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Stanley et al.

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[54] **METHOD OF MAKING CHEMICALLY PROTECTED OFF-THE-LOOM FABRICS**

[75] Inventors: **Leonard A. Stanley,** Charlotte, N.C.; **Glynn E. Fouche, Jr.,** Rock Hill, S.C.

[73] Assignee: **The Kendall Company,** Walpole, Mass.

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Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 221,308, Jan. 27, 1972, abandoned, which is a continuation-in-part of Ser. Nos. 36,037, May 11, 1970, abandoned, and Ser. No. 36,038, May 11, 1970, abandoned.

[52] **U.S. Cl.** **28/72.6;** 28/74; 117/136; 117/138.5; 139/426; 161/88

[51] **Int. Cl.**[2] **D02G 3/36;** D06M 13/00

[58] **Field of Search** ..... 28/72.6, 72.5, 74 R, 75 R, 28/76 R; 117/136, 137, 138.5; 106/15 AF, 15 RF; 139/426 R, 420 R, 383 R; 161/88–92

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Primary Examiner—James Kee Chi

[57] **ABSTRACT**

Methods of making chemically protected off-the-loom greige fabrics by treating unsized warp yarns, usually of cotton or rayon, in a size bath with a chemical protecting material added thereto, drying the sized and chemically protected warp yarns and interweaving them with untreated filling yarns to provide an off-the-loom fabric wherein, after being exposed to water, both the warp and filling yarns are chemically protected without subsequent processing. Greige cloth resistant to such factors as fire, rot, bacteria, fungus, insects and the like as well as fabrics having desired additives such as herbicides, fertilizers, insecticides and the like may be so provided.

4 Claims, 3 Drawing Figures

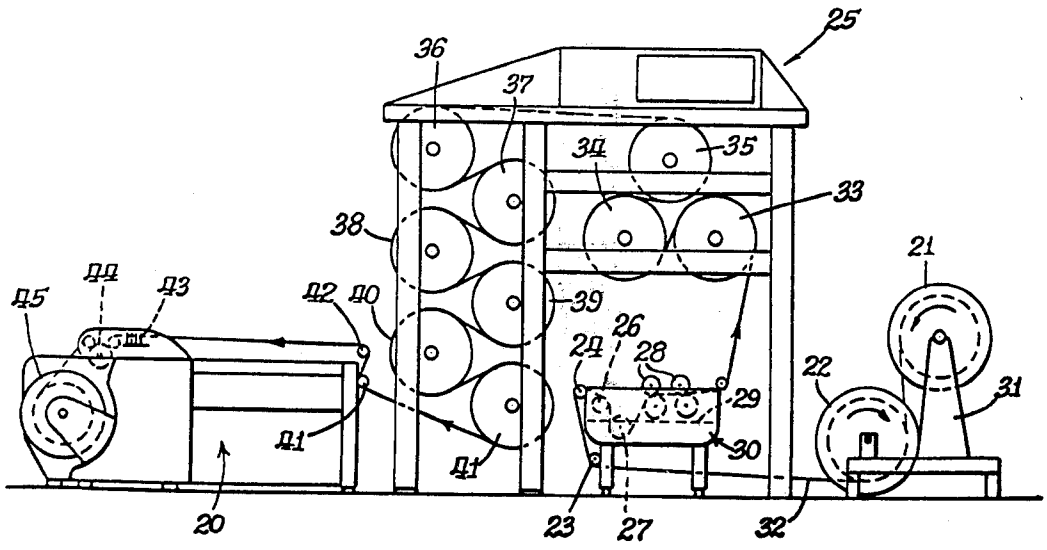


Fig.1.

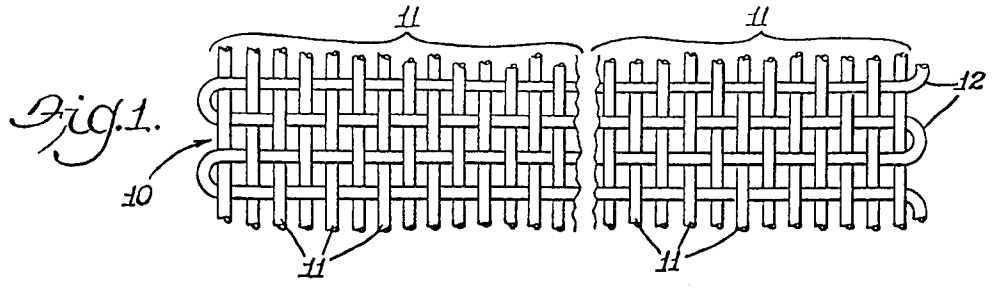


Fig.2.

