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MOTHPROOFING COMPOSITION.

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This invention relates to moth proofing compositions containing a soluble fluoride or a soluble silico-fluoride of the alkali metals or of the metals zinc and aluminum or mixtures of such fluoride or silico-fluoride salts, adapted to be readily and easily absorbed by woolen fabrics, yarns, furs and the like, when applied thereto, and capable of rendering such goods which have been treated with such composition, practically speaking, immune to the attacks of the moth larvæ without, however, exhibiting any of the detrimental effects of the goods which have been subjected to the well known processes wherein such fluorides are applied in the presence of a large amount of acid.

It has heretofore been proposed to protect such articles from the attack of moth larvæ by employing sodium fluoride or sodium silico-fluoride, but, in all of the prior processes, so far as I am aware, the impregnation of the fabric has been accomplished in the presence of a relatively large amount of acid. Particularly in the early stages of this art sulphuric acid was used in relatively large quantities and at fairly high concentrations. This acid treatment ultimately affected the fabric, decreasing its tensile strength and durability. Later in the art milder acids were substituted which minimized the deleterious effect of the stronger acids previously used, but, nevertheless, sufficient acid was present to appreciably impair the strength and durability of the fabric.

With these considerations in mind, one of the objects of this invention is to provide an effective moth proofing treatment for finished fabrics, knitted goods, etc. For example, the present invention is particularly well suited to household use and to the treatment of finished fabrics after they leave the mill and either before or after making such fabrics into clothing. Being intended for such use, it widely differs from prior moth proofing treatments and particularly those practised in conjunction with dyeing processes or during the manufacture of fabrics. In these latter cases, liberal amounts of either strong or relatively weak acids have been employed and the goods thoroughly washed or rinsed or subjected to some subsequent treatment. However, when treating finished goods, garments, etc., thorough washing or rinsing is not practical or feasible and thus the treatment of this invention is constituted to properly moth proof without requiring subsequent washing and without impairing the fibers of the treated woolens.

Another object of the invention is to obtain a moth proofing treatment which will be permanent, i. e., will not be lost through wear, usage, cleaning, wetting by rain, etc.

A further object of the invention is a moth proofing composition which may be efficiently and properly applied to woolens by spraying or sponging them with the composition. I have found that solutions of fluorides in combination with other chemicals, having moth proofing properties, do not easily penetrate into fabrics and when applied in pure form are apt to roll off or evaporate without impregnating the fabrics. The production of a practical moth proofing solution involves therefore the problem of obtaining a composition which will effectually wet the fabric and be dissipated by capillary attraction throughout the fabric in order that a uniform moth proofing may be obtained and to preclude, furthermore, spotting or marking of delicate fabrics. Even if fabrics be immersed in a moth proofing solution, the wetting of the fabric or thorough impregnation thereof by the moth proofing solution does not always readily follow; but, furthermore, as it is not feasible to immerse finished articles, clothing, etc., in a moth proofing solution, the solution must, to be practical, be so constituted, that it will of itself effect efficient wetting of the fabric. It is an object of this invention, therefore, to provide a moth proofing composition which will accomplish this result.

It is known that solutions of fluorides and silico-fluorides are effective in making woolen fabrics immune to the attacks of moth larvæ. My investigations have shown, however, that if sodium sulphate or other soluble sulphate is added to a solution of sodium fluoride or sodium silico-fluoride, woolens treated therewith take up or absorb the solution much more readily and with greater rapidity than in cases where solutions of sodium fluoride or sodium silico-fluoride are used alone or in admixture. Moreover, it is

found that when a soluble sulphate is employed the moth proofing effect is increased.

While it is possible to moth proof woolens by impregnating them with sodium fluoride or sodium silico-fluoride, either with or without the addition of sodium sulphate or other soluble sulphate, my research showed that the best results are obtained when a relatively weak acid, in well defined predetermined quantities, is employed in conjunction with these salts: For example: when solutions of a soluble fluoride or a soluble silico-fluoride of the alkali metals, and more especially solutions of sodium fluoride and sodium silico-fluoride are to be used, maximum efficiency with respect to ease of wetting, permanency of moth proofing and lack of deteriorating effect, may be obtained by adding to these solutions a small quantity of an organic acid, such as oxalic, tartaric, formic, citric or acetic acids.

I have found that certain small amounts of these acids materially increase the wetting power of the moth proofing composition for woolen fabrics and appreciably increase the permanency of the moth proofing effect.

Of all the salt solutions enumerated thus far, it was found that a solution containing sodium fluoride in a concentration of approximately one percent, Glauber's salt—three tenths of one percent to which less than one tenth of one percent of an organic acid (e. g., oxalic acid or citric acid), is added, gives more satisfactory results than a solution of sodium fluoride alone, or a solution of sodium fluoride to which Glauber's salt has been added, when these are used as the impregnating and moth proofing agents in the treatment of woolens or woolen cloths. In lieu of oxalic acid or citric acid, such acids as formic, tartaric or acetic acids may be used. In all cases the acid strength is less than one tenth of one percent and in practice I usually employ about .03% of acid.

