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METHOD FOR WEIGHTING TEXTILES

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This invention relates to the treatment of fibrous textile materials, more particularly, textile fabrics or cloth, and it especially relates to the finishing and weighting of such textile materials.

In the treatment of textile fabrics, such as cotton, it is customary to subject the cloth to soap scouring, kier boiling, mercerizing and bleaching operations prior to dyeing or printing. The bleaching and scouring action sometimes causes the cotton to lose 10% to 15%, or even 20%, of the natural gums and oils normally present in the fibres. To regain this weight the cotton has heretofore been treated with various loading or weighting materials including metallic salts, such as magnesium sulphate, calcium chloride, or similar compounds. Sugar has also been used for this purpose. Many objections have been raised to the use of such metallic salts inasmuch as these cause tendering of the goods and in some countries it is forbidden to import textile materials containing them. Sugar is objectionable because it caramelizes during the course of treatment of the goods in the mechanical finishing processes of drying, ironing, steaming, pressing and the like. Moreover, sugar is also liable to be objectionable because it is extremely hygroscopic in steamy atmospheres where it gets sticky.

It is also common practice in the textile industry to incorporate various substances into the textile fibres so as to make them pliable and soft, e. g., oils, fats, glycerine and the like. Ordinary dextrins, thin-boiling starches and similar materials are also used to coat the fabrics but such coating materials produce a hard finish on the goods.

Both of the foregoing treatments are herein referred to generically as "finishing treatments" because they are applied at the last or finishing stage of manufacture of the textile materials.

It is to be observed, however, that there are a number of points of distinction between weighting and the various fulling and softening treatments. For instance, weighting is especially important in finishing textiles made from natural fibrous materials such as cotton, which lose weight during the various processing steps. A fulling and softening treatment might be advantageous however, on any type of textile material which tends to be stiff, including artificial as well as natural materials. In present practice, as will be apparent from the foregoing discussion, the weighting materials are quite different physically and chemically from the softening agents.

The use of starches or substances containing starchy matter in some of the mechanical finishing processes, such as Sanforizing process, has not proven entirely satisfactory, however, due to the fact that the blanket of the machine against which the goods are pressed gets wet because of the sticky hygroscopic nature of the starches and tends to collect considerable accumulations of starch to an objectionable extent, which material is very difficult to remove besides interfering with the satisfactory operation of the machine. This objectionable condition is also true of the electrically heated ironing shoes in the Sanforizing machine and by reason of the hard accumulations of starch sticking to the shoes the cloth is subjected to abrasion and often is caused to tear. It has been previously proposed to use a textile weighting composition consisting of an intimate mixture of urea and starch; however, it is found that the objectionable sticky hygroscopic effect is still present and is accentuated by the highly hygroscopic urea when the combination of urea and starch in an aqueous solution is dried down therefrom.

It is accordingly one of the objects of the present invention to overcome the above difficulties and provide a textile weighting composition which will not be hygroscopic when on the cloth at ordinary atmospheric conditions, and also a material which may have either an alkaline or a neutral or very weak acid characteristic when used in an aqueous solution.

Another object of the invention is to provide a textile weighting composition which will not tender the goods when used in large amounts as occurs with metallic salts hitherto employed in the art which tend to produce acid when heated on the cloth.

Another object of the invention is to provide a textile weighting composition which will not cloud or dull the colors of designs on the goods.

Another object of the invention is to provide a textile weighting composition which will weight the goods without destroying their softness or become discolored when it is applied to the fabric, especially where heat is used for drying of the goods.

Another object of the invention is to provide a weighting material which will largely volatilize when the fabric is burned and therefore will provide a fabric which is low in the ash which may occur.

A further object of the invention is to provide goods which after treatment, are more fire resistant than similar goods weighted with the usual textile weighting materials, and to reduce the inflammability of the material by raising the ignition temperature of the goods.

A further object of the invention is to provide an unctuous type of textile weighting material which will render the goods rather pliable and soft so that they will have a nice feel and handle.

