Patented Sept. 9, 1947

2,427,097

UNITED STATES PATENT OFFICE

2,427,097

SHRINKPROOFING AND FELTPROOFING OF KERATINOUS TEXTILE FIBERS

Jonas Kamlet, New York, N. Y., and Mark Weisberg and Leo Beer, Providence, R. I.

No Drawing. Application August 23, 1944, Serial No. 550,858

7 Claims. (Cl. 8—127.6)

1

This invention relates to a process for shrinkproofing and feltproofing of keratinous textile fibers. It relates further to a process for improving the properties of wool, and has particular relation to a new and improved method of treating keratinous textile fibers, such as wool, with chlorinating agents.

The well known tendency of keratinous textile fibers to felt when subjected to mechanical working, will cause shrinkage during laundering. This is a serious technical disadvantage inherent to many applications of woolen goods, e. g. clothing, blankets, knit goods, etc. The obviation of this disadvantage is a primary object of this invention.

The main object of our present invention is to improve the properties of keratinous textile fibers by subjecting them to the action of a chlorinating agent under conditions which prevent or substantially reduce detrimental secondary effects of the chlorine on the fibers. More particularly, it is the main object of our invention to reduce the felting properties and shrinking of wool, and simultaneously improve its wearing properties, particularly the abrasion resistance and tensile strength.

Other objects and the advantages of our invention will be apparent from the following specification, which describes by way of example some preferred embodiments of our invention.

It is well known that halogenation, and particularly chlorination, renders wool resistant to shrinkage and felting on laundering. The compounds heretofore used for this treatment are the free halogens, hypohalous acids, inorganic and organic hypohalites, and certain N-halogenated organic compounds such as the N-chloramides and imides. These substances contain the group WY where W is halogen, divalent oxygen, (—O—) or singly bonded tervalent nitrogen, and Y is halogen. All of these have usually been applied from aqueous or alcoholic solutions. In each case, the effective halogenating agent is an electropositive halogen ion. Even when gaseous chlorine is used on air-dried wool, it is believed that the fibers contain sufficient inherent moisture to liberate the required quantity of electropositive chlorine.

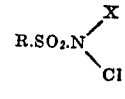
The disadvantages connected with the prior processes for the chlorination of woolen fibers or fabrics have been generally known. Although chlorination of woolen fabrics results in reduction of their felting properties, the chlorinated fabrics become harsh and yellow, and their tensile strength and abrasion resistance is substantially reduced. Moreover, the known processes often result in uneven chlorination of wool. In a continuous process for treatment of piece goods, the first part of the fabric entering the bath may be overtreated and the last part of the fabric leaving the bath may be undertreated.

2

In order to avoid such undesirable secondary effects of chlorination, the use of compounds containing electropositive halogen atoms, in the presence of compounds containing amino- and/or imino groups, has been suggested. By this modified process the felting properties of wool may be diminished, but its wearing properties are simultaneously impaired. It has also been suggested to treat wool with a neutralized hypochlorite solution containing formaldehyde. This process has not proved satisfactory either, because such hypochlorite solution has a substantial oxidizing, and therefore deteriorating effect on wool, and this effect cannot be prevented by the presence of ancillary agents such as formaldehyde in the hypochlorite solution.

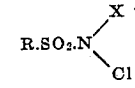
The basis of the present invention is the finding that the shrinking and felting of keratinous textile fibers may be obviated without discoloration of the treated material or other undesirable side effects, and that a substantially shrinkproof and non-felting fabric of improved wearing properties, especially increased resistance to abrasion and higher tensile strength may be obtained by the following sequence of steps of treatment:

(*a*) The keratinous material (e. g., wool, or a mixture of wool with other fibers or textile materials) is treated with an aqueous solution of formaldehyde, or a formaldehyde-yielding compound (such as trioxymethylene, paraformaldehyde, trioxane, methylal, etc.), followed by (*b*) the treatment of the material thus pre-treated with an aqueous solution of a member of the group of compounds of the general formula



where R is a member of the group consisting of hydroxyl, alkyl, alicyclic and aryl groups, X is a member of the group consisting of hydrogen and chlorine, and the water-soluble salts thereof, in the presence or absence of an additional quantity of formaldehyde or a formaldehyde-yielding compound.

