

Patented Sept. 29, 1931

1,825,178

## UNITED STATES PATENT OFFICE

ROBERT DOUGLAS COGHILL, OF ROSLYN, DUNEDIN, NEW ZEALAND

PROCESS FOR THE TREATMENT OF FIBERS OR FIBROUS MATERIALS

No Drawing.

Application filed December 28, 1929. Serial No. 416,736.

This invention has been devised with the object of providing an improved process for the treatment of native substances containing vegetable fibrous materials, or like fibers, or materials made therefrom such as fabrics or sacking.

The invention comprises a process whereby the said substances or materials are subjected in the first instance to the action of a bath of hot water containing in solution an acid or an alkali, or a salt of these, or a caustic alkali. Or a prepared solution of the alkali may be added to the bath from another receptacle. Such substances or materials are fed through this bath by being drawn therethrough, either in a stretched or loose condition and at the same time are subjected to a squeezing and rubbing action, together with a pounding action which is exerted thereon. This treatment is for the purpose of removing the non-cellulose and other foreign matters from the material being treated and generally improving its nature to make it more suitable for the purposes for which it is to be used.

In certain cases the material if treated in a bath containing a caustic alkali may while still containing a percentage of the alkali, be immediately subjected to the action of carbon bisulphide or of an emulsion formed by a mixture of carbon bisulphide with either a caustic alkali or silicate of soda solution.

The invention also comprises the subsequent treatment of the material, if it be a fiber, to beating and softening actions after it has been allowed to absorb a quantity of an oil bearing agent, or if it be a fabric to beating, rubbing, glazing and pressing, and also to binding and softening actions, the binding medium aiding to produce a non-frayable material, or to an action to produce a woolly surfaced cloth. Or, from the fiber to produce a silky wool like substance which possesses absorbent properties to fluids and which is also capable of being combed or carded, and then spun; or to treat the fiber so that it may be formed into a fabric and then the fabric subjected

to the treatment designed for a fabric, as beforementioned.

It has been found that a vegetable fibrous cloth composed, for instance, of coir, hemp, jute, or phormium tenax fiber or tow (phormium fiber or tow in particular) is greatly improved by having its surfaces pounded, squeezed and rubbed simultaneously with it being slowly drawn through heated, or boiling, water which has the addition of an acid or an alkali and an emulsified or soluble oil made thereto. Should it be intended to guard against shrinkage, the cloth is kept in a stretched condition while being drawn through the said bath. The noncellulose and gummy matters are thereby dissolved out of the cloth, while the alkali exercises a marked beneficial action on certain vegetable fibrous materials. Treatment with carbon bisulphide, as explained, also in certain instances improves the vegetable fibrous material. Silicate of soda has been found to be a suitable alkali, as has also caustic soda, but sulphides and sulphites or carbonates, as ammonium, sodium, or potassium carbonate, or mixtures thereof, may be used.

Similar results follow the treatment in a like manner of the leaf or the native substance containing vegetable fibrous material, and also the fiber itself.

In giving effect to the invention, the said solution is contained within a vat having any approved means for heating the solution to the required temperature, approximately a boiling temperature. The solution is usually made up of equal parts of silicate of soda and caustic soda, but may contain silicate of soda only, or any of the agents of mixtures beforementioned. Situated within the vat are any approved means constructed to provide for the substance being treated, while in a stretched or loose condition, simultaneously with the action of the bath, to a combined squeezing and slight pounding action. These means may comprise series of pairs of fluted and plain rollers along between which the substance is fed. Should the substance being treated be a fabric material a rubbing action should also be imparted to it by using alternately

plain and fluted rollers and causing the upper roller of each pair of plain rollers to rotate at a different speed to the lower. Or, other means known in the art concerned in the manufacture of fabric materials may be employed to effect this part of the process as for instance, a cylinder or drum over the surface of which the fabric is caused to travel and a number of small beaters which fit exactly over this surface and exercise a rapid and continual beating action on the damp material as it travels over the revolving cylinder.