In accordance with my invention I have discovered that a non-hygroscopic compound or one of low hygroscopicity which is adapted for use as a weighting composition and possesses proper-

ties of existing in a dry state when on the cloth at ordinary atmospheric conditions can be made by the mixture of two strongly hygroscopic substances with or without additions of other chemical materials to the resulting compound for imparting various other desired properties thereto in which the mixture essentially comprises a soluble, hygroscopic, crystalline, nitrogenous substance, preferable urea, intimately associated with a substance capable of exerting a modifying action on the urea to an extent sufficient to suppress or render impotent the normal hygroscopic properties of the urea at ordinary atmospheric conditions. For this modifying agent I preferably employ a solid weak acid or a salt substance capable of reducing the hygroscopic qualities of urea when dried down from mixed solutions of the same, such as boric acid, gluconic acid, lactone, tartaric acid, citric acid, or magnesium salts, specifically magnesium sulphate, or calcium chloride. In addition, I may add, for the purposes of imparting an unctuous quality to the composition, a solid weak acid in a dry finely divided condition such as boric acid or a fatty acid such as stearic acid or some other fatty acid which is solid at ordinary temperatures. Furthermore, in order to promote reaction of the desirable pH (5–10) in the bath when the compound in used for the treatment of textiles, I may add, in some cases, a conditioning agent comprising an alkali metal phosphate, such as tetra-sodium pyrophosphate or sodium metaphosphate; and the following gives a more detailed description of the present embodiments of this invention, illustrating the preferred means by which these advantageous results may be accomplished.

As a specific example of one composition for use in weighting textiles, I may utilize these ingredients in the following proportions:

	Per cent by weight
Urea	85
Boric acid	11
Tetra-sodium-pyrophosphate	2
Stearic acid	2

As another example, I may use magnesium sulphate in lieu of boric acid and sodium metaphosphate instead of the tetra-sodium-pyrophosphate in the above formula and in the same quantity thereof, the proportions of the other ingredients therein set forth remaining the same.

I have found that the urea should be present in amounts not less than 50% nor more than 90% of the total weight of the composition. The urea is the chief component of the weighting material and although the urea is more expensive at present than are many of the conventional textile weighting materials on the market, such as, for example, dextrines, magnesium sulphate or sugar, it is nevertheless more desirable even at its greater expense because goods treated with urea will be properly weighted without becoming discolored or clouded. I use with this urea, boric acid because the boric acid is an unctuous type of material and provides a smooth or slippery tendency in the material and will not stick to the electric ironing shoes or the cushioning blankets in a Sanforizing finishing unit. The presence of the boric acid with the urea, possibly in a combined relation when on the fabric, prevents to a great extent a high hygroscopicity of the dried compound. The tetra-sodium-pyrophosphate constituent of the compound acts as a buffer and assures the maintainance of the pH value of the compound on the correct side of alkalinity. The above first specific example gives a pH of 8.3. The fatty acid is employed to increase the unctuous property of the material, making it slippery and does not tend to increase the hygroscopic effect of sogginess to a material treated with the above ingredients.

Another property that this mixture of ingredients has is that, when mixed with cold water, the compositions will dissolve readily and it is not necessary that any heat be applied in order that the materials may be worked.

If desired, starch or modified starches, or dextrines, may be incorporated by a customer as an added ingredient to this mixture to impart a certain degree of stiffness thereto, and this may be done since there is no chemical combination of the starch with the compound ingredients of urea, boric acid, alkali-metal phosphate, and the fatty acid, and as the starch is relatively non-hygroscopic, the treated cloth does not act sticky as is true when urea and starch alone are used. If the starch is present in a very small amount, the stiffening effect of the starch will be apparent without its taking up too great moisture and as the urea in the cloth, after treatment by this composition, will be in a combined form as urea borate, I have, therefore, provided a new textile weighting compound free from a hygroscopic effect on the starch if any is used. The starch does not combine with urea.

Prior investigations have shown that urea and magnesium or calcium salts, which are both very hygroscopic, will when mixed in solution and dried down give double salts which are relatively non-hygroscopic. (See Journal of American Chemical Society, vol. 59, pages 570–1, 1937; vol. 58 page 1975, 1936.) I have foreseen the desirability of using these compositions for textile weighting, the advantages of which, besides their reduced hygroscopicity, are their very low cost, the production of clear glassy transparent deposits, and an elimination of the embrittling and tendering actions on the goods which frequently occurs when using magnesium or calcium salts alone due to tendency of these salts to hydrolyze to basic salts and liberate free acid under the action of the steam formed during drying of the textiles. In mixtures with urea which under the same conditions of heat and steam in drying liberates some ammonia, tendering is eliminated thus making the cloth finishers' operations free of worry.

