

# UNITED STATES PATENT OFFICE

1,927,022

## ART OF TREATING NATURAL AND ARTIFICIAL SILK AND AGENTS THEREFOR

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No Drawing. Application December 17, 1931  
Serial No. 531,772

12 Claims. (Cl. 8—2)

This invention relates to the art of treating natural and artificial silk and more particularly to a process of degumming natural silk or desizing rayon or artificial silk and to an agent therefor.

It is well known that heretofore the degumming of silk was usually effected by boiling silk, whether in the form of fibre or fabric or the like, in a solution containing a high percentage of soap for relatively long periods of time at a boiling temperature. The more serious disadvantages of conventional processes were the necessity of using large amounts of soap, the consumption of excessive amounts of fuel or power for maintaining the boiling temperature of the bath for relatively long periods of time, and the loss of tensile strength by the silk fibre or fabric due to the long boiling periods. Although many attempts have been made to remedy the aforesaid disadvantages, no wholly satisfactory and commercially successful process or agent has been provided.

I have discovered that when silk fibres or fabrics are placed in a bath of hot water containing in solution certain salts, such as alkali salts of weak acids like sodium perborate, sodium carbonate, sodium phosphate and/or mixtures thereof, which have been pretreated with ozone, the degumming of the natural silk and the desizing of the artificial silk occurs at a moderate temperature within a relatively short period of time and without destroying or adversely affecting the tensile strength of the silk fibres of fabrics to any material extent.

It is an object of the present invention to provide a novel process for degumming natural silk fibres or fabrics with the object of freeing them from sericin which coats them and/or forms a part of the raw natural silk fibre or fabric.

It is another object of the invention to provide an improved process for desizing rayon or artificial silk without detrimentally affecting its properties, including tensile strength, lustre, etc., to any material extent.

It is also within the contemplation of the invention to provide an improved agent for degumming natural silk and/or desizing artificial silk or rayon, and/or bleaching thereof.

Other objects and advantages of the present invention will become apparent from the following description.

Generally speaking, an aqueous solution of the novel pre-ozonated salts or their mixtures is established to constitute the degumming or desizing bath. This bath is maintained at a temperature below about 110° C. and above about 20° C., and

preferably at a temperature of about 95° C. Artificial and natural silk, which has been subjected to the conventional operations of fabrication, is immersed in this bath and/or wetted with the solution of this bath for a relatively short period of time. The duration of the treatment given to the silk fibre or fabric will, of course, vary within relatively wide limits, depending upon, for example, the particular pre-ozonated salt used, the weight of the silk fibre or fabric, and the amount of gum which is to be removed. In practice, satisfactory results have been obtained by using a period of time varying from about 5 minutes to about 30 minutes. Usually, a period of time of about 12 minutes has been found to give satisfactory results.

In making up the silk-treating bath, the pH value is preferably about 7.0 to about 12.0 and is usually about 9.0. A bath of this sort is a weak solution of the pre-ozonated salts which are preferably present to an extent varying from about 0.01% to about 20.0%.

In carrying out the present process, it is ordinarily preferred to utilize a mild agitation or movement of the silk fibres or fabrics. Of course, it is possible to carry out the process with or without mechanical agitation. In industrial and commercial operations, however, it is preferred to subject the silk fibres or fabrics, as mentioned hereinabove, to mild agitation or movement. In view of this situation, it is possible to employ standard machinery or equipment now available in the open market. It also should be noted that the process may be carried out in machinery operating on a continuous principle as well as in machinery operating on a batch principle.

After the silk fibres or fabrics have been subjected to the treatment described hereinabove, they are thoroughly rinsed with water. Following this water rinsing, the silk is rinsed with a weak acid, such as acetic acid, as one skilled in the art knows. The silk is now ready for dyeing, weighting, or other finishing operations.

The salts which are useful in carrying the present invention into practice are the alkali salts of weak acids which are capable of being ozonated to form compounds capable of yielding a relatively large amount of nascent oxygen. Illustrative examples of these salts are carbonates of soda or potassium, borates of soda or potassium, phosphates of soda or potassium, or the like. It has not been definitely established as yet as to whether true chemical compounds with ozone are formed or whether additive com-

pounds are formed in which ozone or a product thereof is loosely coupled to the original salt. In any event, it has actually been demonstrated that when borate of soda is ozonated a product is produced which contains a relatively large amount of available nascent oxygen. A compound of this sort appears to be very effective as a natural silk degumming agent and as a rayon or artificial silk desizing agent and has given results which have not been accomplished or realized in the silk art.

