Oct. 20, 1936. W. L. WIRBELAUER 2,058,120

COLORED FIRE RESISTANT FABRIC AND METHOD OF MAKING THE SAME

Filed March 1, 1933

Fig. 1.

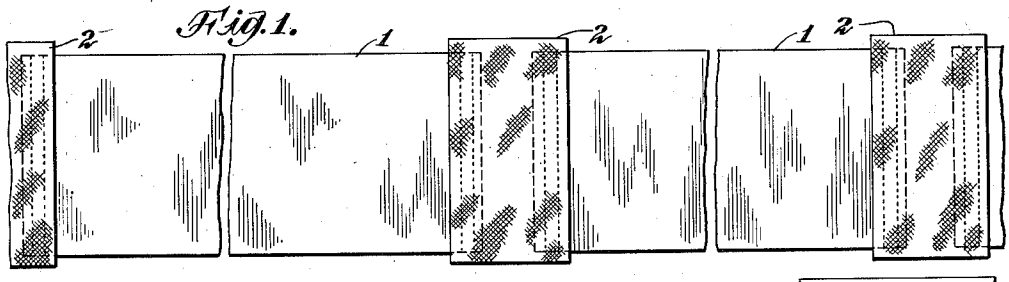


Fig. 2.

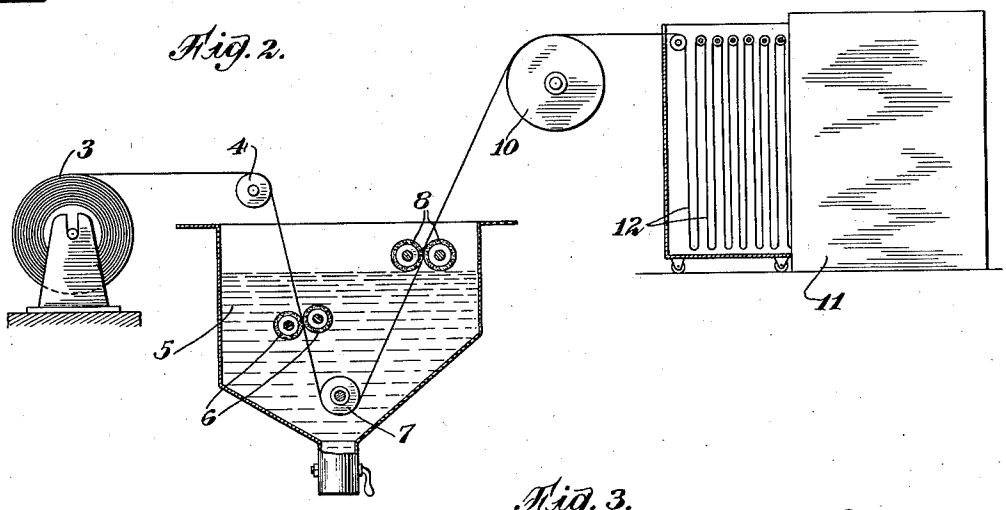


Fig. 3.

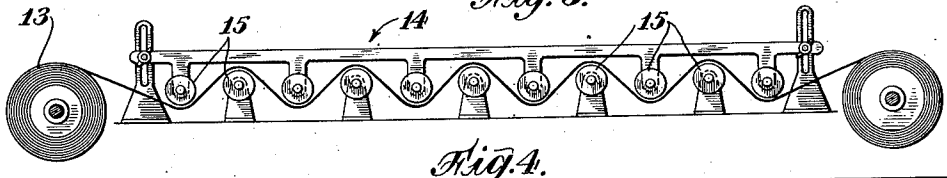


Fig. 4.

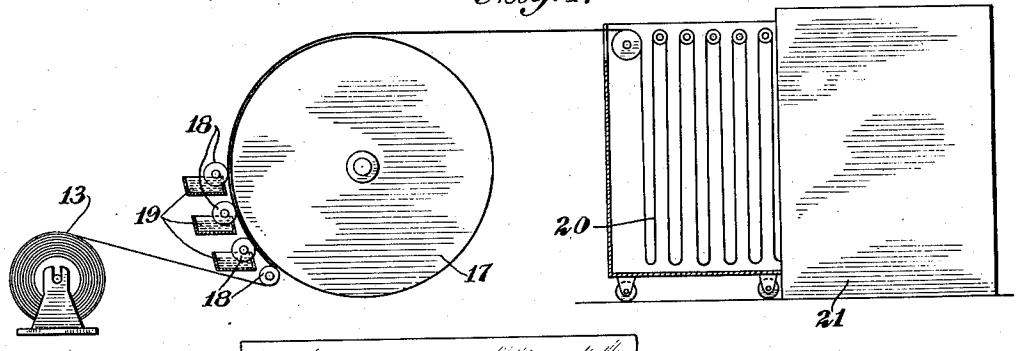
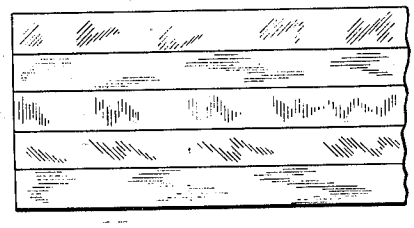


Fig. 5.