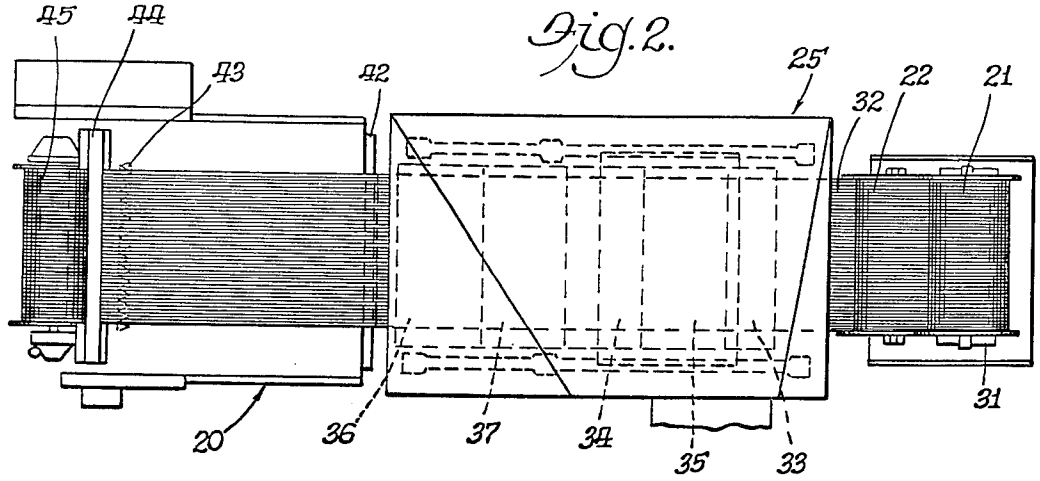
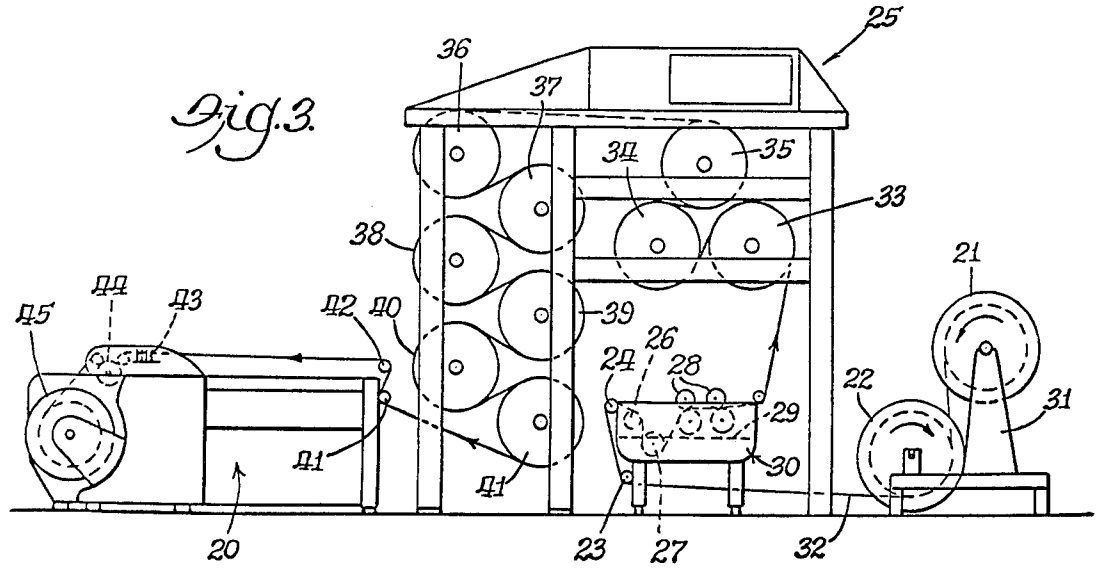


Fig.3.