A solution containing sodium silico-fluoride of a strength of approximately one-half of one percent, alum—three tenths of one percent, to which approximately 1/100 to 3/100 of one percent of oxalic acid is added, can also be used with very satisfactory results in place of a sodium fluoride acid solution just mentioned above.

The exact amounts of acids to be added will vary for different woolens and woolen fabrics; but for general purposes the acid strengths which I have referred to will be found satisfactory for general use.

It will be noted that the amounts of acid referred to are relatively small, and that these proportions are taken advisedly since research and experimentation have clearly demonstrated that in order to maintain the durability of the treated fabric, the acidity of such fabric must be maintained at a minimum. This minimum amount of acid is that amount which will produce the desired result without effecting an appreciable increase in the acidity of the resulting moth proofed product, whilst materially improving the wetting power and the permanency toward the rinsing and washing of the moth proofing effect.

This acid concentration which shows a minimum of deleterious effects with a great increase in the desirable properties, I term "the optimum amount of acid". This optimum is not identical for all woolens, but varies within a small range and is found within the limits of acidity as expressed above.

The proportions which I have referred to give a very clear understanding of the percent of acid used in this invention in contradistinction to the very liberal use of acids as heretofore carried on in prior art processes where relatively large quantities of acids were employed with a view to making sure that sufficient acid was included, and without due regard to the detrimental effects of a pronouncedly acid reaction in the resulting product.

Any one of these compositions in which the fluoride or silico-fluoride salt is the essential ingredient, is packaged and sold to the trade in such form that it can be applied to woolen goods in the raw or finished state by immersion, spraying or the like.

It is to be noted that cloth treated with my moth proofing composition does not have to be rinsed or washed as is the case in the prior processes wherein fluorides are applied in a strongly acidic solution.

By the term "soluble fluoride", I mean to include fluorides of the alkali metals, such as sodium, potassium, lithium and also the metals zinc and aluminum.

By the term "soluble silico-fluoride", I mean to include the silico-fluorides of the alkali metals, and zinc and aluminum.

The term "a metal sulphate" is intended to include the alkali metal sulphates as well as zinc and aluminum sulphates, and potash alum.

It is of commercial practical importance that when using the composition including silico-fluorides, soluble sulphates and the small quantity of acid as described, it will not act on glass; and this renders it possible to package the composition for household use in bottles in which it may be kept indefinitely and ready for use.

Having thus fully described the invention, what I claim as new and desire to secure by Letters Patent is:

1. A moth proofing composition containing therein a soluble fluoride, a metal sulfate, and an organic acid in a quantity of less than .1%.

2. A moth proofing composition contain-

ing therein a soluble fluoride, approximately 1%, a metal sulfate, and an organic acid in a quantity of less than .1%.

3. A moth proofing composition containing therein a soluble fluoride, approximately .3% of a metal sulfate, and an organic acid in a quantity of less than .1%.

4. A moth proofing composition containing therein a soluble fluoride approximately 1%, approximately .3% of a metal sulfate, and an organic acid in a quantity of less than .1%.

5. A moth proofing composition containing therein a soluble fluoride, a metal sulfate, and citric acid in a quantity of less than .1%.

6. A moth proofing solution containing a soluble silico fluoride, alum, and an organic acid in a quantity of less than .1%

7. A moth proofing solution containing a soluble silico fluoride, a suitable metallic salt, and less than .1% of an organic acid.

8. A moth proofing solution containing a soluble silico fluoride, a suitable aluminum salt, and less than .1% of an organic acid.

9. A moth proofing solution containing a soluble silico fluoride of approximately .5%, alum, and an organic acid in a quantity of less than .1%.

10. A moth proofing solution containing therein a soluble silico fluoride approximately .5%, alum approximately .3%, and an organic acid in a quantity of less than .1%.

11. A moth proofing solution containing therein a soluble silico fluoride, alum, and an organic acid in a quantity of less than .05%.

12. A moth proofing solution containing therein a sodium silico fluoride, alum, and an organic acid in a quantity of less than .1%.

13. A moth proofing solution containing therein sodium silico fluoride, approximately .5%, alum, and an organic acid in a quantity of less than .05%.

14. A moth proofing solution containing therein sodium silico fluoride approximately .5%, alum approximately .3%, and an organic acid in a quantitl of less than .05%.

15. A moth proofing solution containing therein sodium silico fluoride, alum, and an organic acid in a quantity from .01% to .03%.

16. A moth proofing solution containing therein sodium silico fluoride, alum, and oxalic acid in a quantity from .01% to .03%.

17. A moth proofing composition embodying a chemical capable of rendering woolens immune from the attacks of moth larvæ and in solution therewith an acid in a quantity less than .1%.

In testimony whereof I have signed the foregoing specification.

MICHAEL G. MINAEFF.