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COLORED FIRE-RESISTANT FABRIC AND METHOD OF MAKING THE SAME

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Application March 1, 1933, Serial No. 659,136

3 Claims. (Cl. 91—68)

This invention relates to a colored, fire-resistant fabric, particularly one comprising woven asbestos cloth as the base material, and to the method of making the same.

There is a recognized need for colored, fire-resistant fabric. Attempts have been made to develop a decorative asbestos cloth, for use in making awnings or for other purposes for which common textile materials have the disadvantage of inflammability; but, because asbestos fabrics are not susceptible to being colored thoroughly and durably by usual methods, such as dyeing, there has not been developed heretofore a satisfactory product.

In the preferred embodiment, the invention comprises a colored fabric including a base material of woven asbestos and, impregnated thereinto, a coloring composition that is preferably an oil paint containing conventional ingredients and also special additions, to impart the desirable properties of resistance to burning, to penetration by water, and to the action of mildew, and to increase the pliability. The invention comprises also the improved coloring composition of the properties described and the method of applying it, in such manner as to produce thorough impregnation of the base fabric and pliability of the finished product.

The method of making the improved product of the present invention includes the thorough impregnation or saturation of asbestos cloth or the like with a relatively fluid coloring composition comprising a pigmentary material, a binder therefor, and special ingredients added to impart the particular properties which have been indicated as desirable. The impregnation or saturation step is followed by a heat or other treatment adapted to set or harden the treating liquid, as, for example, by removal of volatile thinner and the oxidation of oxidizable material therein. To the product so made, there may be applied another additional coloring composition, in limited areas, as, for example, in stripes upon the surface of the colored base material.

The coloring composition impregnated into the asbestos cloth or the like may include ingredients from the following classes of materials:

(1) A pigment, to establish the color desired, as, for example, titanium oxide, zinc oxide, stannic oxide, or other pigment or mixture of pigments.

(2) A binding material that, after being dried or set upon the fabric, is not removed by washing with water, is somewhat flexible, and that is durable upon exposure, as, for example, a drying oil such as linseed oil, China-wood oil, or other paint oils or mixtures thereof.

(3) A plasticizing agent adapted to increase the pliability of dried paint film, the plasticizer being substantially non-volatile at atmospheric temperatures, practically permanent in the film, and preferably also combustion-retarding. Tricresyl phosphate is suitable for this purpose. Triphenyl phosphate may also be used. Likewise, petrolatum (a soft petroleum wax) or menhaden oil may be used, if effective combustion-retarding properties of the plasticizer are not essential for the particular use for which the product is to be used.

(4) Inorganic combustion-retarding material, adapted to reduce the rate of burning of a paint film, by decreasing the proportion of combustible material therein, including inert, incombustible, powdered materials of which very finely divided mineral matter, such as comminuted diatomaceous earth used in substantial proportion, is the preferred example. Very fine talc or barytes, in substantial proportion, may also be used for the purpose.

(5) Combustion-extinguishing material. Examples of this type of material are the substantially non-volatile, incombustible, paint-soluble, water-insoluble products such as chlorinated naphthalene and chlorinated diphenyl derivatives, suitably the polychlor compounds that, when present with the other ingredients in a burning film develop a gas that tends to exclude oxygen and thus extinguish the flame.

(6) Waterproofing ingredients, to decrease the susceptibility of the finished product to leakage of water therethrough, as, for example, aluminum stearate, aluminum naphthenate, or other material or mixtures adapted to produce negative capillarity for water.

(7) A mildew-proofing agent such as 3-chlor-2-hydroxy-diphenyl, ortho-phenyl-phenol, or trichlorphenol. This type of material is used when the base fabric contains a proportion of cotton fibers or the like that are susceptible to the action of mildew. The mildew-proofing agent should be substantially non-volatile at atmospheric temperatures, stable on exposure to air, water, and sunlight, and compatible with the other ingredients of the paint film, but are preferably not soluble in water.

