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TREATMENT OF WOOD, FIBER BOARD, WOOD-PULP, WOOD-FIBER AND THE LIKE

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6 Claims. (Cl. 91—68)

This invention comprises improvements in or relating to the treatment of wood, fiber board, wood-pulp, wood-fiber and fibers containing ligno-cellulose, and has for its object to provide a process for improving the color of such materials and to render the treated materials resistant to fire. It has hitherto been the practice to change or remove the natural coloring matter of wood-pulp by bleaching it with chlorine, but this treatment is not applicable to a number of materials, such, for example, as jute, hemp, baste and other fibers containing ligno-cellulose, which are unable to withstand the bleaching treatment and further does not confer on the treated materials any fire-resistant properties.

The coloring and fire proofing treatment according to the present invention consists in precipitating an insoluble phosphate (e. g. a phosphate of calcium, magnesium, aluminium, zinc or iron) within the cell structure of the material. This treatment has no prejudicial effect on fibers containing ligno-cellulose, and depends for its efficiency in altering the color of the material by the color of the precipitated phosphate which masks the color of the fibers.

It will be understood that no material is totally insoluble and the term insoluble as used in this specification means having an insolubility of the order of that of the insoluble phosphates of calcium, magnesium, aluminium or iron.

According to a feature of the invention the materials (e. g. wood, fiber board, wood-pulp, wood fiber and fibers containing ligno-cellulose such as jute, hemp and baste) may be treated successively with a solution of an acid phosphate and a solution capable of reacting with the acid phosphate to precipitate an insoluble phosphate within the cell structure of the material.

The order in which the two steps of the process are caused to take place is largely a matter of convenience and the most advantageous sequence of operations is readily determined by means of a simple preliminary test.

By depositing within the cell structure a precipitate consisting of or containing a zinc phosphate, a product is obtained which is not only fire-resisting and from which the fire-proofing material is not readily removable by treatment with water, but which in addition is resistant to the attack of animal and vegetable life which normally destroys such fibers. The material may first be soaked in a solution of the soluble acid phosphate of zinc and subsequently in a solution containing mono-ammonium phosphate or di-ammonium phosphate or a mixture of

these substances. Alternatively, a mixture consisting of insoluble zinc phosphate together with the insoluble phosphates of other metals, for example of magnesium, calcium, aluminium or iron may be precipitated together within the cell structure of the material from a mixed solution of these salts. Thus for example the material may be treated first with a solution of a soluble phosphate such as a solution of one or more of the ammonium phosphates and then with a solution containing acid phosphates of magnesium and zinc.

This invention also includes a process for the treatment of wood, fiber board, wood-pulp, wood-fiber and like fibers containing ligno-cellulose by precipitating within the cell structure of the material a colored insoluble phosphate such as the phosphate of chromium. Alternatively one or more salts yielding insoluble colored phosphates may be mixed with one or other of the salts mentioned above and precipitated with them within the fibers.

In one preferred form of the invention the material may be treated first with a solution containing mono-ammonium phosphate and small proportions of boric acid and di-ammonium phosphate, and then with a solution of acid calcium phosphate. After precipitation of the insoluble phosphate the material may conveniently be treated with a solution of sodium aluminate and/or sodium silicate with or without addition of colloidal substances such as carrageen, or viscose.

The treatment according to the invention has the advantage that it confers fire- and water-resisting properties on the material. As mentioned above, it is applicable generally to wood, fiber board, wood-pulp, wood-fiber and fibers containing ligno-cellulose such as jute, hemp and baste. When the invention is to be applied to wood-pulp or fibers the material may conveniently be compressed into boards with an adhesive and, if desired, a suitable filling material.

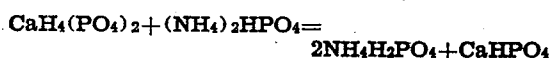
Example

A practical embodiment of the invention will now be described with reference to the treatment of the material known under the registered trade mark Essex board which comprises a mixture of sawdust and glue.

The first stage in the treatment consists in immersing the "boards" in a bath containing an aqueous solution containing about 30 to 35% by weight of mono-ammonium phosphate, a small proportion of di-ammonium phosphate and a

trace of boric acid. The boards are generally immersed in this solution for a period of from ten to twenty minutes. The time of immersion depends upon the thickness of the board, the porosity of the board and the absorbent properties of the cell structure of the board.

In the second stage of the process the boards are removed from the above-mentioned bath and transferred to a bath containing 15 to 20% of the soluble acid phosphate of calcium. The acid phosphate of calcium reacts with the diammonium phosphate to precipitate the insoluble calcium phosphate within the cell structure of the material. The reaction may conveniently be represented by the following equation:—



The precipitated calcium phosphate confers a white color on the material, which remains impregnated with the mono-ammonium phosphate and is thereby rendered fireproof.

As a final operation the boards are immersed in a bath containing a solution of sodium aluminate and/or sodium silicate with or without addition of colloids such as carragheen or viscose.

Alternatively the second stage of the process may consist in immersing the boards in a solution containing acid phosphate of zinc together with acid phosphate of magnesium.

This invention when applied to the treatment of jute, for example in the form of sacking, may be carried out by the process described above for the impregnation of "boards".

A solution of acid phosphate of zinc suitable for use in the present process may be prepared for example by mixing 8 parts by weight of zinc oxide with 26 parts by volume (39 parts by weight) of phosphoric acid, H_3PO_4 (s. g. 1.500) and adding sufficient water to bring the volume up to 100.

I claim:

1. A process for fire-proofing and rendering resistant to attack by animal and vegetable life cellulosic materials containing ligno-cellulose which comprises treating the cellulosic materials successively and in any order with a solution of a soluble acid phosphate of zinc and with a solution reacting therewith to precipitate an

insoluble phosphate within the cell structure of the material.

2. A process for fire-proofing cellulosic materials containing ligno-cellulose which comprises treating the material successively and in any order with a solution of a soluble acid phosphate of a metal yielding an insoluble phosphate and with a solution of a soluble phosphate to precipitate said insoluble phosphate within the cell structure of the material.

3. A process for fire-proofing cellulosic materials containing ligno-cellulose which comprises treating the material successively with a solution of a soluble acid salt of a metal yielding an insoluble phosphate and subsequently with a solution of an ammonium phosphate.

4. A process for fire-proofing cellulosic materials containing ligno-cellulose which comprises treating the material successively and in any order with a solution of acid phosphates of any number of the metals calcium, magnesium, aluminium, zinc or iron and with a solution of a soluble phosphate capable of precipitating insoluble phosphates of the said metals within the cell structure of the material.

5. A process for fire-proofing, coloring and rendering resistant to attack by animal and vegetable life fibrous cellulosic materials containing ligno-cellulose which comprises treating the said fibrous material successively and in any order with a solution of acid phosphates including a soluble acid phosphate of zinc and an acid phosphate of a metal yielding a colored insoluble phosphate and with a solution capable of precipitating said phosphate of zinc and colored phosphate within the cell structure of the material.

6. A process for fire-proofing and coloring substances having a basis of fibrous cellulosic material containing ligno-cellulose which comprises treating said substances successively and in any order with a solution of a mixture of soluble acid phosphates yielding insoluble phosphates and including a soluble acid phosphate of a metal yielding the colored insoluble phosphate and with a solution of soluble phosphate precipitating the insoluble phosphates within the cell structure of the fibrous material.

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