Patented Feb. 11, 1941 2,231,458

UNITED STATES PATENT OFFICE

2,231,458

SIZED TEXTILE AND METHOD OF SIZING TEXTILES

William W. Trowell, Wilmington, Del., assignor to Hercules Powder Company, Wilmington, Del., a corporation of Delaware

No Drawing. Application March 18, 1939, Serial No. 262,634

6 Claims. (Cl. 91—68)

This invention relates to an improved textile material, more particularly to a textile characterized by a soft finish, and to a method of sizing or finishing textiles.

Textile products are usually finished or sized by treatment with various compositions to add weight and to impart richness and attractiveness to the touch. What is desired is softness, fullness and a well bodied handle unaccompanied by harshness and boardiness. In the past, starch, glucose, glycerine, sulphonated oils, sulphonated tallow, waxes, cellulose derivatives, etc. have been used to finish textiles without, however, obtaining a completely satisfactory finish. Compositions imparting fullness unaccompanied by harshness and compositions used as softeners have had various disadvantages such as discoloring upon being heated by driers and ironing devices or upon storage, becoming rancid, dusting, clouding colors, causing the textile to become damp and soggy or sticky because of their hygroscopicity, or being attractive to insects and lower organisms.

It is an object of this invention to provide textile materials having a soft finish; also products having a finish which is soft, full, well-bodied, colorless, stable, resistant to scorching, non-hygroscopic, and unpalatable to insects and lower organisms. It is a further object to provide a method of producing such sizes or finishes in textiles.

Now in accordance with this invention, I accomplish these objects by treating textiles with a solution containing nitro-isobutane-triol and drying the treated material. For example, the textile is padded through a solution of the nitro-isobutane-triol in water, squeezed to remove excess solution, and dried. It may be ironed or calendered, if desired.

The textile materials in accordance with this invention are characterized by their soft finish. A soft, full handle, rich and attractive to the touch, is readily obtained. The finish adds weight to the textile, is colorless, does not scorch readily in drying, does not dust or cloud colors, does not become rancid or attract insects, and does not become soggy or sticky in a humid atmosphere.

The compound, nitro-isobutane-triol, which I utilize in finishing or sizing textiles, is a white crystalline solid readily soluble in cold water and very soluble in warm water. The melting point of the pure substance is 335–340 degrees F. but in general the material will have a melting point in the range from 320 to 340 degrees F. However, the method according to this invention is not limited to the use of material in this range since less pure material may be utilized, if desired. The nitro-isobutane-triol may be prepared by condensing formaldehyde with nitromethane according to methods well known to the art. Nitro-isobutane-triol is believed to have the chemical structure of a derivative of isobutane in which each of the three primary carbon atoms carries an hydroxyl group and the tertiary central carbon atom carries a nitro group.

In accordance with this invention, desirable soft finishes are imparted to textiles, such as textile fabrics, by the simple process of treating the textiles with a solution, for example in water, of nitro-isobutane-triol and drying them. Preferably the solution is neutral or nearly neutral. For example, a fabric is padded through the solution and the excess solution removed by squeeze rolls. The treated material is then dried, for example, on the usual drying cans or by heated air. Usually it will then be ironed or calendered to impart a smooth finish.

The finish obtained will depend upon the quantity of nitro-isobutane-triol in the textile which in turn will depend upon the concentration in the treating solution, assuming the action of squeeze rolls to be constant. Less than 0.05% nitro-isobutane-triol in the textile, based on the weight of the untreated material will have little effect. In general, about 0.5% to about 1% nitro-isobutane-triol in the textile, based on the weight of the untreated material, imparts a very soft finish. Such a quantity is readily applied to the textile by dilute solutions such as, for example, of about 0.5% or 1% concentration. Raising the quantity of nitro-isobutane-triol, for example, to the range of about 2% to about 5%, based on the untreated textile, causes a soft, full finish, with much body and moderate stiffness to be developed. Such a quantity is readily applied to the textile by solutions of about 3% to about 6%. While for most textiles, no more than about 10% nitro-isobutane-triol, based on the weight of the untreated material, will be applied, in special cases of extreme sizing as much as about 25% may be used. For example, by treating a cotton print cloth with a 50% solution of nitro-isobutane-triol in water, and drying the cloth, a very full bodied finish with a somewhat waxy feel and a fairly high luster capable of being brought up to a glazed finish by ironing, is obtained.

