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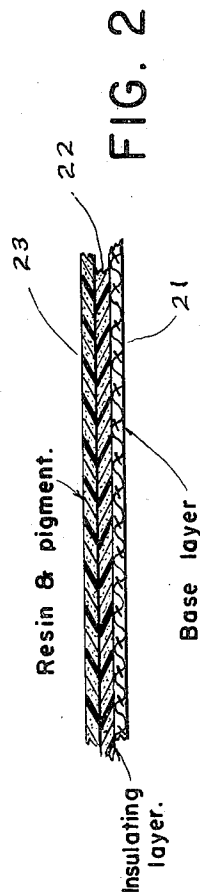
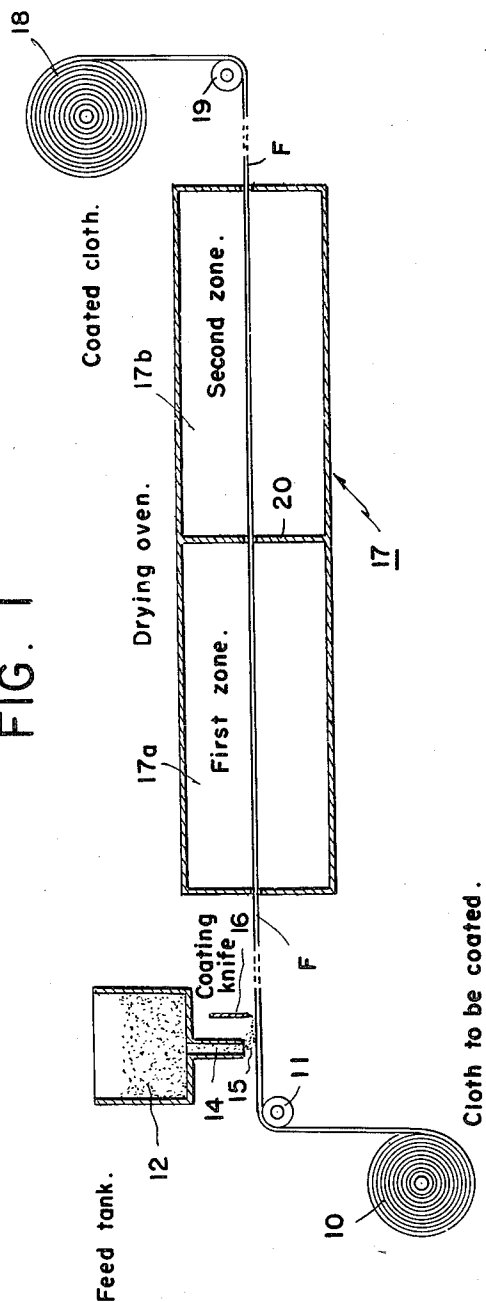
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PROCESS FOR PREPARING A HEAT INSULATED FABRIC

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FIG. 1



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PROCESS FOR PREPARING A HEAT INSULATED FABRIC

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This invention relates to coated fabrics and methods of preparing the same and more particularly to coated textile fabrics adapted for use in the manufacture of wearing apparel such as in outer garments of all sorts, including suit materials, jackets, coats, etc., as well as in bed garments, gloves, footwear and hats. In its more specific aspects, the invention relates to and is concerned with a new and improved coated textile fabric of this nature which is provided with a base or under fabric of textile material of any desirable fiber and weave having thereon a thin coating of heat-insulating material which, in turn, is covered with a thin outer protective coating for the insulating coating.

There have been efforts made heretofore to produce heat-insulating clothing and included in these efforts were attempts to laminate with the fabric metallic foil reflecting liners. These attempts have been failures because metal foils for use in garments are simply too heavy for this purpose and militate against optimum hand of the fabric. Other workers in the art have improved upon the foregoing procedure by coating the fabric with a thin, discontinuous film containing metallic flakes, the flakes being held on the surface of the fabric by an organic binder. Such a coated fabric, however, has the inherent disadvantage that the insulating coating is entirely unprotected and liable to be chipped, cracked or dislodged from the base fabric or otherwise deteriorated during use of the garment.

It is, accordingly, one of the prime objects of the invention to provide a textile fabric of this nature having a base or under fabric of textile material of any desired fiber and weave and having thereon a thin coating of substantially opaque heat-insulating material comprising a thin, continuous film containing metallic powder, and a protective outer coating superimposed over said insulating coating to hide the base fabric completely and to protect the insulating coating against wear and tear and against breaking and dislodgement from the base fabric.

A further object is to provide a coated textile fabric of the foregoing character which may be used in outer clothing of all sorts and in which the insulating coating is not only hidden from view at all times, but which is protected against wear by the outer protective layer.

A still further object is to produce a fabric of this nature in which most of the physical characteristics of the base fabric are retained, such as flexibility, pliability and springiness.

A still further object is to provide a coated fabric in which the outer layer may be of any desired color and which may be embossed to simulate leather as well as other materials.

Other objects will be apparent and will become obvious as a description of the invention proceeds.