It is to be observed that the present invention provides a process of degumming natural silk and desizing rayon or artificial silk without detrimentally affecting the strength or lustre of the original silk. As a matter of fact silk when treated by the present process maintains its strength and is also decolorized and/or bleached to give increased lustre.

It is also to be noted that the present invention provides a process which can be carried out not only at atmospheric pressure but also at pressures below and above atmospheric pressure.

Furthermore, the present process shortens the time between the weaving process and the process which follows the degumming or desizing of the silk to such an extent that the silk fibre or fabric may be fed progressively and continuously by manual or mechanical means or both through the degumming or desizing bath, the rinsing bath, the neutralizing bath of weak acid and the drying operation or the dyeing or weighting or other finishing operation.

Moreover, the present invention provides as a stable article of commerce, a dry or semi-dry silk degumming or silk desizing agent which is very effective for degumming and/or bleaching natural silk and desizing and/or bleaching artificial silk or rayon. The aforesaid article of commerce embraces pre-ozonated alkali salts of weak acids which can be prepared, distributed and sold in a dry or semi-dry condition or in a concentrated solution.

In the present specification and claims, when I use the expression "salts of weak acids", I mean salts which are capable of giving a saponifying value, action or number as one skilled in the art will readily understand.

I am aware of the fact that it is old to use ozone in a bath in and by itself, hydrogen peroxide, soap, caustic soda, and saponifiable salts. These old agents and processes, however, have not produced the results which can be obtained by the use of the present process and the present bleaching, degumming and desizing agent.

Although the present invention has been described in connection with certain preferred embodiments including certain temperatures, periods of time, concentrations, and the like, it is to be understood that variations may be resorted to without departing from the scope and spirit of the present invention as one skilled in the art will readily understand.

In connection with the pre-ozonated alkali salts of weak acids, it is to be observed that these can be made in any appropriate or suitable manner as one skilled in the art will readily under-

stand. Thus, ozone may be bubbled through a solution of such salts to produce a concentrated product to be used as an article of commerce for carrying out the present invention. In a similar manner moist or dry salts of the aforesaid type can be ozonated with ozone to produce pre-ozonated salts.

I claim:

1. As an article of manufacture, a natural silk degumming and an artificial silk desizing agent which comprises a pre-ozonated alkali salt of a weak acid.

2. As an article of manufacture, a natural silk degumming and an artificial silk desizing agent which comprises a pre-ozonated alkali salt of a borate.

3. As an article of manufacture, a natural silk degumming and an artificial silk desizing agent which comprises a pre-ozonated alkali salt of a carbonate.

4. As an article of manufacture, a natural silk degumming and an artificial silk desizing agent which comprises a pre-ozonated alkali salt of a phosphate.

5. As an article of manufacture, a natural silk degumming and an artificial silk desizing agent which comprises a pre-ozonated borate of soda.

6. As an article of manufacture, a natural silk degumming and an artificial silk desizing agent which comprises a pre-ozonated carbonate of soda.

7. As an article of manufacture, a natural silk degumming and an artificial silk desizing agent which comprises a pre-ozonated phosphate of soda.

8. An article of commerce such as set forth in claim 1 in which the weak acid is an oxygen-bearing acid.

9. The process of treating silk which comprises wetting silk containing a substance of the group consisting of gum and size in a bath containing a pre-ozonated alkali salt of a weak acid.

10. The process of treating silk which comprises wetting silk containing a substance of the group consisting of gum and size in a bath containing a pre-ozonated alkali salt of a weak acid and maintaining the temperature of said bath below about 110° C. and above about 20° C. throughout the degumming or desizing process.

11. The process of treating silk which comprises wetting silk containing a substance of the group consisting of gum and size in a bath containing a pre-ozonated alkali salt of a weak acid, maintaining the temperature of said bath below about 110° C. and above about 20° C., and holding the silk in said bath for a period of about 5 minutes to about 30 minutes.

12. The process of treating silk which comprises establishing a bath containing about 0.01% to about 20.0% of pre-ozonated alkali salt of a weak acid, wetting the gummed silk or sized silk in said bath, maintaining the temperature of said bath at about 95° C. and holding the silk in said bath for a period of about 1 minute per "lineal pound" of silk.

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