By the term, "textile," or "textile material" used herein and in the appended claims, I mean goods manufactured by weaving, such as cotton, silk, woolen, linen, rayon, etc. cloth; and also material

capable of being woven, such as cotton, silk, woolen, linen, rayon, hemp, etc. yarns. The description of the present invention given hereinbefore is considered to refer not only to textile fabrics but also to be equally applicable to textile yarns.

Yarns, especially warp yarns, are sized to prepare them for weaving. Improved behavior in weaving so as to require less attention by the weaver and to produce better cloth, is desired. Starch, gums, gelatine, and so forth are used, but they tend to embrittle the yarns. Softeners heretofore used have the disadvantages of hygroscopicity, tendency to discolor in drying, etc. as hereinbefore mentioned. By sizing with nitro-isobutane-triol, preferably as a softener in combination with cheap sizes such as starch, increase in strength as much as 30% can be obtained and protection against abrasion, breakage, and loss in weight is imparted to the yarns. Flexibility is obtained. Dusting out of the starch, when starch is used, is prevented. The fiber ends are smoothed out so that they lie parallel to the yarn. Yarns sized, for example, with a combination of nitro-isobutane-triol and starch, have the stiffness and protection of a starch size without brittleness and without the various disadvantages hereinbefore mentioned for older softeners.

A yarn may conveniently be sized in preparation for weaving by immersing the yarn in a sizing solution, for example, by means of an immersion roll or bar. The saturated yarn may then be run through squeeze rolls, preferably rolls one of which is lapped with woolen cloth so as to insure saturation and equal distribution of the size by moderate pressure, excess size returning to the sizing bath. The yarn may then be dried by carrying it over heated cylinders, after which it may be separated by rods and expansion reed and wound on warp beams, for example, for weaving.

The method in accordance with this invention includes within its scope the production upon textiles of crush and crease resistant finishes characterized by an attractive softness. No additional softening operation is required. Such finishes are especially valuable when applied to velvets and plushes. In this modification of my invention, a fabric is treated with a solution containing urea and nitro-isobutane-triol. Alternatively the two substances may be applied in separate solutions. The solution or solutions are made slightly alkaline, for example with a small quantity of sodium hydroxide. The treated fabric is then dried at an elevated temperature. The finish has body, softness, and added resilience, that is, a strong tendency to return to its original form upon creasing or crushing, without effect upon the shade and transparency of, for example, a transparent velvet. The same type of finish applied to a viscose rayon fabric reduces to some extent the tendency for slipping to take place in the fabric.

The following examples are given in further illustration of the product and method in accordance with my invention:

Example 1

A bleached cotton print cloth, having a count of 80 warp threads and 80 filling threads per inch and measuring about 4 yards per pound, is padded through a solution consisting of 10 parts by weight of nitro-isobutane-triol and 2,000 parts by weight of water, the solution being at a temperature of 75 degrees F. The treated cloth is ironed dry at a temperature of 270 degrees F. The finish imparted to the cloth is very soft and smooth. The finished cloth contains between 0.5 and 1% of nitro-isobutane-triol by weight.

Example 2

A 2.85 yards per pound mercerized cotton sheeting is padded through a solution consisting of 100 parts by weight of nitro-isobutane-triol and 2,000 parts by weight of water, the solution being at a temperature of 120 degrees F. The treated cloth is dried at 300 degrees F. The finish imparted to the cloth is very soft and full with much body and moderate stiffness. The finished cloth contains about 2½% nitro-isobutane-triol by weight.

Example 3

A silk back, rayon pile, transparent velvet is padded through a solution at a temperature of 140 degrees F. having the following composition:

	Parts by weight
Water	2,000
Urea	100
Nitro-isobutane-triol	100
Sodium hydroxide	1
Total	2,201

Excess solution is removed by squeezing and the treated velvet dried for 30 minutes in an oven at a temperature of 230 degrees F. A soft, crush-resistant finish with some body is imparted to the velvet. The shade and transparency of the velvet are not impaired.

Example 4

A solution is prepared according to the following composition:

	Parts by weight
Water	1,000
Glacial acetic acid	2
Nitro-isobutane-triol	20
50% resin solution	80
Total	1,102

The 50% resin solution mentioned above is an aqueous ammoniacal solution containing 50% of a resin which is the reaction product of diethylene glycol with the condensation product of a terpene and maleic anhydride. A print cloth of the same character as is used in Example 1 is padded through the solution, squeezed, and oven dried 5 minutes at 248 degrees F. The print cloth increases 6% in weight and possesses a full, mellow moderately stiff finish.