(8) A resin such as a usual varnish resin, as, for example, "ester gum" (the substantially neutral reaction product of glycerin and rosin) or dammar resin. The resin is added suitably in the form of a spar varnish, say a varnish con-

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taining 35 gallons of China-wood oil to 100 pounds of the resin. The functions of the resin include increasing the rate of drying of the impregnated product and improving the adherence of the colored film to the fabric in the finished product.

(9) A paint drier, to accelerate the rate of drying of the impregnated product, as, for example, the linoleate of lead and manganese or oleate of cobalt or nickel.

(10) Thinner of conventional type, to increase the fluidity of the composition at the time that it is being applied to the fabric base. Such a thinner is petroleum spirits of volatility somewhat greater than that of kerosene, a so-called "turpentine substitute."

It is to be understood that ingredients of the several types mentioned may be omitted from the composition if their function or properties are not desired in the finished product and that the materials of types mentioned may be substituted by equivalent materials.

The materials used and the method of manufacture of the product of the invention are illustrated specifically in the following examples, reference being made to the attached drawing in which:

Fig. 1 is a plan view of pieces of asbestos cloth attached to each other by leaders or union members, preparatory to being passed through the coloring composition;

Fig. 2 is a diagrammatic side view, partly in section, of equipment that may be used in impregnating the cloth with the coloring composition and drying the impregnated product;

Fig. 3 is a side view, also diagrammatic and partly in section, of equipment that may be used to increase the pliability of the finished product, if the desired degree of pliability is not obtained otherwise;

Fig. 4 is a side view, diagrammatic and partly in section, of equipment for applying stripes of coloring composition to a previously colored base product and drying the striped product; and

Fig. 5 is a plan view of the finished colored and striped asbestos cloth.

In the various figures like refernce characters denote like parts.

Thus, there are shown units of fire-resistant, fibrous material, such as asbestos cloth **1**, attached to each other at their ends by short lengths of muslin or other flexible material **2**. These assembled pieces of asbestos cloth are formed into a roll **3**, and then unrolled and passed, in single thickness, over the guide roller **4**, into the bath of relatively fluid impregnating coloring composition **5**. To cause the impregnating liquid to be forced into the cloth, the cloth is passed between the pair of coacting rollers **6** that are immersed in the coloring composition and forced against each other by spring or other pressure, then over the guide roller **7**, out of the bath, and then between one or more pairs of squeeze rollers **8**, which act as a wringer, to remove the excess of impregnating liquid. The cloth may be passed over the guide roller **10** and then into the drier **11**. For economy of space, the impregnated cloth may be hung in festoons **12**, as it is passed into and through the drying chamber. The drying chamber is maintained at atmospheric temperature or above, say at 100 to 120° F. The drying fixes or sets the coloring composition in situ, in intimate association with the asbestos fibers.

After the product has been dried until it is not tacky, it may be formed into a roll **13** and sent through a socalled "breaker" indicated generally at **14** (Fig. 3). This breaker consists essentially of means for causing the cloth, while under tension, to be flexed alternately in one direction and then in the other, as by being passed over rollers **15** which are arranged in series, in offset relation to each other, as illustrated. During passage of the cloth under tension over these rollers with the consequent repeated flexing thereof, the continuous paint film that may have been formed in the cloth originally, is broken or fractured, at close intervals, in a direction transverse to the length of the piece of cloth.

The use of the breaking step or the equipment illustrated in Fig. 3 is optional and may be omitted except in cases where the coloring composition used is not of itself adapted to give a sufficiently pliable film, in the finished product, without being broken subsequent to drying.

The dried product, either after breaking or without breaking is available for use or for the application, in selected areas, of a coloring material of different color or shade from that first used. Thus the uniformly colored base fabric may be subjected to strong compression, by being passed between calender rolls (not shown), to smooth the surface, and then to a printing or to a striping operation, as illustrated in Fig. 4, to give a striped product of the type shown in Fig. 5. Thus the cloth in the roll **13** may be unrolled, calendered, and passed, in smooth form, over the large drum **17**, against which operate the striping rollers **18**. Each of the striping rollers is partly immersed in a bath **19** of coloring material and is adapted to apply the coloring material to the colored fabric, in stripes of selected width and position, according to the width of the face of the rollers and the placement of the rollers.

After being striped, the product may be formed into festoons **20** and sent through the drier **21**.

The finished product may contain a plurality of stripes of selected colors, as illustrated in Fig. 5.