Typical examples of the group of compounds of general formula



and the water-soluble salts thereof are: N-chlorsulfamic acid, sodium N-chlorsulfamate, potassium N, N-dichlorsulfamate, N-chlor, N-methylsulfamic acid, sodium N-chlor, N-cyclohexylsulfamate (Sveda, U. S. Patent 2,288,976 of July 7, 1942), sodium N-chlorbenzene sulfonamide, potassium N-chlor,- p-toluene sulfonamide, sodium p-N,N-dichlorsulfonamidobenzoate, etc.

The compounds found to be most suitable for the chlorination envisaged by the present invention are the water-soluble salts of N-chlor- and N,N-dichlorsulfamic acid, e. g., sodium N-chlorsulfamate, sodium N,N-dichlorsulfamate.

The simplest sulfonamide is sulfamic acid (aminosulfonic acid), $HO.SO_2NH_2$. This compound was first described by Rose (Pogg. Ann. 33, 235 (1834); 42, 415 (1837); 61, 397 (1844), and Berglund (Lunds Univ. Acta 13, 4 (1875), who prepared it by decomposing lead imidosulfonate with hydrogen sulfide. Sulfamic acid is now being manufactured on a large scale industrially by the reaction of urea with fuming sulfuric acid (Baumgarten, U. S. Patent 2,102,350 of Dec. 14, 1937) or with chlorsulfonic acid (Wyler, U. S. Patent 2,109,952 of March 1, 1938), and has found a wide field of industrial applicability (Cupery and Gordon, Ind Eng. Chem., 34, 792, July, 1942).

The N-chlorinated and dichlorinated sulfamates may be obtained by reacting an aqueous solution of one mole-equivalent of an alkali metal- or an alkali-earth metal sulfamate with an aqueous solution of more than 1.50 moles and preferably two moles of hypochlorous acid. The reaction proceeds almost instantaneously by mixing the reagents at room temperature, and probably occurs in two stages. The first results in the formation of the N-monochlorsulfamate in quantitative yield by the reaction of equimolar amounts of the sulfamate and the hypochlorous acid:

$$MOSO_2NH_2+HOCl\rightarrow MOSO_2NHCl+H_2O$$

(where M represents an equivalent of an alkali-metal or an alkali-earth metal).

The second stage results in the conversion of part of the N-monochlorsulfamate obtained in the first stage to N,N-dichlorsulfamate, thus:

$$MOSO_2NHCl+HOCl\rightleftarrows MOSO_2NCl_2+H_2O$$

This reaction is indicated as reversible since, at this stage, the stability of the N,N-dichlorsulfamate is such that, as its relative concentration increases, its tendency to hydrolyze increases similarly. In accordance with the mass action law, the reaction equilibrium is shifted from right to left as the molar fraction of N,N-dichlorsulfamate increases.

If 0.51 mole of hypochlorous acid is available for reaction with each mole-equivalent of N-monochlorsulfamate formed in the first stage (original HOCl—NH_2SO_2OM molal ratio=1.51:1.00), the hypochlorous acid is quantitatively converted to N,N-dichlorsulfamate, and there is thus obtained a mixture of 0.51 mole-equivalents of N,N-dichlorsulfamate ($MOSO_2NCl_2$) and 0.49 mole-equivalents of N-monochlorsulfamate ($MOSO_2NHCl$). However, if 1.00 mole of hypochlorous acid is available for reaction with each mole-equivalent of N-monochlorsulfamate formed in the first stage (original HOCl—NH_2SO_2OM molal ratio=2.00:1.00), the conversion to N,N-dichlorsulfamate is not quantitative. There is obtained a mixture of 0.85 to 0.95 mole-equivalent of N,N-dichlorsulfamate ($MOSO_2NCl_2$) and 0.05 to 0.15 mole equivalent of N-monochlorsulfamate ($MOSO_2NHCl$). The use of more than two moles of hypochlorous acid per mole equivalent of alkali metal- or alkali-earth metal sulfamate does not result in complete suppression of N-monochlorsulfamate formation. At least 0.05 mole of N-monochlorsulfamate is always obtained with each mole of N,N-dichlorsulfamate. The unreacted hypochlorous acid is comparatively unstable and is destroyed or dissipated in the course of preparing, concentrating, storing or using the compositions of the present invention. Thus, no advantage is obtained by using more than two moles of the hypochlorous acid per mole equivalent of sulfamate.