METHOD OF MAKING CHEMICALLY PROTECTED OFF-THE-LOOM FABRICS

CROSS REFERENCE TO RELATED APPLICATIONS

This application is a continuation-in-part of our earlier application Ser. No. 221,308, filed Jan. 27, 1972 now abandoned, which was in turn a continuation-in-part of our applications, Ser. Nos. 36,037 and 36,038; both filed May 11, 1970 now both abandoned. Its inventions relate to novel methods of making chemically protected off-the-loom textile fabrics, that is, greige cloth, having sized warp yarns.

BACKGROUND OF THE INVENTION

As is well known, the usual method of treating cellulosic and other fabrics, particularly of cotton, as for example, to protect them by imparting resistance to fire, rot, bacteria, fungus, insects and the like is by impregnation of the cloth in an aqueous bath of suitable chemicals. This procedure is relatively less effective for cotton greige cloth, however, because such cloth is usually formed of cotton yarns which still retain all of the natural oils and waxes, in addition to the warp size necessary for weaving the warp yarns, and hence are substantially nonabsorbent with respect to protecting materials. For this reason, the usual procedure of impregnating the cloth is not particularly effective with cotton or rayon greige cloth because of substantial lack of absorbency particularly in the sized warp yarns of the latter. The only manner of making such cloth more receptive to such impregnation is by desizing, bleaching and/or scouring. However, cloth so treated is no longer inexpensive off-the-loom cloth but rather is relatively expensive finished cloth to which the extra expense of still further processing with protecting materials would be added.

Other fabrics made with spun or continuous filament rayon or other synthetic yarns which, like natural cotton yarns, are substantially nonabsorbent, have the same disadvantages with respect to normal protective and other treatment, except they may not need bleaching and scouring.

For example, flame resistance of fabrics, particularly apparel fabrics, household fabrics and automotive fabrics, has been brought into public focus because of the high incidence of accidents in which serious, oftentimes fatal, burns and extensive property damage has resulted from ignition of fabrics having undesirably low flame resistance. Such fabrics, even when they have not been the initial source of the accidental burning, are active in propagating and augmenting the conflagration with subsequent increase in body injury and property damage.

As a result of the attention directed to flammability of fabrics, the Flammable Fabrics Act has been broadened in scope and new standards are in the process of being promulgated. Thus, the Federal Highway Administration has proposed flammability tests and standards for interior materials for passenger vehicles, trucks and busses, and comparable standards for household furnishings and wall coverings are being considered. Many of the fabrics used as linings, cushion coverings, and the like, have in the past been made of off-the-loom cloth which has, with the exception of wall coverings and the like, formed nonvisible and usually overcovered portions of the seat, sides, backs and bottoms of household furnishings and automobile interiors. Low count lightweight off-the-loom fabrics formerly used in these constructions simply are not sufficiently flame resistant to pass the proposed automotive tests and probably will not pass finally approved tests for flammability applicable to automotive interiors, home furnishings and wall coverings. Such fabrics are by their very nature in the lowest cost range. Any treatment which enhances flame resistance, to be completely feasible, therefore, must be simple and uncomplicated with a minimal cost increase from present off-the-loom cloth processing. And this is not possible with heretofore known processes, which require two additional steps, first finishing and thereafter treating with flame retardants.

As another example, untreated cotton duck of about 12 to 14 ounces per square yard after being wet out and buried in soil composed of good topsoil or leaf mold, well rotted and shredded manure and coarse sand in equal parts and rich in microbial life, is completely deteriorated in from seven to ten days by rot and mildew. It is well known that rot and mildew cause severe economic losses in untreated cotton duck and other untreated cotton fabrics used in tarpaulins, tents, seedbed covers, sandbags and the like, which come in contact with the soil during ordinary use. Mildew also causes substantial economic loss where untreated backing fabrics for wall coverings in certain tropical and humid regions are exposed to warm and moist conditions. As with imparting flame resistance, however, the heretofore known method of imparting mildew and rot resistance to such fabrics is by a separate finishing operation in which off-the-loom cloth is desized and impregnated in an aqueous bath containing a water miscible fungicide such as copper naphthenate, and dried. While such an operation is effective in imparting a degree of mildew and rot resistance, the method is relatively expensive.

