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NITRATED FABRIC FOR LACE MAKING AND METHOD FOR MAKING SAME

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This invention relates to nitrated cellulose fabrics which are adapted to be used as a backing or ground fabric in the process of making lace and like articles, and to a method and means for manufacturing such nitrated fabrics.

Heretofore such backing or ground material has been prepared by nitrating cheap cotton fabrics, such as cheese cloth, in sulphuric-nitric acid baths to render the same completely soluble in caustic soda. Such nitrated fabrics have had a comparatively high nitrogen content, varying from about 8% to about 12%, since with a nitrogen content lower than 8% the fabric could not be completely dissolved in caustic soda so as to free the lace therefrom. On the other hand the large percentage of nitrogen has rendered the backing material highly inflammable and otherwise hazardous to use.

It has been proposed to load the fabric in any of several various manners with a fire-proofing material. Such procedure and the resulting fabric, however, are subject to several drawbacks: the method involves the use of relatively expensive substances and therefore renders the nitrated fire-proofed fabric relatively costly; a fabric fire-proofed in this manner is rough and stiff and thus extremely difficult to stitch upon; the treated fabric is appreciably more hygroscopic than untreated cotton fabrics and the increased absorption of moisture by such fire-proofed fabric has resulted in causing the needles of the embroidery machine and other parts of such machinery to rust.

Accordingly, it is the principal object of my invention to overcome these and other disadvantages and to provide a novel method and means whereby a highly improved backing or ground will be obtained at a relatively low cost.

Another object of my invention is to provide a nitrated fabric of the character described which shall to a high degree be less inflammable than the cellulose fabric from which it was prepared, which shall retain its original tensile strength, which shall have a percentage by weight of nitrogen considerably below that presently employed, and yet completely dissolve in relatively low concentrations of caustic soda or in solutions of an even weaker alkaline compound.

Other objects of my invention will in part be obvious and in part hereinafter pointed out.

Describing my invention in general terms, I have found that a strong non-inflammable and alkaline-soluble cellulose fabric containing a percentage by weight of nitrogen considerably below the minimum heretofore required to render same completely soluble in a caustic or alkaline solution, may be provided by nitrating such fabric in a bath containing a major percentage of phosphoric acid.

Prior to nitration the fabric may be dried for about five minutes at about 120° F. in an oven, in order to remove substantially all the moisture therefrom. I then submerge the fabric in a nitrating bath prepared in accordance with my invention. Said bath should comprise a mixture of nitric and phosphoric acids wherein the phosphoric acid consists of a major percentage by volume. I have found that baths in which the percentage by volume of nitric acid ranges from about 5% to 30% and that of the phosphoric acid from 70% to 95% will give satisfactory results. If desired, to reduce cost, a small percentage of the phosphoric acid may be replaced by sulphuric acid in amounts varying from about 0.5% to 8% of the total bath composition by volume.

The time that the fabric is left submerged in the nitrating bath is inversely proportional to the temperature at which the bath is maintained. For example, at temperatures around 40° F. a period of submersion of about thirty-six hours is required. At 60° F. eight to twelve hours would be sufficient. From about 100° F. to 120° F. the submersion period is about an hour, while at temperatures at or slightly over 120° F. one-half hour will suffice.

After the fabric is removed from the nitrating bath it is washed out with water to remove most of the acid. The fabric is then washed in a weak soltuion of an alkaline substance, such as sodium carbonate or tri-sodium phosphate, to neutralize the remaining acid, and finally the residual alkaline substance is washed out with water.

By way of illustration and without limiting myself to this particular form of my invention, the following illustrates a bath composition which will give satisfactory results:

	Parts by volume
Nitric acid-concentration about 97%	25
Phosphoric acid-concentration about 75%	75

A fabric prepared by submersion in the above bath, at a temperature of about 100° F. for one hour, and subsequently washed out in the manner above described, will have about 0.5% by weight of nitrogen. This percentage may be varied, without departing from the spirit of my invention, between about 0.4% and 1% by altering the nitrating bath composition within the ranges above stated and by manipulating the tempera-

ture and time controls of the submergence period.

A nitrated fabric prepared in the manner above described is soft and can hardly be distinguished by touch from un-nitrated cloth. Also, the treated fabric will have the same or a slightly greater tensile strength than the original cloth and about the same degree of hygroscopicity. The treated fabric is non-inflammable and upon the application of high temperatures will merely char. The nitrated fabric can be completely dissolved in relatively low concentrations of caustic soda. Thus, for example, a fabric containing 0.5% of nitrogen can be completely dissolved in caustic soda solution of as low as 3° Baumé. This should be contrasted with the extremely strong caustic concentrations heretofore employed where high degrees of nitration were obtained in a nitrating bath principally comprising nitric and sulphuric acids.

I may also carry out the step of dissolving my improved nitrated fabric in solutions having a lower pH value than caustic soda, as for example aqueous solutions of sodium carbonate.

It will thus be seen that there is provided a product and a method and means for manufacturing the same in which the several objects of this invention are achieved, and which is well adapted to meet the conditions of practical use.

As various possible embodiments might be made of the above invention, and as various changes might be made in the embodiments above set forth, it is to be understood that all matter herein set forth is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. An alkaline-soluble, non-inflammable, nitrated, cellulose backing fabric for use in making lace and like articles, said fabric containing from about 0.4% to 1% by weight of nitrogen, said fabric having been rendered alkaline-soluble and non-inflammable by nitration in nitric acid in the presence of phosphoric acid.

2. An alkaline-soluble, non-inflammable, nitrated, cellulose backing fabric for use in making lace and like articles, said fabric containing about 0.5% by weight of nitrogen, said fabric having been rendered alkaline-soluble and non-inflammable by nitration in nitric acid in the presence of phosphoric acid.

3. In the process of nitrating and fire-proofing cellulose fabrics to provide a backing fabric for use in making lace and like articles that improvement which comprises the step of imparting from about 0.4% to 1% by weight of nitrogen to the fabric by treatment with nitric acid in the presence of phosphoric acid.

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