The sodium N-chlorsulfamate/N,N-dichlorsulfamate mixtures have the advantage of being prepared from cheap and readily available raw materials. A mixture of 0.95 mole of sodium N,N-dichlorsulfamate and 0.05 mole of sodium N-chlorsulfamate contains 36.9% of active chlorine. The corresponding lithium-N-chlorsulfamate/N,N-dichlorsulfamate mixtures contain 40.5% of active chlorine, and are believed to have a higher content of electropositive chlorine than any stable N-chlorinated sulfonamide heretofore described.

Beside the method heretofore described (involving the reaction of one mole of alkali metal- or alkali-earth metal sulfamate with two moles of hypochlorous acid, first used by Traube and von Drathen (Berichte, 51, 114 (1918) to obtain an impure potassium N,N-dichlorsulfamate) a number of alternate methods are available for preparing the chlorinated sulfamate composition of the present invention. Thus:

(*a*) One mole-equivalent of sulfamate is reacted with 1.51 to 2.00 mole-equivalents of hypochlorite:

$$MOSO_2NH_2+MOCl\rightarrow MOSO_2NHCl+MOH$$
$$MOSO_2NHCl+MOCl\rightleftarrows MOSO_2NCl_2+MOH$$

The MOH liberated by this reaction may be neutralized unless its presence in the reaction mixture is desirable.

(*b*) One mole of sulfamic acid is reacted with 1.51 to 2.00 mole equivalents of hypochlorite:

$$HOSO_2NH_2+MOCl\rightarrow MOSO_2NHCl+H_2O$$
$$MOSO_2NHCl+MOCl\rightleftarrows MOSO_2NCl_2+MOH$$

The MOH liberated by this reaction may similarly be neutralized.

(*c*) One mole equivalent of sulfamate is chlorinated with 1.51 to 2.00 moles of chlorine in the presence of 1.51 to 2.00 mole-equivalents of alkali:

$$MOSO_2NH_2+MOH+Cl_2\rightarrow MCl+MOSO_2NHCl$$
$$MOSO_2NHCl+MOH+Cl_2\rightleftarrows MCl+MOSO_2NCl_2$$

Other and obvious modifications of the above will occur to any person skilled in the art. Thus in reaction (*b*) it is obvious that the use of an equimolar mixture of hypochlorous acid and hypochlorite will obviate the necessity of neutralizing the liberated MOH; et cetera, et cetera.

It should be understood, however, that this invention is in no wise limited to the above-mentioned derivatives of sulfamic acid. Among others found to be suitable are such compounds as the N^1-alkali metal-N^1,N^4-dichlor-N^4-acylsulanilamides (Hultquist and Crossley, U. S. Pat

2,328,455 of August 31, 1943) in addition to those other sulfonamides and their derivatives enumerated above.

Chlorination by means of chlorosulfamates in acid solution takes place slowly and homogeneously and results in uniform products of high quality. The addition of a cationic or acid-resistant wetting agent to the bath has proved to facilitate thorough and uniform penetration of the woolen goods with the constituents of the bath.

We have further found that the protective action of formaldehyde on wool at temperatures of 5°–50° C. may also be obtained if no pretreatment with formaldehyde of the wool to be chlorinated takes place, but the formaldehyde is present in the acid chlorosulfamate bath used for chlorination.

The length of the treatment may be varied in accordance with the concentration of the reagents. Thus, periods of 30 to 60 minutes have been found suitable for the chlorination. The temperature may conveniently be within the range of practical operating conditions, i. e. between 5° C. and 60° C. However, these conditions are by no means critical, but may be modified to suit individual circumstances without changing the basic nature of the present invention. It is obvious that an increase in reaction temperature may be compensated by a corresponding decrease of the reaction time.

The process of the present invention is applicable generically to keratinous fibers or their mixtures with other textile fibers whether the fibers be a textile, yarn or woven goods. Wool is the principal keratinous fiber, but this invention is applicable to all other keratinous textiles, such as rabbit fur.

The following examples are given to define and illustrate the present invention but in no way to limit it to reagents, proportions or conditions described therein. Obvious modifications will occur to any person skilled in the art. All proportions given are parts by weight.

Preparation of chlorinated sulfamates

Example I.—97 parts of crystalline sulfamic acid (1.00 mol) are added in small portions to 1012 parts of a well-cooled 14% solution of sodium hypochlorite (1.90 moles). The resultant solution is then cautiously neutralized with 61 parts of glacial acetic acid (1.00 mole), and then contains 169.2 parts of sodium N,N-dichlorsulfamate (0.90 mole) and 15.4 parts of sodium N-chlorsulfamate (0.10 mole).