This feeding of the material may be carried out by the employment of an endless travelling band, or bands, and in causing such band or bands to pass between the rollers of each pair, or underneath the said beaters. If the material is a cloth it may be attached at its feeding end to the said band. The pairs of rollers may be alternately plain and fluted, and in some instances cogged, in each pair one bearing upon the other with a springy pressure. If the substance being treated is in the form of fiber, it may be guided from one pair of rollers to another, by passing along a false bottom or trays disposed horizontally between the rollers at about the level of the contact between the pairs.

In certain cases the treatment of the material in this manner may be carried out in enclosed vats and under vacuum, or reduced pressure.

After this treatment, the material is well washed and squeezed in the vat, first with clear water, then with slightly acidulated or alkaline water, according to whether an alkali or an acid has been added to the original hot solution, and then in clear water again. It may then if desired be allowed to absorb a quantity of an oil bearing material and is dried.

If the material be native substances containing vegetable fiber, it will then be subjected to scutching to separate out the fiber. This fiber, and also the treated fiber, if it is fiber that has been treated, may be bleached if required, but in any case is mildly beaten or softened by approved means such as beaters or fluted rollers, and then combed or teased or well blown in any of the methods adopted in similar circumstances, to remove from it, fluffy matter, short fibers, dust and other foreign substances.

If the material be a heavy fabric, such as sacking, the aforesaid treatment with carbon bisulphide is omitted, and the material after washing from the alkali treatment and having the excess liquid expressed therefrom, is, while still damp, finally beaten or pounded as by the action of beaters or fluted rollers or in a similar manner to the beetling of linen, and may then be calendered in the usual manner, or compressed between heavy

warm rollers, if necessary being sized prior to this. The fabric may be on a conveying surface while being beaten or pounded.

After the softening or pounding action has been applied to it, the fabric may be sized and partly dried with hot air and by passing over heated rollers. It is then passed between smooth warm rubbing surfaces and has every inch of its surface well rubbed by rapidly spinning discs or revolving cylinders which are pressed tightly on it, or any smooth warm surface may be rapidly rubbed against it so as to semi-glaze the fabric and give a paper like surface to it and at the same time aid in striking out the material and filling up any open patches or spots showing through loose weaving, although the aforesaid pounding action has a similar effect. If not then dry, the fabric is then completely dried.

The treated dampened cloth, if not subjected to the sizing and glazing operations, is subjected to pounding and softening operations, after which, for its final treatment it is passed between several pairs of heavy heated rollers and then ironed or calendered by known processes employed in this operation.

Fiber that has been treated to the before-mentioned process for the removal of the non-cellulose material and for the cleansing of the fiber, has various uses such as engineer's waste, or for use when teased or combed or finely carded, as a felt or kapok substance, but principally it is adapted for use in the manufacture of a yarn for weaving into a cloth, by the mixture with it of a proportion of untreated vegetable fibrous matter, the combination then being combed, carded and spun into a yarn in the usual way. The treated fiber may, however, be woven into a cloth by itself, with or without the aid of a binding agent as herein-after explained.

The yarns thus made may be woven and to give greater strength to the cloth, each alternate thread either of the warp or the weft, or all or one of the other may be composed of the natural vegetable fiber only.

The binding agent for the treatment of the yarn, either of the natural untreated fiber or the treated fiber, when such is used, may be formed of a cellulose, guttapercha, rubber, casein, starch, dextrose, or oxidized oil solution applied to the material so as to dampen it during, or just before or after the spinning operation, or the raw material is so dampened at any time before being spun. The weaving of the cloth may be effected while the yarn is damp with the binding agent, or the cloth while being woven, may have a similar solution sprayed on to it. The binding agent may be afterwards dissolved out of the material and the fabric submitted to heavy pressure. It may also

be subjected to the action of an alkali and carbon bisulphide, and then rinsed and subjected to pressure once more.

The cloth thus made is treated for the removal of unbound surface fiber, is bleached and pounded if necessary, and ironed or rolled under pressure. But where a light loosely woven fabric, or a fabric of open mesh, as a net, has been made, its surface is given a coating of either dextrose, starch, glue, casein, cellulose, guttapercha, rubber or an oxidized oil, in any convenient manner, as by immersion in the solution if the said agent is a liquid, or by applying it to its surfaces, if the agent be in the form of a dough or paste constituted by its mixture with a suitable thickening medium. These agents are applied as many times as are necessary and the fabric is allowed to dry after each application. In the final treatment of a material thus made, the pounding action is not required, but the rolling or ironing action under pressure may be effected after the material is dry.