A typical composition used for coloring asbestos cloth by impregnation is the following:

Coloring composition used

	Parts by weight
Pigments	22.5
Pulverized diatomaceous earth	2.5
Boiled linseed oil	15.0
Spar varnish	5.0
Tricresyl phosphate	3.0
Aluminum naphthenate	0.75
Aluminum stearate	0.75
Polychlordiphenyl	14.0
3-chlor-2-hydroxy-diphenyl	0.5
Linoleate of lead and manganese	1.0
Volatile thinner (petroleum spirits)	35.0
Total	100.00

These ingredients may be compounded into a paint composition in conventional equipment. The pigment and diatomaceous earth may be ground with the oil and varnish, and a small amount of the thinner added thereto to give proper consistency to the paste. The aluminum stearate and naphthenate may be dispersed in a small portion of the thinner, at a temperature of 160–180° F., to give a solution containing approximately 5 to 10 parts of dissolved material to 100 parts by weight of the total mixture. The color paste and the dispersion of stearate and naphthenate so made are then blended with the remainder of the materials.

The coloring composition used for striping may

be similar to that described above. However, if applied to a previously impregnated base fabric, it is not necessary that the striping composition should contain the waterproofing or all of the other ingredients of the base color coat. Also, the striping composition, since it is not to be impregnated into a fabric and should not flow too readily, may contain a small proportion only of thinner and be substantially less fluid than the composition used for impregnating and forming the base color.

A typical composition that has been used satisfactorily for print stripes, designs, or other colored effects upon the base material, is the following:

	Parts by weight
Pigment (iron oxide)	30
Spar varnish	20
Polychlordiphenyl	10
Thinner (petroleum spirits)	5
Linoleate of lead or manganese	1.0
3-chlor-2-hydroxy-diphenyl	0.5

The asbestos cloth used as a base material may contain a certain proportion of cotton, or other textile fiber, say one part of cotton by weight, spun with four parts of asbestos fibers. It is to protect such fiber susceptible to mildew that a mildew-proofing ingredient is added to the coloring composition.

The finished product of the present invention is decorative and as awning cloth, for example, has very satisfactory properties. The color does not fade rapidly in sunlight and is not washed out by rain. Furthermore, the cloth does not permit leakage of water through it; it is impermeable to water over considerable periods of time. Cut edges of the cloth have approximately the same color as the base color coat of the original surfaces. The pliability is so great that the cloth may be flexed repeatedly without breaking. The impregnation process, in which the coloring composition is forced into the fabric base material, gives a good footing to the coloring composition, whereby scaling or peeling off of the composition is prevented; a film of coloring matter is formed around the fibers in the fabric base and is set in situ. When the cloth is ignited, as by a small flame, the combustion thus initiated quickly ceases when the source of ignition is removed.

While the product of the invention has been described as being particularly desirable for use as awning cloth, it may be used also for other purposes, as, for example, for tents, canopies, covering of mattresses, and fabric for steamer chairs and other ship purposes.

In cases where a high degree of resistance to burning, pliability, or brilliance of color is not desired, the binder in the coloring composition may be a cellulose ester, as, for example, cellulose nitrate or acetate.

The coloring composition comprising the cellulose ester binder is a modified lacquer. Such a lacquer may be of conventional type plus the special ingredients necessary to give resistance to burning to the action of mildew to penetration by water and to increase the pliability. Thus, the lacquer may contain pyroxylin, usual lacquer solvents and thinners, pulverized diatomaceous earth, tricesyl phosphate, aluminum naphthenate and stearate, a polychlor-diphenyl, and/or 3-chlor-2-hydroxyl-diphenyl.

In case the lacquer used is one having a cellulose acetate base, then the acetate is substituted for the pyroxylin in the composition described and the solvents and thinners are changed to those which are suitable for use with the acetate.

The details that have been given are for the purpose of illustration and not restriction, and many variations therefrom may be made without departing from the spirit and scope of the invention.

What I claim is:

1. A colored article of manufacture comprising asbestos cloth and paint associated therewith, the said paint including 3-chlor-2-hydroxy-diphenyl.

2. Colored asbestos cloth, adapted for use in awnings, comprising asbestos cloth and, associated therewith, a pliable coloring composition including a drying oil, a pigment, and combustion extinguishing, waterproofing, mildew-proofing, and plasticizing agents, the said coloring composition being provided with fractures at close intervals, to increase the pliability.

3. The method of making a decorative, fire-resistant fabric which comprises applying a paint composition in relatively fluid form to asbestos cloth, forcing the composition into the cloth, to impregnate it throughout, setting the paint composition in situ, then calendering the product, whereby smoothing of the surface is produced, then applying another coloring composition to the smoothed surface, in selected areas, drying the said composition and then increasing the pliability of the product by repeatedly flexing it, to fracture the set coloring composition.

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