Example II.—A quantity of a high test commercial bleaching powder containing 143 parts of calcium hypochlorite (two mole-equivalents) is dissolved in a solution of 116 parts of calcium sulfamate (one mole equivalent) in 2000 parts of water. The mixture is vigorously shaken for two hours at room temperature, and is then filtered from the precipitate of calcium hydroxide formed. The resultant filtrate is neutralized with hydrochloric acid and assayed, on the basis of active chlorine content, 0.81 mole-equivalent of calcium N,N-dichlorsulfamate and 0.19 mole-equivalent of calcium N-chlorsulfamate.

Example III.—119 parts of crystalline sodium sulfamate (1.00 mole) is dissolved in 852 parts of 14% sodium hypochlorite solution (1.60 moles). The resultant solution is then neutralized with 60% sulfuric acid and assayed, on the basis of active chlorine content, 0.60 mole of sodium N, N-dichlorsulfamate and 0.40 mole of sodium N-chlorsulfamate.

Example IV.—A solution of 106 parts of soda ash (two mole-equivalents) in 2000 parts of ice water is chlorinated until 142 parts of chlorine gas (two moles) has been absorbed. To the resultant 5.25% hypochlorous acid solution (1.0 M) is now added 119 parts of crystalline sodium sulfamate (1.00 mole). There is thus obtained a solution assaying 0.95 mole of sodium N,N-dichlorsulfamate and 0.05 mole of sodium N-chlorsulfamate.

The active chlorine concentrations of the compositions of the present invention are readily determined by a simple iodometric titration. A weighed quantity of the composition in solution or in the solid state equivalent to about 100 mgms. of pure composition is dissolved in 10.0 cc. of glacial acetic acid, 500 mgms. of potassium iodide is added and the liberated iodine is titrated with standard 0.100 N sodium thiosulfate solution, using starch as an external indicator.

Treatment of materials

Example V.—50 grams of an air-dried woolen fabric are immersed for 30 to 60 minutes at 20°–25° C., in a bath containing per liter of water

1.0 gm. of a wetting agent (e. g., the sodium salt of a highly sulfonated castor oil, propylnaphthalene sulfonic acid or similar acid resistant wetting agent), and

15–20.0 cc. of 35% aqueous formaldehyde solution.

At the end of this period, the formaldehyde bath is discarded and replaced by a fresh bath at a ratio of 25 of water to 1 of wool, containing

30–40 cc. of an aqueous solution of sodium N-chlor/N, N-dichlorsulfamate assaying 7.0% to 8.5% of electropositive chlorine, 8 cc. of 66° Bé. sulfuric acid, and 15 cc. of 37% aqueous formaldehyde solution and the treatment is continued at 20°–25° C., for 30 to 60 minutes.

The material is then rinsed and neutralized in a bath containing per liter of water

10.0 cc. of 35° Bé. sodium bisulfite solution
10.0 grams of soda ash or 28% aqua ammonia.

Comparative testing of the abrasion resistance and tensile strength of the untreated starting material and the material treated as described above, carried out under equal conditions, have the following results:

	Abrasion Resistance	Tensile strength	
		warp	filler
Untreated material	2,450	60.5	42.5
Treated material	4,400	80.0	45.0

Example VI.—50 grams of an air-dried woolen fabric are immersed for 30 to 60 minutes at 20°–25° C. in a bath containing per liter of water

30–40 cc. of an aqueous solution of sodium N-chlor/N,N-dichlorsulfamate assaying 7.0% to 8.5% of electropositive chlorine
1.0 gm. of sodium propylnaphthalene sulfonate (as a wetting agent)
8 cc. of 66° Bé. sulfuric acid
20–30 cc. of 37% aqueous formaldehyde solution.

The woolen material is then removed from the bath, rinsed with water and neutralized with a solution containing per liter of water

20.0 cc. of 28% aqua ammonia
5.0 grams of sodium thiosulfate.

After rinsing the material again, and, if desired, treating with a dilute soap solution, it is dried.