Quite apart from mildew and rot resistance and at a level which is ineffective for substantially reducing mildew and rot deterioration during soil burial procedures, certain warp sizings have been known to contain minor solid percentages (of the order of 0.05 to 0.5 percent based on the weight of the untreated warp yarns) of a fungicide as a preservative for the sizing to inhibit mildew growth during storage under normal conditions of storage humidity and temperatures.

SUMMARY OF THE INVENTION

It is an important object of this invention to provide novel methods of making chemically protected off-the-loom cloth of cellulosic fibers, such as cotton and rayon, substantially resistant to one or more of such factors as fire, rot, bacteria, fungus, insects and the like, as well as to provide fabric having other desired additives, such as herbicide, fertilizer, insecticides and the like, — all without destroying its greige character, without serious modification of its processing and without substantial additional cost other than that of the protective material added. These objectives are substantially realized by the simple step of adding to the sizing fluid bath during the preparation thereof a percentage by weight of a selected generally cold water insoluble chemical protecting material.

Our invention, in general, lies in our discovery that, by the addition of a sufficient quantity of any one of a

number of known chemical protecting materials, such as flame retardant or mildew and rot resistant agents, directly to the warp yarn slasher sizing bath, before the sized warp yarns are woven with the unsized filling yarns into cloth, the woven gray fabric, without any further chemical treatment, becomes chemically protected and so made flame resistant or mildew and rot resistant without any pretreatment of the unsized filling yarns.

We have unexpectedly discovered that exposing such fabrics to the presence of moisture, such as by wetting with water and even by ambient moisture occurring as water vapor present when the fabric is subsequently used, allows a sufficient amount of the chemical protecting material to diffuse from the warp yarn sizing into the untreated, unsized filling yarns to protect them and thus protect the entire fabric to render it highly flame resistant or rot and mildew resistant or the like. This resistance may be obtained, according to our invention, without substantial addition to the processing steps or the expense of greige cloth, thus providing a desirably economical product, easily produced.

More specifically, we have found that sizing agents in slashing mixtures conventionally used for sizing the warp yarns, as is necessary for weaving them into greige cloth, which sizing is not normally removed, makes an excellent retentive carrier for the desired protective material used in the preparation of greige cloths of enhanced flame rot, bacteria, fungus, insects, or other resistance, or cloths having other desired additives, such as herbicide or fertilizer. Any water-compatible binding agent including aqueous starch, polyvinyl alcohol, carboxymethyl cellulose or other commonly used warp sizing agents or combinations thereof, make suitable sizing carriers useful in the invention. When fabrics of the invention are continuously exposed in use to outside weather, particularly to heavy rainfall which tends to leach out such usual sizings as starch, polyvinyl alcohol and carboxymethyl cellulose, it is preferred to employ a less water-soluble warp sizing to act as a carrier replacing wholly or partially the usual sizing. Typical examples of such sizings are emulsions of polyvinyl acetate and polyacrylates, and dispersions of polyvinyl butyrals.

An effective percentage of flame retardant material is from about 3 to about 20 percent solids add-on based on the weight of the unsized warp yarns, with a weight of about 8 to 14 percent being preferred for the combination of low cost and effectiveness, dispersed throughout the sizing. For fungus and rot resistance, an effective percentage of a well known fungicide is from 1 to 5 percent solids added to the slashing fluid during its preparation. Thus, if the wet pickup of slashing fluid is 100 percent of the untreated warp yarn weight and the percentage of fungicide in the slashing fluid is 3 percent, the percent solids add-on of the fungicide would be 3 percent.

Whether or not the warp yarns are relatively nonabsorbent is of little significance when a carrier is utilized. A variety of materials may be made to adhere to the warp yarns without other steps than merely mixing them into the sizing during its preparation in the proper proportion to disperse them throughout the sizing.

In accordance with our discovery, when warp yarns treated with a chemical protecting material in accordance with the method of this invention are interwoven with ordinary unprotected, untreated, unsized cotton, rayon or other cellulosic filling yarns or other filling yarns, the resultant cloth has enhanced protection both in the warp direction and, unexpectedly, in the filling direction as well, apparently by partial transfer of the chemical protecting material from the warp yarns to the filling yarns in the presence of moisture, even ambient moisture. The reason for this unexpected protection of the otherwise untreated filling yarns is not completely understood, by may possibly be due to a number of factors; in the case of flame or fire resistance, reduction of oxygen at the yarn intersections, partial decomposition of the flame-resistant material and other phenomena which occur at flame temperatures, and, in the case of rot, fungus and bacteria resistance, by the partial migration of sizing and fungicide from the warp yarns to the intimately contacting filling yarns, which comes about naturally when the cloth is wetted by water, even by the presence of ambient moisture alone. Since moisture is necessary to the development of rot and mildew fungae, the filling yarns are rendered resistant at the time when conditions would otherwise be optimum for fungus growth.

