

## UNITED STATES PATENT OFFICE

2,304,478

PROCESS OF TREATING MATERIALS COM-  
PRISING ALBUMIN, SUCH AS HAIR,  
BRISTLES, AND THE LIKE

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No Drawing. Application October 19, 1939.  
Serial No. 300,184

3 Claims. (Cl. 8-128)

This invention relates to a process of treating materials consisting of albumin or containing albumin. More particularly, the invention relates to a process of treating animal hairs, bristles, and the like as used for brushes, and the like with such compounds that the bristles thus treated show bactericidal properties. The invention also relates to the articles made in accordance with my new process.

Accordingly, it is an object of the invention to produce hairs, bristles and the like having bactericidal properties.

It is another object of the invention to impregnate materials containing albumin with a compound containing gold or silver ions which ions are known for their bactericidal properties.

It is a further object of the invention to bind the gold or silver ions directly with the albumin of the material to be treated.

It is still an object of the invention to treat the hairs or bristles with compounds having bactericidal properties in such a manner that the hairs or bristles thus treated do not substantially change their color, and further in such a manner that the hairs or bristles preserve their original properties, e. g., their stiffness.

It is still another object of the invention to provide a cheap process of treating hairs, brushes, and the like in such a manner that the same have bactericidal properties.

It is a still further object of the invention to impregnate hairs, bristles and the like in such a manner that the bactericidal compounds formed on the hairs or bristles can practically not be removed by means of washing and the like treatment.

I have found that by reacting compounds producing silver ions such as silver salts, which are suitably dissolved in an aqueous solvent, with hairs, bristles and the like as used, e. g., for brushes products having highly bactericidal properties are obtained. It is not necessary to treat the thus impregnated bristles with reducing agents or with other compounds which react with the used silver compounds. Tests have shown that in accordance with my new process products are obtained in which the silver is bound on the albumin containing material, i. e., on the hairs, bristles and the like. The new compound can not, or only to a small extent, be removed by washing the same with water or an aqueous solution. Such products show very active bactericidal properties and furthermore the color of the material thus treated remains substantially

unchanged and the material preserves its original properties such as its stiffness.

In order to obtain permanently active products the bristles and the like are preferably treated with soluble silver compounds until the treated material contains, even after washing the same with water, at least 5% silver and suitably 7% silver and more of the total dry weight.

The action of the soluble silver compounds upon the material to be treated is suitably continued until in a sample of the material at least in the outer third of its cross sectional area silver may be detected after previous washing of the material with water. If desired, the material, e. g., bristles may be treated with a swelling agent previously to or during the action of the silver compounds. However, care must be taken that either such swelling agents are used which do not produce reaction products having a low solubility with the used soluble silver compounds or, if this is not the case, the used swelling agents as, e. g., diluted alkali metal solutions must be applied before the soluble silver compounds are reacted with the bristles and the like and the swelling agents must be removed again by means of washing the bristles.

Besides soluble silver compounds other suitable substances may be reacted with the material to be treated such as, e. g., substances having a bactericidal action or substances which increase the action of the silver compound. However, only such substances may be used which do not form compounds having a low solubility with the soluble silver compounds. E. g., the material to be treated may also be reacted with soluble gold compounds. The action may take place previous to, during or after the action of the silver compounds. It is sufficient if small amounts of gold are incorporated into the material to be treated and it has been found that thus products are obtained in which the gold is bound in a form having a low solubility.

Frequently, it may be advantageous to subject the material to be treated to a rest process by means of previous washing after the action of the soluble silver compounds has taken place and to thereafter thoroughly wash the thus treated material.

In the following several examples are given showing how my process may advantageously be performed.

*Example 1.*—100 grams of white bristles are immersed at room temperatures in a solution containing between 3% and 5% of silver nitrate and the bristles remain in the solution which

may occasionally be stirred until a sample of the material shows a silver content of at least 8% of the weight of the bristles dried in air, after the sample has previously been washed with water. The thus treated main amount of the bristles may either be directly worked after a short washing treatment or the same may be watered for a longer time while repeatedly changing the washing water. The thus treated bristles show a silver content of 7% of the weight of air dried bristles in spite of repeated watering.

*Example 2.*—100 grams of bristles are treated as set forth in Example 1 and after the same show a silver content of about 12% without washing the bristles are stored for 24 hours whereafter the same are washed. The storing causes that the main amount of the silver is fixed in the bristles and thus even by a longer washing treatment only small amounts of soluble silver compounds may be removed and the bristles show a silver content of about 8%. Instead of using one continuous rest period it may be advantageous to repeat the washing treatment several times while interposing every time a short rest period.

*Example 3.*—100 grams of bristles are treated for about 2 hours with an aqueous solution of about .05% to .5% of auric chloride at room temperatures or at slightly elevated temperatures. Thereafter, the bristles are washed for a short time and treated with a solution containing between 3% to 5% silver nitrate and the bristles are left in the solution, e. g., as disclosed in connection with Example 1 until the same have taken up about 8% by weight of silver. The thus treated bristles contain besides the silver about .05% chemically bound gold and show an increased activity.

The time which is necessary for the action of the soluble silver compounds may be shortened, e. g., by a previous swelling treatment which is particularly adapted for bristles which show a small capacity to react with the silver compounds. For this purpose the bristles may be treated for 15 minutes with a solution of 1% of sodium hydroxide at room temperatures and

the same may be subjected to a subsequent thorough washing in order to remove the sodium hydroxide.

The time which is necessary for the action of the soluble silver compounds depends upon the properties of the material to be treated, upon the concentration of the used reacting material, upon the temperature and the like factors.

I have also found that fibres, threads, bristles and the like shaped products made from synthetic resins, e. g., from urea formaldehyde condensation products may be treated with soluble silver salts which are absorbed by these resins and thus show bactericidal properties. The synthetic resin products are, e. g., treated as set forth in the following example.

*Example 4.*—Bristles made from synthetic resins and similar products are treated with a solution of a soluble silver salt. The silver ions are absorbed by the bristles and a product is obtained which exerts a highly bactericidal action.

I claim:

1. Process for imparting permanent bactericidal properties to hairs and bristles comprising subjecting the said articles to the action of an aqueous silver salt solution until the silver is bound with the albumin of the treated articles as a water insoluble compound and thoroughly washing the treated articles in order to remove any soluble silver salt.

2. Process for imparting permanent bactericidal properties to hairs and bristles comprising subjecting the said articles to the action of an aqueous silver salt solution until a quantity of silver has been absorbed by the said articles as a water insoluble silver albumin compound which is equal to at least 5% of their dry weight and thoroughly washing the treated articles in order to remove any soluble silver salt.

3. As a new article of manufacture a bristle having its original appearance and stiffness its albumin contents being bound as a water insoluble silver albumin compound.

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