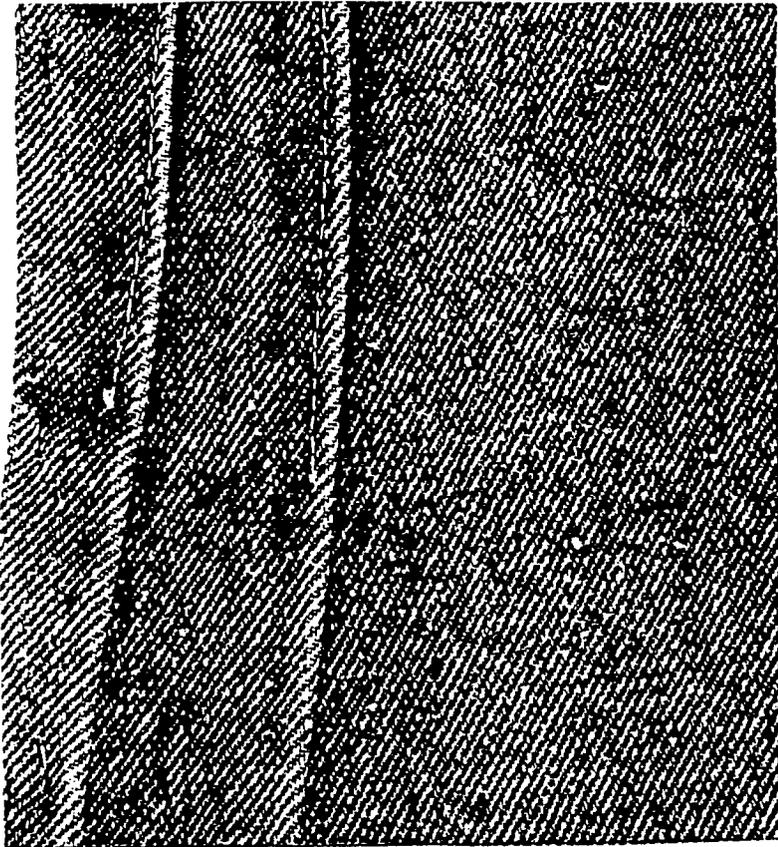


Fig. 2



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	US-A-4 575 887 (VIRAMONTES) * Column 3, lines 16-45 *	1,2,5-7 ,10,11, 17,18	C 11 D 11/00 D 06 B 11/00
P,A	BE-A- 905 631 (GOLDEN TRADE S.R.L.) * Page 3, lines 22-24; page 4; page 5, lines 1-2; page 7, lines 20-24; page 8, lines 1-11 *	1-3,5, 12,15, 17,18	
A	FR-A-2 116 614 (REBISCOUL) * Claim 1 *	1,4-7, 10,11, 17	
A	US-A-3 504 510 (D. FREZE et al.)		
A	DE-A-3 217 188 (ACHEMCO)		
A	DE-A-3 129 699 (MARUO CLOTHING INC.)		
A	FR-A-2 259 179 (THE PROCTER & GAMBLE CO.)		
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			D 06 F C 11 D D 06 B D 06 C
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 02-03-1988	Examiner D HULSTER E.W.F.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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