Example 5

A 2.85 yards per pound mercerized cotton sheeting is padded through a bath consisting of 50 parts by weight of nitro-isobutane-triol, 50 parts by weight wheat starch, 75 parts by weight talc and 2,000 parts by weight of water, the solution being at a temperature of 160 degrees F. The treated cloth is dried at 300 degrees F. over drying cans. The finish imparted to the cloth is very full, soft and firm without being "boardy" or harsh in handle. It will be understood that all references to starch in this specification mean the usual prepared form of starch suitable for textile sizing.

Example 6

A sizing bath suitable for sizing cotton warp

yarns is prepared by dissolving 100 pounds of starch, 10 pounds of vegetable gum, and 6 pounds of nitro-isobutane-triol in water to make a mix of 120 gallons. The yarn is sized using this bath in the usual manner.

Example 7

A sizing bath suitable for sizing rayon warp yarns is prepared by dissolving 14 pounds of gelatin, and 1 pound of nitro-isobutane-triol in water to make a mix of 100 gallons. The yarn is sized using this bath in the usual manner.

Example 8

A sizing bath suitable for sizing woolen warp yarns is prepared by dissolving 30 pounds of starch, 5 pounds of vegetable gum, and 4 pounds of nitro-isobutane-triol in water to make a mix of 100 gallons. The yarn is sized using this bath in the usual manner.

Example 9

A sizing bath suitable for sizing flax warp yarns is prepared by dissolving 30 pounds of tapioca starch and 5 pounds of nitro-isobutane-triol in water to make a mix of 100 gallons. The yarn is sized using this bath in the usual manner.

Example 10

A sizing bath suitable for sizing hemp warp yarns is prepared by dissolving 100 pounds of starch, 5 pounds of vegetable gum, and 12 pounds of nitro-isobutane-triol in water to make a mix of 120 gallons. The yarn is sized using this bath in the usual manner.

Conveniently, the nitro-isobutane-triol utilized in obtaining my improved textile product may be dissolved in the dye bath used to color the textile, thereby obviating the need of a separate finshing treatment. However, it is not desirable to add it to vat dye baths or other highly alkaline solutions.

The nitro-isobutane-triol may be applied in combination with other textile finishing agents, for example, starch, resins, waxes and so forth, if desired. Its effect is, in general, to impart softness to the combined finish, that is, to overcome the feeling of harshness imparted by many finishes. Nitro-isobutane-triol is unique among solids in its ability to bring about a soft handle used alone or in combination with other agents. For example, a stiff starch finish having a somewhat soft feel as contrasted to the usual harsh or boardy feel is obtained when nitro-isobutane-triol is included in the finish.

The term "soft" or "softness" used herein and in the appended claims is used in the manner of the textile trade, that is, it is the antithesis of harshness of handle, or harshness to the touch. Thus, comparing two finished textile fabrics of similar stiffness, one may be stiff but soft in handle, the other stiff and harsh.

It will be understood that the details and examples hereinbefore set forth are illustrative only, and that the invention as broadly described and claimed is in no way limited thereby.

What I claim and desire to protect by Letters Patent is:

1. A textile impregnated with a sizing material imparting an improved handle to the textile, said sizing material comprising nitro-isobutane-triol in an amount sufficient to render the textile of soft handle.

2. A textile impregnated with a sizing material providing a finish for the textile, the sizing material comprising nitro-isobutane-triol in a quantity between 0.05% and about 25% of the weight of the untreated textile, the nitro-isobutane-triol imparting an improved handle to the sized textile.

3. A textile impregnated with a sizing material imparting an improved handle to the textile, said sizing material comprising starch and nitro-isobutane-triol, the latter in an amount sufficient to render the textile of soft handle.

4. A warp yarn impregnated with a sizing material imparting stiffness and improved behavior of the yarn in weaving, said sizing material comprising nitro-isobutane-triol in an amount sufficient to render the yarn flexible.

5. A process of sizing a textile which comprises impregnating the textile with a sizing solution containing nitro-isobutane-triol, whereby the textile becomes impregnated and sized with material comprising nitro-isobutane-triol in an amount sufficient to render the textile of soft handle.

6. A process of sizing a warp yarn which comprises impregnating the yarn with a sizing solution containing nitro-isobutane-triol, whereby the yarn becomes impregnated and sized with material comprising nitro-isobutane-triol in an amount sufficient to render the yarn flexible.

WILLIAM W. TROWELL.