As for fire and flame resistance, any of the well known flame retardants may be used in the methods of this invention to impart enhanced flame-resistance to warp yarns and to fabrics of the invention made from such treated yarns. Typical retardants which are only representative of the broad class of available suitable and well-known retardants are boric acid, borax, diammonium phospate, sodium phosphate, aluminum sulfate, ammonium sulfate, ammonium sulfamate, ammonium molybdate, sodium tungstate, ammonium bromide, and trisodium phosphate. In the main, those mentioned are relatively inexpensive and may be used alone or in combination with each other or with other flame retardants.

Among the very large group of fungicides which are suitable in the preparation of the rot and mildew resistant fabrics of this invention, the following very commonly used fungicidal agents are mentioned as representative but by no means exclusive agents:

Such quaternary ammonium compounds as methyl dodecyl benzyl trimethyl ammonium chloride; quaternary ammonium naphthenate; alkyldimethylbenzyl ammonium chloride; di-isobutyl phenoxy ethoxy ethyl dimethyl benzyl ammonium chloride; and others.

Such organometallic compounds as diphenyl mercury dodecenylsuccinate; copper-8-quinolinolate; zinc naphthenate; phenyl mercuric acetate, lactate, oleate, proprionate; bis(tributyl) tin oxide; and others.

Such melamine derivatives as melamine formaldehyde condensates, such as trimethyl melamine and mono, and di- or tri-methylated trimethylol melamine.

Such substituted phenols and bis-phenols as orthophenylphenol; 2, 4, 5-trichlorophenol; tetrachlorophenol; pentachlorophenol; coconut amine salt of tetrachlorophenol; dihydroxydichlorodiphenylmethane; 4-chloro-2 cyclopentolphenol; methyl salicylate; orthohydroxy biphenyl; dichlorophenoxyphenol; sodium pentachlorophenate; and others.

Such organosulfur compounds as N-trichloromethylthio phthalimide; dimethyldithiocarbamic acid (zinc salt); 2-mercaptobenzothiazole (zinc salt); and others.

The addition of an antibacterial agent such as a combination bis-phenol and zirconyl to water-resistant slashing size according to the invention may be used for producing cloth having bacteria protecting properties. Such material complexes on drying to a slow-diffusing but highly wash and dry-cleaning fast odor suppressor by retardation of bacterial putrefaction odors of perspiration and other body exudates. Such off-the-loom cloth needs only to be compressively shrunk and without any further treatment for use in apparel interlinings. Specifically, treatment in the warp size bath with one half to five percent addition (on weight of warp sheet) of 5-chloro-2-(2, 4, dichlorophenyoxy) phenol with 1.5 to 3 mol. equivalents of ammonium zirconyl carbonate agent will produce the desired results. The antibacterial agents are more specifically described in U.S. Pat. No. 3,594,113.

An insect resistant fabric such as a carpet backing fabric with the warps infused with a moth and carpet beetle insecticide may be provided according to the invention. For example, a mixture of emulsifiable hexachlorophenoxyoctahydroendo, exo-dimethanenaphthalene with insecticidally active chlorinated hydrocarbons may be provided in the warp size bath, with the filling yarns being protected thereby as well as the warp yarns.

Among the fabrics having other desired additives, which may be produced according to the methods of the invention, are, for example, insect repelling fabrics in which the purpose of the insecticide is to prevent insects from passing through or remaining near the fabric, in order to protect other materials. Illustrative of such uses are agricultural nettings and outdoor gear, warp sized according to the invention to include an insect repellent such as an emulsion of beta butoxy beta thiocyano diethylether or a miticide such as 1,1-bis(chlorophenyl)-2,2,2,-trichloro ethanol. Such materials as fertilizers and herbicides may also be added.

For the purpose of more fully explaining the invention, reference is now made to the following detailed description of preferred embodiments thereof, taken with the following drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates a typical fabric of the invention; and FIGS. **2** and **3**, illustrate, respectively, schematic plan and side views of a typical warp slasher useful in producing fabric of the invention.

