Patented Jan. 16, 1934

1,943,975

UNITED STATES PATENT OFFICE

1,943,975

WATER REPELLENT SIZE FOR FIBER PRODUCTS

Elbert C. Lathrop and Fergus A. Irvine, Chicago, Ill., assignors to The Celotex Company, Chicago, Ill., a corporation of Delaware

No Drawing. Application November 6, 1930 Serial No. 493,913

8 Claims. (Cl. 92—21)

This invention relates to the treatment of fiber or fibrous materials whereby the same is (water repellent), sized and given color, and has for its object to provide a method of treatment, as well as a finished product, which can be economically carried out in a manner more efficient than those heretofore proposed.

In the use of numerous of the fibers which are utilized for the manufacture of paper, board, and insulating board, it is quite common that the color of the fibers may vary according to the season of the year or because of some other more or less uncontrollable condition. In the manufacture of board and insulating boards, due particularly to the fact that insulating boards are largely manufactured of raw materials seasonably obtained from vegetative sources, it is common for the color to vary in accordance with the length of time that the basic fibrous material thereof has been in storage. Further, in the manufacture of board and insulating board, the fibrous material generally is digested only lightly and ordinarily is not bleached, as a result of which there is at times a considerable variation in the color of the resulting product.

It is a particular object of this invention to provide a treatment of fibrous materials utilized in the production of paper, board, and insulating board whereby a uniform color may be maintained in the finished product and a further object of the invention is to provide a fiber treatment which can be employed simultaneously to produce integral water repellent sizing of the product and to maintain a uniform coloring thereof. Other and further objects of the invention will become apparent upon reading the following detailed description.

The invention comprises what might be termed a simultaneous dyeing and integral sizing of the fibrous material which treatment is applied ordinarily to the fiber while in the condition of half stock, and in the utilization of this treatment the usual rosin and alum sizing treatment may be dispensed with although this is unnecessary. In the ordinary rosin and alum sizing treatment there is ordinarily a considerable amount of difficulty involved in obtaining the requisite water repellent characteristic of sizing which difficulty is apparently due to the relative sensitiveness of the rosin and alum process of sizing. According to this invention the simultaneous coloring and sizing of the stock is accomplished in a manner quite similar to the usual rosin and alum process and in fact a rosin emulsion is used which is identical with that used in the previous process.

Instead of using alum to precipitate and coagulate the rosin on the fiber, as rosin sizing, an iron salt preferably $FeCl_3$ is used although other iron salts may be utilized, particularly one embody both $FeCl_3$ and $Fe_2(SO_4)_3$ since it may be economical at times to obtain the desired iron salts by chlorination of $Fe_2(SO_4)_3$ which commonly does not convert all of the salt from the sulphate to the chloride with the result that the final product is more or less a mixture of the several salts.

To the fibrous material digested washed and refined or treated in any other desired manner, and in a condition of half stock, there is added the size, for example one per cent of rosin emulsion, which is the ordinary paper sizing rosin emulsion formed by heating and agitating the rosin with an alkali, the amount of rosin emulsion being expressed in per cent of solids in the emulsion relative to the dry weight of fiber to which it is added. For the best results, the rosin emulsion should be distributed thoroughly and uniformly through the fiber mass to which it is added, after which there is added a solution preferably containing one per cent more or less of $FeCl_3$ based on the dry weight of fiber. This solution, as intimated above, may be replaced by a solution comprising a combination of salts such as both $FeCl_3$ and $Fe_2(SO_4)_3$.

Upon addition of the size precipitant and coagulant to the fiber containing the rosin emulsion, the sizing is deposited on the fiber producing an integrally sized product which, after being dried, will be resistant to wetting. It may be that, when the $FeCl_3$ is added, the stock is outside the range of acidity or alkalinity within which the sizing will be deposited most satisfactorily on the fibers, which range is approximately between the pH of 4.0 and 8.0, in which case an adjustment may be made with NaOH or other alkali to bring the pH within the most satisfactory range, which latter appears to be between pH 4.5 and pH 5.5.