The bleaching process, either of the fiber, or of the cloth or fabric made therefrom, may be effected by any approved method, as by immersion in baths of chlorides or hypochlorites, or sodium peroxide or hydrogen peroxide solutions, or potassium permanganate followed by sodium bisulphite baths. It has been found however that the following method of treatment is a convenient and an economical method. Chemically treated air is allowed to act on the fibrous material (which may be damp with weak acid or water only, or it may be dry) in the presence of electric rays. For instance, air, either hot or cold and dry or moist, is charged with oxygen ozone or chlorine or a suitable mixture. This air is contained within a bleaching chamber, the correct percentage of active content in it being maintained throughout, and the chamber is so constructed that means may be applied to keep the internal atmosphere either warm or damp, or both, during the bleaching operation. Ultra-violet rays or rays of a similar nature, obtained by electrical means are simultaneously employed with the chemically charged air by releasing them within the chamber.

The apparatus employed in carrying out the several steps of the process hereinbefore described, may be varied in its details of construction to provide for capacity of the plant, and may be of any known design or as particularly described herein, by means of which the desired actions may be imparted to the fabric or fiber, or native fibrous containing matter.

I claim:—

1. A process for the treatment of fabrics of vegetable fibrous composition, comprising an initial treatment of the said fabric while being squeezed and rubbed and also

lightly pounded, to a bath of approximately boiling solution of silicate of soda and water, subsequently washing the fabric in clear hot water, then squeezing and partly drying the same and allowing it to absorb an oil bearing substance and while still damp therewith subjecting it to a gentle pounding action, and finally treating the fabric to the action of a size or starch solution and while still damp therewith to the action of warm rapidly revolving rollers, or cylinders, through or over which it is passed.

2. A process for the treatment of fabrics of vegetable fibrous composition, comprising an initial treatment of the said fabric while being squeezed and rubbed and also lightly pounded, to a bath of approximately boiling solution of silicate of soda and water, subsequently washing the fabric in clear hot water, then squeezing and partly drying the same and allowing it to absorb an oil bearing substance and while still damp therewith subjecting it to a gentle pounding action, and finally treating the fabric while in a damp condition to the action of heavy pressure rollers through which it is passed, followed by a gentle pounding action and then to the action of warm rapidly revolving rollers through or over which it is passed.

3. A process for the treatment of native fiber containing substances, or fibers, or fibrous materials as fabrics, comprising initially treating the material by squeezing, rubbing and gently pounding while drawing it slowly through a bath containing an approximately boiling solution of an alkali with water; and subjecting the material while still containing a percentage of the alkali solution, to the action of carbon bisulphide.

4. A process for the treatment of native fiber containing substances, or fibers, or fibrous materials as fabrics, comprising initially treating the material by squeezing, rubbing and gently pounding while drawing it slowly through a bath containing an approximately boiling solution of an alkali with water; and subjecting the material while still containing a percentage of the alkali solution, to the action of an emulsion formed by a mixture of carbon bisulphide and a caustic alkali.

5. A process for the treatment of native fiber containing substances, or fibers, or fibrous materials as fabrics, comprising initially treating the material by squeezing, rubbing and gently pounding while drawing it slowly through a bath containing an approximately boiling solution of an alkali with water; and subjecting the material while still containing a percentage of the alkali solution, to the action of an emulsion formed by a mixture of carbon bisulphide and a silicate of soda solution.

6. A process for the treatment of native  
fiber containing substances, or fibers, or  
fibrous material as fabrics, comprising sub-  
jecting the materials to an initial treatment  
by being drawn through a bath of a hot  
solution of an alkali with water combined  
with a rubbing and gentle pounding there-  
of, washing in clear water and subsequently  
in acidulated water, then squeezing and  
partly drying and permitting absorption of  
an oil bearing substance by immersion in  
a mixture of an emulsified saponified or  
soluble oil and water, and subjecting the  
matter to pressure to express a percentage  
of such oil bearing substance and while still  
damp, to a gentle pounding action.

In testimony whereof, I affix my signa-  
ture.

ROBERT DOUGLAS COGHILL.

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