REFERRING IN MORE DETAIL TO THE DRAWINGS:

FIG. **1** illustrates a typical off-the-loom greige fabric **10** of the invention of which the cellulosic warp yarns **11** are treated with sizing modified by inclusion of a suitable agent. Filling yarns **12** are usually untreated, unsized cellulosic yarns of cotton or rayon.

FIGS. **2** and **3** are, respectively, schematic illustrations in plan and side view of a typical warp slasher **20** wherein warp beams **21** and **22** of unslashed warp yarns are mounted in the creel frame **31** from which the warp yarns **32** enter under the hood **25.** The warp yarns are then fed around idler rollers below the surface of the size **29** in the size box **30.** The sized yarns are led through the squeeze rolls **28,** after which they pass around dry cans **33** to **41** in succession. From the dry cans, the yarns pass over idler rollers **41'** and **42** to comb assembly **43** which separates them. Thence the yarns pass over, under and over the rolls of tension device **44** and onto the loom beam **45.** The dried, treated and sized warp yarns are then in condition to be interwoven with filling yarns on a conventional loom, not shown.

The preferred embodiments of the invention are all cotton or cellulosic fabrics made from normal twist yarns with the weight of the filling yarn being not substantially greater than that of the untreated warp yarns.

Preferred Flame Retardency Embodiments of the Invention

To illustrate the efficacy of the methods of this invention as applied to flame retardency and the degree of flame retardency achieved, a typical 14 × 10 fabric with cotton warp yarns **31** singles and cotton filling yarns **39** singles was used in a series of tests involving two warp slashing fluids respectively 5 percent cornstarch on weight of the solution and 3 percent carboxymethyl cellulose on weight of the solution. The time of burning measured in accordance with Federal Method 5908 (AATCC-33-1962) was determined for these fabrics and for similar fabrics in which the warp sizings were modified with various flame-retardant agents as follows:

Control A : 5 percent cornstarch.
Control B : 3 percent carboxymethyl cellulose.
Example 1-A: 5 percent cornstarch, 8 percent ammonium sulfamate, 2 percent ammonium sulfate.
Example 2-A: 5 percent cornstarch, 10 percent ammonium borophosphate.
Example 3-A: 5 percent cornstarch, 10 percent diammonium phosphate.
Example 1-B: 3 percent carboxymethyl cellulose, 8 percent ammonium sulfamate, 2 percent ammonium sulfate.
Example 2-B: 3 percent carboxymethyl cellulose, 10 percent ammonium borophosphate.
Example 3-B: 3 percent carboxymethyl cellulose, 10 percent diammonium phosphate.

In each example and the controls, the percentages are based on the weight of the slashing solution and the wet pickup regulated by squeeze rolls to 100 percent of the dry weight of the warp yarn in the unsized state.

The burning times in seconds of 5 inches of fabric for the various controls and example fabrics tested in the filling direction (marked F) and in the warp direction (marked W) were as follows:

TABLE I

	Burning times in seconds (AATCC-33-1962)	
	F	W
Control A	3.1	2.9
Control B	3.0	2.8
Example 1-A	3.7	3.6
Example 2-A	3.9	3.7
Example 3-A	3.6	3.4
Example 1-B	3.6	3.2
Example 2-B	3.4	3.3
Example 3-B	3.3	3.2

It should be noted that the burning times in the warp direction of fabrics whose warp yarns had been treated in accordance with the method of the invention were increased over the controls. Likewise, what was not an-

ticipated, the burning times in the filling direction of these fabrics were increased over the controls.

When a degree of flame resistance is required in fabric whose untreated flame resistance is low, retardent sizing treatment of the warp yarns may be inadequate to attain the desired level of flame resistance. Supplemental measures which enhance the flame resistance of the fabric may be employed as follows:

1. Treat the filling yarn before being woven with an aqueous or solvent solution or emulsion of a suitable flame retardant either as an individual yarn or in package form. This may be accomplished by dipping, spraying, brushing, wiping or other means which attain an effective level of solid pickup. Obviously, if the filling yarn is or has been made absorbent, an effective level is more readily obtained. But even with nonabsorbent yarns, the capillarity or surface acceptance may be adequate to obtain satisfactory wet pickup. Spun yarns generally have sufficient capillarity (unless they are high twist yarns) for retaining an effective amount of retardant material to enhance the flame resistance to a considerably degree after the treated yarn is dried and interwoven with warp yarns which have been subjected to sizing treatment in accordance with the invention.