The action in this method of sizing is apparently due to the fact that the $FeCl_3$ reacts to form $Fe(OH)_3$ or basic ferric salts under the conditions of and within the pH range of the treatment. The $Fe(OH)_3$ apparently acts on the rosin emulsion in the same general manner as does alum with the result that apparently a resinate of iron is deposited in place of the usual aluminum resinate.

It has been discovered that the amount of $FeCl_3$ to be added, if in excess of the minimum, may be increased to a quite considerable extent, that is, to 3 or even 5 or more times the minimum

amount necessary and that, by adding the $FeCl_3$ in varying amounts between the minimum necessary and that of several times the minimum, it is possible to produce a fiber colored through a considerable range of the shades of brown. Further, by increasing and decreasing the amount of added $FeCl_3$, it has been found possible to compensate for variation in the color of the stock and, by such manipulation, to produce finished fiber products of a substantially uniform shade of color.

A particular advantage of this process, not heretofore mentioned, is that the action involved in precipitating and coagulating the size upon the fibers is apparently not nearly so critical as is the case with alum sizing, and therefore by this process the sizing is greatly simplified and more uniform results can be obtained.

It is to be understood that if the fiber stock is dark or if a relatively light board is desired as the final product then in such event the rosin coagulating and precipitating agent may comprise a mixture of alum and ferric chloride in which the proportions will vary depending upon the shade of color desired in the final product.

It is to be understood that the invention hereof is directed to a water repellent size application as distinguished from a water proofing treatment.

A water proofing treatment is considered to be a treatment wherein the protection is afforded through the use of a water impervious material applied as a coating or used as a binder or matrix in which the fibrous material is embedded and in which the proportion of water proofing material with respect to fiber, for protection, is from about one part waterproofing to four parts of fiber to equal proportions of waterproofing and fiber.

On the other hand a water resistant size is considered to be a treatment of the usual rosin and alum sizing or a treatment of like effect achieved with other materials and wherein the results are apparently due to a colloidal deposit of the water repellent substance on the fiber surfaces as distinguished from a water impervious coating or embedment thereof and wherein the results are obtained by the use of size in the ratio of about, size ½ to 2½ parts to fiber 100 parts.

It is obvious that those skilled in the art may vary the steps and combinations of steps constituting the method, as well as vary the ingredients above mentioned, within the scope of this invention, and therefore it is not desired to be limited to the foregoing disclosure except as may be required by the claims.

What is claimed is,—

1. The method of controlling the coloring of fiber products wherein, in integrally sizing fibers to cause the products made therefrom to be water repellent, wherein as the size precipitant, ferric salts consisting principally of ferric chloride are added in varying quantities depending upon the shade of coloring desired, from the minimum for sizing to ten per cent by weight of dry fibers treated.

2. The method of coloring and sizing for making fiber products water repellent, consisting in adding to fibers in dilute suspension an emulsion of a sizing agent, the sizing agent coagulated and precipitated on the fiber by addition of a coagulating and precipitating agent comprising principally ferric chloride.

3. The method of sizing fiber materials by the coagulation and precipitation of rosin with ferric chloride.

4. The method of precipitating and coagulating rosin size, which consists in bringing into contact therewith, while in dilute suspension together with fiber, an iron salt comprising principally ferric chloride.

5. A method of sizing a paper pulp derived from vegetative sources which consists in treating the pulp while in dilute suspension of 0.5 per cent to 5.0 per cent consistency with 1.0 per cent to 3.0 per cent of an emulsion of an integral waterproofing sizing agent, and with 0.25 to 2.5 per cent of ferric salt comprising principally ferric chloride.

6. Fiber products sized with the reaction product of rosin and ferric chloride.

7. Fiber products integrally sized to be water repellent with rosin coagulated and precipitated by a coagulant and precipitant comprising principally ferric chloride and alum.

8. The method of sizing fiber materials wherein rosin is coagulated and precipitated on the fiber by the use of a coagulant and precipitant consisting of principally ferric chloride and alum.

ELBERT C. LATHROP.
FERGUS A. IRVINE.