As a comparison, fifty grams of the same woolen material were treated in the same manner in a bath having the same composition as above, but not containing formaldehyde, and the abrasion resistance and tensile strength of the untreated material and the material treated in both solutions described in this example were tested under equal conditions. The results were as follows:

		Abrasion resistance	Tensile strength	
			warp	filler
1	Untreated material	2,450	60.5	42.5
2	Material chlorinated in the presence of formaldehyde	3,800	63.0	39.5
3	Material chlorinated in the absence of formaldehyde	3,200	28.5	11.5

Example VII.—50 grams of an air-dried woolen fabric are immersed for 30 to 60 minutes at 50° C. in a bath containing per liter of water:

30–40 cc. of an aqueous solution of sodium N-chlor/N,N-dichlorsulfamate assaying 7.0% to 8.5% of electropositive chlorine
1.0 gm. of sodium propylnaphthalene sulfonate (as a wetting agent)
8 gm. of 66° Bé. sulfuric acid
20.0–30.0 cc. of 37% aqueous formaldehyde solution.

The woolen material is then removed from the bath, rinsed with water and neutralized with a solution containing per liter of water

20.0 cc. of 28% aqua ammonia
5.0 grams of sodium thiosulfate.

After rinsing the material again, and, if desired, treating with a dilute soap solution, it is dried.

We have found that under the above described conditions decomposition of sodium mono- and dichlorsulfamate and chlorination of wool take place rather slowly, and, therefore, our process acts mildly on the fibers and no undesired secondary effects occur. After removal of the wool, the bath still contains formaldehyde and active chlorine. In spite of their acid character, our chlorinating solutions do not adversely affect cotton fabrics in any way. We have found, for example, that if fabrics consisting of a mixture of cotton and woolen fibers are treated in accordance with our present invention, the cotton fibers of the fabric retain their full tensile strength. Furthermore, washing tests have shown that woolen goods treated according to our invention show a shrinkage of only 1% to 2%.

We have also found that the addition to the bath of a chlorosulfamate solution containing about 7.0 to 8.5% of active chlorine, and the use of formaldehyde in the amounts stated in the above examples, are necessary for obtaining the above described favorable effects in our invention. These amounts represent a moderate excess of the reagents over that amount required for chlorination. If the active chlorine content is substantially lower than that of the bath described in our examples, the woolen goods treated may exhibit undesirable felting and shrinking properties, while an increased amount of chlorine in the bath may injure the fibers. The periods of treatment stated in our examples (30 to 60 minutes) have proved to give satisfactory results, but our invention is not limited, in any way to these reaction conditions.

The following tests were conducted to determine the best conditions for this process with woolen fabrics. Seven swatches with a total weight of 287 grams were prepared. Each swatch had a weight of 41 grams and was marked at intervals of 12 inches to measure the shrinkage. The chlorinating solution used was a solution of sodium N-chlorsulfamate/N,N-dichlorsulfamate assaying 7.5% available chlorine.

These seven samples (287 grams) were pretreated together for thirty minutes in a bath of the following composition at room temperature, 20–25° C. The weight of the fabric in proportion to that of the liquid was in a ratio of 1:25.

7 liters water.
120 cc. 37% formaldehyde solution
6 grams Alronol 90 as a wetting agent.

After this pretreatment, the pieces were taken out of the formaldehyde bath, separated, and each swatch, without squeezing, was treated for one hour at room temperature, 20°–25° C., in baths of different compositions as described in the following seven trials. The ratio of material treated to the solution in this bath is 1 to 20, but it was found advisable to increase the ratio to 1 to 30 in order to decrease the chlorine concentration per liter so as to avoid the danger of attacking the fibers. The quantity of active chlorine itself has to be based on the weight of the woolen material:

Trials	1	2	3	4	5	6	7
	Cc.	Cc.	Cc.	Cc.	Cc.	Cc.	Cc.
Water	800.0	800.0	800.0	800.0	800.0	800.0	800.0
Chlorinating soln. 7½% Cl by vol	28.0	30.0	32.0	34.0	36.0	38.0	40.0
H_2SO_4 66° Bé	7.8	8.4	9.0	9.4	10.0	10.5	11.0
Formaldehyde—37%-	10.0	10.75	11.50	12.25	13.00	13.75	15.00

The following table shows the quantity of Cl for 100 grams woolen material used for trials 1 to 7, the quantity of Cl consumed by each of the swatches, and the quantity of Cl remaining in the bath:

	Volume Cl	Consumed Cl	Remaining Cl
	Per cent	Per cent	Per cent
1	5.16	4.98	0.1
2	5.50	5.27	0.2
3	5.90	5.56	0.3
4	6.26	5.85	0.4
5	6.63	6.19	0.4
6	7.0	6.49	0.5
7	7.36	6.78	0.5

After one hour's treatment in the chlorinatin bath, the swatches were rinsed with water for 1 minutes and treated in a neutralized solution c sodium bisulfite plus a small excess of soda as to remove the chloramines from the fibers.