2. Replace the filling yarn of such a fabric with a synthetic yarn which is inherently wholly flame resistant or of improved flame resistance, such as yarns of glass, polyolefins, polyvinyls and acrylates.

3. Replace the filling yarn of such fabric with flame-retardant rayon or other cellulosic fiber whose molecule has been modified to render it inherently flame resistant or whose structure includes trapped polymeric flame retardants.

Obviously, one may further enhance the flame resistance of filling yarns having improved but inadequate resistance and hence of the fabric of (2) and (3) by the treatment of (1).

4. Treat the warp treated cloth with filling yarns which are deficient in flame resistance whether of absorbent or nonabsorbent cotton or of rayon or synthetic polymer, with an aqueous or solvent solution or emulsion of a suitable flame retardant, and dry to provide a cloth of still greater flame resistance. Spraying or brushing the flame-retardant fluid onto the cloth is preferred because excess liquid may cause loss of both sizing and retardant and may involve further processing steps.

Examples 2, 3 and 6 in Tables II and III below illustrate further embodiments of the invention and show comparative burning rates. Examples 3 is an example of a fabric made with retardant sized warp yarns in accordance with this invention and with an after-spray of retardant in accordance with (4) above. Example 6 is an embodiment of a fabric described in (3) above.

TABLE II

No.	Fabric	Warp Size	Spray Applications Retardant % Solids Add-on		Burning Rate Horizontal*	
1	Grey 14×10 cotton	Starch	none	none	10″	43 in/min
2	Grey 14×10 cotton	Starch + boro-phosphate complex	none	none	10″	27 in/min
3	Grey 14×10	Starch + boro-	Boro- phosphate complex	4.4 in water	0**	0

TABLE II-Continued

No.	Fabric	Warp Size	Spray Applications Retardant % Solids Add-on	Burning Rate Horizontal*

*Proposed Motor Vehicle Safety Standard No. 302.
** Burning did not reach 1½ inches from starting point.

TABLE III

No.	Fabric	Warp Size	Burning Rate 45° incl. AATCC-33-1962
4	Grey 14×10 cotton	Starch	5 inches in 2.9 seconds
5	14×10 grey cotton warp AVISCO PFR rayon fill	Starch	5 inches in 3.4 seconds
6	14×10 grey cotton warp AVISCO PFR rayon fill	Starch and borophosphate complex	5 inches in 4.4 seconds
7	14×10 100% AVISCO PFR rayon	Starch	5 inches in 5.5 seconds

A borophosphate complex suitable for imparting enhanced flame resistance is sold under the trademark PYROSAN B by Laurel Products Corporation, 2600 East Tioga, Philadelphia, Pa. 19134. A somewhat similar inorganic phosphate type retardant is sold under the tradename APEX 311 by Apex Chemical Co., Inc., 200 South First St., Elizabethport, N. J.

AVISCO PFR is the trademark under which FMC Corporation, 1517 John F. Kennedy Boulevard, Philadelphia, Pa. 19103, markets a permanent flame retardant regenerated cellulose fiber made in accordance with the teachings of U.S. Pat. No. 3,455,713. Another suitable permanent flame retardant regenerated cellulose material is available in fiber form from Courtaulds of North America, P.O. Box 9262, Plaza Station, Greensboro, N. C., under the tradename DURAFIL FR.

A preferred embodiment of the invention which will pass the 45° inclined test method AATCC-33-1962 is as follows:

1. A typical 14 × 10 off-the-loom fabric of the invention with untreated cotton filling yarns and slash treated flame resistant cotton warp yarns — the slashing fluid being a solution of 5 percent cornstarch and 10 percent ammonimum borophosphate with a wet pickup of 100 percent of the weight of the untreated warp yarns. The fabric had a burning time of 3.7 seconds.