Briefly stated, the process by which the foregoing insulating textile material is produced comprises (1) applying to the base fabric an insulating layer which consists of a coating of an organosol having dispersed there-

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in the desired metallic powder, (2) heating the coated fabric to drive off the diluent of the organosol and melt the resin particles and plasticizer thereof to form a continuous film with the metallic powder bound in place by the resin, (3) calendering the thus coated fabric to "iron" the base coat and thus produce a smooth surface for application of the top or outer coat, (4) applying a protective coating to the insulating coating, the protective coating comprising another organosol similar or identical to that employed in the insulating coating but containing instead of metallic powder, one or more coloring pigments, (5) again heating the coated fabric to drive off the diluent from the organosol to fuse the resin and plasticizer and bind the pigment in place, and then (6) embossing or otherwise treating the top coat to produce any desired pattern.

The base or under fabric employed in accordance with the invention may be any of those which are commonly in use today and include fabrics made of natural fibers such as cotton, wool, silk, linen and ramie, as well as fabrics prepared from synthetic fibers of cellulosic origin such as rayon, cellulose acetate or any of the regenerated celluloses. Fabrics made from true synthetic fibers may also be employed and such fibers may be polyvinyl chloride, polyvinyl acetate, vinyl chloride-acetate copolymers, polyvinylidene chloride, as well as any synthetic linear condensation super polymers, such as linear polyamides of which nylon is typical. Of course, the base or under fabric may be in any desired pattern or color, printed or woven, or it can be plain white or dyed in any desired solid shade.

The organosol employed in each coating step is substantially the same except that the organosol employed in the insulating coating has metallic powder dispersed therethrough whereas the organosol employed in the protective coating has coloring pigments dispersed therethrough. Organosols consist of an appropriate synthetic resin dispersed with a plasticizer in a thinner or diluent, along with a stabilizer and filler, if deemed desirable.

Any appropriate particle-binding, film forming synthetic resin may be employed in the foregoing organosols, such as polyvinyl chloride or copolymers of vinyl chloride and vinyl acetate. Particularly good results are obtained by the use of the Vinylite resins VYNV. 1 and VYNV. 2, which are the vinyl chloride-acetate resins developed by Bakelite Corporation expressly for dispersion use.

As plasticizers in the organosols there may be employed any of the common natural plasticizers such as abietic acid esters, castor oil, tung oil, linseed oil and soy bean oil or any of the common esters such as dimethyl phthalate, dibutyl phthalate, dioctyl phthalate (2-ethyl hexyl), di-B-butoxy ethyl phthalate, dicapryl phthalate and various mixed phthalates, butyl stearate and related esters, dibutyl sebacate, dioctyl sebacate, methyl glycolate and tricresyl phosphate.

As thinners or diluents the following may be employed: benzene, toluene, and xylene which represent a moderate choice of aromatic thinners, while aliphatic hydrocarbons such as petroleum ether or hexane may be used. Typical proprietary thinners and diluents are: "Apcothinner," "Sovasol" #3, "Sovasol" #4, Hi-Flash Naphtha, VM & P Naphtha, "Solvesso" Xylol, "Solvesso" 100 and "Solvesso" 150. Ester diluents or thinners include methyl formate, ethyl acetate, n-butyl acetate, amyl acetate, 2-ethylhexyl acetate, methylamyl acetate, 2-ethylbutyl acetate, Cellosolve acetate, isobutyl propionate and butyl lactate. Also the various Cellosolves such as ethylene glycol monoethyl ether, propylene glycol monoethyl ether, etc., as well as Carbitol and butyl Carbitol. Similarly, chlorinated hydrocarbons such as methylene chloride, chloroform, carbon tetrachloride, ethylene dichloride and

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chlorobenzene may be used. Ketones such as acetone, methyl ethyl ketone, diisobutyl ketone, methyl isobutyl ketone cyclohexanone and similar volatile ones find use as diluents in the composition. Certain volatile ethers such as di-ethyl ether, dioxane, or diisopropyl ether, as well as certain alcohols such as isobutanol, 2-ethylhexyl alcohol, and cyclohexanol have some use as diluents and thinners for some resins. The classes of diluents and thinners may also be used in admixture with each other consistent with the principles set forth.

Included in the foregoing list, many of the ketones and esters have the dual function in the organosol of being dispersants as well as thinners and diluents.

The organosols also preferably contain stabilizers such as fused lead stearate, basic lead phosphite, stabilizer A-5, stabilizer C-2, stabilizer G-18 and Victor stabilizers 53 and 85 and various fillers such as calcium carbonate, York whiting, "Surfex," "Atomite," etc.

As stated hereinbefore, the metal powder is dispersed through this organosol to form the insulating coating. Preferably the metal powder is of pure aluminum of such particle size that 99% thereof pass through a 325 mesh screen. However, the invention is not limited to aluminum powder since other metallic powders such as powders of copper, silver, iron, steel, brass, bronze, Monel metal, zinc, or any alloy of two or more of the foregoing, may be employed in powder form. Naturally, consideration of economics will dictate the selection of the metal or alloy employed.