The pieces are then rinsed and neutralized, an then rinsed and soaped at 30° C. All the sampl are non-felting, but the higher the Cl concentra tion, the less the loss on yardage as the followin table shows. This figure will vary in accordan with the quality of the goods treated. The no

treated blanket material used showed, after washing, a loss (shrinkage) of 10%:

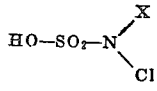
	Original Measure	Measure after Processing	Loss	Percentage
	Inches	*Inches*	*Inches*	
1	12	10 13/16	1 3/16	10.4
2	12	10 13/16	1 3/16	10.4
3	12	10 13/16	1 3/16	9.9
4	12	10 13/16	1 3/16	9.9
5	12	10 11/16	1 5/16	9.6
6	12	10 15/16	1 1/16	9.4
7	12	10 11/16	1 5/16	9.6

Tensile strength

	Warp	Filler
Untreated material	50.5	137.0
Trial # 1	55.0	145.0
Trial # 2	55.0	145.0
Trial # 3	55.0	145.0
Trial # 4	55.0	146.0
Trial # 5	55.0	144.0
Trial # 6	55.0	145.0
Trial # 7	56.0	145.0

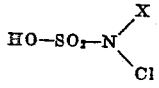
Having described our invention, what we claim and desire to protect by Letters Patent is:

1. A process for chlorinating wool and other keratinous textile fibers, which comprises treatment of said fibers with a compound selected from the group consisting of formaldehyde and formaldehyde yielding compounds, and treatment of said fibers with a compound selected from the group consisting of compounds corresponding to the general formula



and water-soluble salts thereof, wherein X is selected from the group consisting of hydrogen and chlorine.

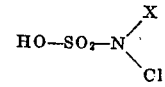
2. A process for chlorinating wool and other keratinous textile fibers, which comprises treatment of said fibers with a compound selected from the group consisting of formaldehyde and formaldehyde yielding compounds, and treatment of said fibers with a compound selected from the group consisting of compounds corresponding to the general formula



and water-soluble salts thereof wherein X is selected from the group consisting of hydrogen and chlorine, said treatments being effected simultaneously.

3. A process for chlorinating wool and other keratinous fibers, which comprises treatment of said fibers with a compound selected from the group consisting of formaldehyde and formaldehyde yielding compounds, and subsequent treatment of said fibers with a compound selected from

the group consisting of compounds corresponding to the general formula



and water soluble salts thereof, wherein X is selected from the group consisting of hydrogen and chlorine.

4. A process as claimed in claim 3, wherein chlorination takes place in the presence of an additional quantity of a substance selected from the group consisting of formaldehyde and formaldehyde yielding compounds.

5. A process for chlorinating wool and other keratinous textile fibers, which comprises treatment of said fibers with a compound selected from the group consisting of formaldehyde and formaldehyde yielding compounds, and treatment of said fibers with a chlorinating agent consisting of an aqueous solution of the reaction product of a member of the group consisting of sulfamic acid and salts of sulfamic acid with a member of the group consisting of the salts of hypochlorous acid.

6. A process for chlorinating wool and other keratinous textile fibers, which comprises treatment of said fibers in aqueous solution with formaldehyde and simultaneous treatment of said fibers with a chlorinating agent consisting of an acid aqueous solution of the reaction product of a member of the group consisting of sulfamic acid and salts of sulfamic acid with a member of the group consisting of the salts of hypochlorous acid.

7. A process for chlorinating wool and other keratinous textile fibers, which comprises treatment of said fibers in aqueous solution with formaldehyde and subsequent treatment of said fibers with a chlorinating agent consisting of an acid aqueous solution of the reaction product of a member of the group consisting of sulfamic acid and salts of sulfamic acid with a member of the group consisting of the salts of hypochlorous acid.

JONAS KAMLET.
MARK WEISBERG.
LEO BEER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,311,507	Arthur	Feb. 16, 1943
787,923	Kann	Apr. 25, 1905
2,144,824	Wiegand	Jan. 24, 1939

FOREIGN PATENTS

Number	Country	Date
13,088	Great Britain	1911
117,933	Australia	Dec. 17, 1943
659,116	Germany	Apr. 26, 1938
519,343	Great Britain	Mar. 21, 1940
563,387	Germany	Feb. 15, 1933
647,566	Germany	July 7, 1937
656,112	Germany	Jan. 29, 1938