Another preferred embodiment of the invention which will pass both the 45° inclined test method AATCC-33-1962 and the proposed Motor Vehicle Safety Standard horizontal test method No. 302, is as follows:

2. A typical 14 × 10 off-the-loom fabric of the invention with AVISCO PFR rayon filling yarns and slash treated flame-resistant cotton warp yarns — the slashing fluid being a solution of 5 percent cornstarch and 10 percent ammonium borophosphate — 100 percent wet pickup based on the weight of the untreated warp

yarns. Under the 45° test the burning time was 4.4 seconds. By the horizontal No. 302 test, the fabric was self-extinguishing and after being ignited did not burn 1 ½ inches from the starting point.

3. A third 14 × 10 preferred fabric of the invention, similar in every way to preferred embodiment (1) was sprayed after leaving the loom with a 10 percent aqueous solution of an inorganic phosphate to apply 8 percent solids based on the off-the-loom fabric. This fabric passes both tests and is less expensive than embodiment (2). Under horizontal test No. 302 the fabric ignited but self-extinguished before it had burned 1 ½ inches from the starting point.

Preferred Rot and Fungus Protection Embodiments of the Invention

An example of the method of the invention, as applied to rot and fungus protection used in treating the warp yarns before interweaving them with untreated filling yarns is as follows:

EXAMPLE 1

Thirty-one singles cotton warp yarns were sized (and dried in the usual manner) with the following sizing fluid:

Cornstarch 9 percent based on the weight of the solution;

Methyl dodecyl benzyl trimethyl ammonium chloride, 2.5 percent based on weight of the solution.

Wet pickup was 100 percent based on the weight of the warp yarns or a percent fungicide solids of 2.5 percent.

The dried rot-resistant warp yarns were interwoven with 39 singles untreated cotton filling yarns to produce a 32 × 28 fabric.

In determining the mildew and rot resistance of cloth produced in accordance with the invention, the soil burial method described in Federal Method 5762 of May 15, 1951 (CCC-T-191b) published by General Services Administration, Business Service Center, Region 3, Seventh and D Sts. S.W., Washington, D.C., was utilized.

After burial, in accordance with Method 5762 for fourteen days, an untreated control cloth similar to that in Example 1 (but without fungicide) was substantially destroyed by rot and mildew whereas treated samples of Example 1 were substantially free of rot and mildew and retained from 70 percent to 90 percent of the original tensile strength in both warp and fill directions. The preferred sizing has a cornstarch base and includes from 2.5 to 5 percent solids fungicide preferably a quaternary ammonium compound such as methyl dodecyl benzyl trimethyl ammonium chloride.

What is claimed is:

1. A method of making chemically protected off-the-loom fabrics comprising

treating unsized cellulosic warp yarns in a water bath with a water compatible size containing a non-volatile substantially cold water insoluble chemical protecting material

drying the sized and chemically protected warp yarns and

interweaving said warp yarns with unsized and untreated cellulosic filling yarns to provide an off-the-loom fabric

exposing said fabric to moisture to cause partial transfer of said chemical protecting material from said warp yarns to said filling yarns to chemically protect the entire fabric without further treatment thereof.

2. A method as claimed in claim **1** wherein said protecting material is of the class consisting of:

flame retardants, rot and fungus retardants, bacteria retardants and insect retardants for protection of said fabric.

3. A method of enhancing the flame resistance of a cellulosic fabric comprising

treating unsized cellulosic warp yarns in a water bath with a water compatible size containing a non-volatile, substantially cold water insoluble size including three to twenty percent of a non-volatile flame-retardant agent, based on the weight of the unsized warp yarns, dispersed throughout the size

drying the sized warp yarns and

interweaving said warp yarns with unsized and untreated cellulosic filling yarns to provide an off-the-loom fabric

exposing said fabric to moisture to cause partial transfer of said flame-retardant agent from said warp yarns to said filling yarns to flame retard the entire fabric without further treatment thereof.

4. A method of enhancing the mildew and rot resistance of a cellulosic fabric comprising

treating unsized cellulosic warp yarns in a water bath with a water compatible size containing non-volatile, substantially cold water insoluble size including one percent to five percent of a fungicide agent, based on the weight of the unsized warp yarns, dispersed throughout the size

drying the sized warp yarns and

interweaving said warp yarns with unsized and untreated cellulosic filling yarns to provide an off-the-loom fabric

exposing said fabric to moisture to cause partial transfer of said fungicide agent from said warp yarns to said filling yarns to protect the entire fabric from mildew and rot without further treatment thereof.

* * * * *