As another specific example of my invention, I may use the composition containing the following materials within the proportions specified:

	Percent by weight
Urea	50 to 70
Magnesium sulphate	50 to 30

On drying this mixture on cloth, I believe it deposits thereon double salts such as

$MgSO_4.4[CO(NH_2)]_2$
$MgSO_4.5CO(NH_2)_2.2H_2O$
$MgSO_4.6CO(NH_2)_2.2H_2O$
$Mg(NO_3)_24CONH_2.2H_2O$
$MgSO_4.7H_2O$
$MgSO_4.CO(NH_2)_2.3H_2O$

or

$MgSO_4.CO(NH_2)_2$

Obviously other relative proportions of these substances may be used and I may add boric acid to secure an unctuous quality or sodium metaphosphate to increase alkalinity. Calcium

chloride may be used in place of Epsom salts in which case, it forms the double salt

$$CaCl_2.4CO(NH_2)_2$$

While the boric acid employed tends to reduce the hygroscopic effect of the urea, it is found that if Epsom salt (magnesium sulphate) which is often used as a weighting material in the usual treatment of textiles and which is exceedingly hygroscopic, is combined with urea which also is hygroscopic, that the resulting chemical combination of the magnesium sulphate and urea is non-hygroscopic. The relative proportions in this combination of magnesium sulphate and the urea may be varied widely, the urea being present in the above proportions of 50 to 70. This product also overcomes the acidity as it has an alkaline reaction and will serve as a very effective weighting agent and by the overcoming of the hygroscopicity of the magnesium sulphate a better weighting compound is formed and by use of the urea as a predominant part of the compound the other desirable effects from the use of the urea are had, such as above enumerated.

Having thus described several illustrative embodiments of my invention and the best mode known to me for carrying out my method, I desire it to be understood that although specific terms are employed, they are used in a generic and descriptive sense and not for the purpose of limitation, the scope of the invention being defined and limited only by the terms of the appended claims.

I claim:

1. In the weighting of textiles, the process of treating textile materials with a compound having the general formula: $MgSO_4.R$ in which R represents a member of the urea group consisting of

$4(CO(NH_2))_2$
$5CO(NH_2)_2.2H_2O$
$6CO(NH_2)_2.2H_2O$
$CO(NH_2)_2.3H_2O$

and

$CO(NH_2)_2$

which comprises saturating the textile material in a mixture consisting of magnesium sulphate and urea in mixed aqueous solutions of the same, said urea being in a quantity of from 50% to 90% of the weight of the total mixture, and then drying the treated textile material to obtain thereon a double salt formation of the resulting compound of this mixture corresponding to the general formula above-named and in solid form.

2. In the weighting of textiles, the process of treating textile materials with a compound having the general formula: X.R in which X represents a member selected from the group consisting of magnesium sulfate, $MgSO_4$ and calcium chloride, $CaCl_2$ and in which R represents a member of the urea group consisting of

$4(CO(NH_2))_2$
$5CO(NH_2)_2.2H_2O$
$6CO(NH_2)_2.2H_2O$
$CO(NH_2)_2.3H_2O$

and

$CO(NH_2)_2$

which comprises saturating the textile material in a mixture consisting of said compound and urea in mixed aqueous solutions of the same, said urea being in a quantity of from 50% to 90% of the weight of the total mixture, and then drying the treated textile material to obtain thereon a double salt formation of the resulting compound of this mixture corresponding to the general formula above-named and in solid form.

3. In the weighting of textiles, the process of treating textile materials with a compound having the general formula: $CaCl_2.R$ in which R represents a member of the urea group consisting of

$4(CO(NH_2))_2$
$5CO(NH_2)_2.2H_2O$
$6CO(NH_2)_2.2H_2O$
$CO(NH_2)_2.3H_2O$

and

$CO(NH_2)_2$

which comprises saturating the textile material in a mixture consisting of calcium chloride in mixed aqueous solutions of the same, said urea being in a quantity of from 50% to 90% of the weight of the total mixture, and then drying the treated textile material to obtain thereon a double salt formation of the resulting compound of his mixture corresponding to the general formula above-named and in solid form.

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