In the protective coating, the organosol employed is identical with the foregoing organosol except that instead of having metallic powder dispersed therein it has a coloring pigment, preferably in the form of a color paste, including a plasticizer. Among the pigments found suitable are, "Mapico" iron brown No. 420, "Mapico" lemon yellow, "Mapico" black, "Mapico" brown No. 418, "Titanox" A-168 LO, chrome green, medium, fast violet, lamp black, oiled carbon black, basic silicate white lead, basic sulfate white lead, blue basic lead sulfate, basic lead carbonate, "Asbestine" 3X, and "Metro-Nite" BXXXX. Of course, some of the foregoing come under the category of "fillers" and may be employed as such in the organosol.

In each or both of the coating compositions, the organosol is prepared according to the following general formulation:

	Pounds
Resin	100 to 150
Plasticizer	40 to 100
Stabilizer	2 to 6
Filler	0 to 150
Thinner and diluent	15 to 120

In the preparation of the insulating coating, the foregoing ingredients are ground in a pebble mill for about 12 hours, and then the dry metal powder is added thereto and thoroughly mixed in the following approximate proportions:

	Pounds
Organosol	80 to 95
Metal powder	20 to 5

With respect to the top or protective coating, the organosol is the same as above, but instead of adding metallic powder thereto, as in the case of the insulating layer, a desired color pigment is ground with a plasticizer on a three-roll mill to form a color paste in the following proportions:

	Pounds
Pigment	20 to 70
Plasticizer	80 to 30

This color paste is then added to and thoroughly mixed with the organosol in the following proportions:

	Pounds
Organosol	80 to 90
Color paste	20 to 10

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In order to disclose a specific embodiment of the invention, reference is now had to the accompanying drawing in which Fig. 1 shows, in more or less schematic flow sheet form, the apparatus employed in carrying out the present process, while Fig. 2 shows a cross section of the finished composite coated fabric.

In carrying out the process an organosol composition is first prepared having the following formulation:

	Pounds
Vinylite Resin VYNV. 1	100
Diocetyl phthalate (plasticizer)	60
Basic Lead phosphite (stabilizer)	2
Calcium carbonate (filler)	15
Xylol ¹	15
Apcothinner ¹	30

¹ Thinner and diluent.

The foregoing ingredients are ground in a pebble mill for approximately 12 hours. The dry aluminum powder (99% through 325 mesh screen) is then added and thoroughly mixed in the following proportion:

	Pounds
Organosol	200
Aluminum powder	20

In the flow sheet of Fig. 1 reference character 10 represents a roll of base or under cloth fabric which is adapted to be passed over a roller 11 and beneath a feed tank 12 which has a broad spout 14 equivalent to the width of the cloth from whence the coating material 15 flows onto the moving fabric. A conventional coating knife 16, positioned just downstream from the point where the coating material is deposited, spreads the metallic coating uniformly across the fabric which then passes through a suitable drying oven 17 to drive off the volatile liquids. It is then wound onto a take-up roll 18 which is driven by a suitable means such as a driven friction roll 19.

In the drying of the insulating coat, a simple drying oven is employed, contrary to the showing in the drawing. The temperature in this single drying oven is maintained at a temperature of 250° F. and the speed of the coated fabric passing through the drier is such that the fabric is subjected to this heat for 1¼ minutes. The roll of base coated fabric is then taken to a rolling calender which irons the base coat, thus producing a smooth surface for the application of the top coat.

The top coat formulation is the same as the base coat except that the particular color pigment to be used is ground in a plasticizer on a three-roll mill before adding to the organosol. Of course, the metallic powder is omitted from the top coat formulation. The color paste employed in this example is as follows:

	Pounds
Titanium dioxide	20
Diocetyl phthalate	20

This paste is then added to the organosol and thoroughly mixed in the following proportion:

	Pounds
Organosol	200
Color paste	40

The top coat is applied by knife coater illustrated in the flow sheet in the same manner as the base coat, but the dryer temperature is different. Instead of employing a single dryer such as in the drying of the insulating coating, there are provided two drying chambers 17a and 17b with a division wall 20 therebetween, with a suitable slot through which the fabric F will pass. In the first half or the first zone of the dryer indicated at 17a, the temperature is approximately 290° F. In the second half or portion 17b the temperature is preferably around 400° F. The cloth is in each zone about 35 seconds. In other

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words, 35 seconds is consumed by the cloth traveling through each of the heated chambers 17a and 17b.

The high temperature in the second heated chamber 17b is to fuse the resin, that is, to melt the resin particles in the plasticizer to form a continuous film. It must be particularly pointed out that both base and top coats are fused in this operation and that there is some interfusing between the two coating layers to form a stronger and more stable coated fabric. The coated cloth as it emerges from the dryer is rolled up as before after which the top coating on the cloth may be embossed in any desired pattern.

Fig. 2 in the drawing shows the completed coated fabric. The base or under fabric is denoted by reference character 21, the intermediate insulating layer containing the powdered aluminum by the reference numeral 22 and the top coat with the colored pigment by the reference numeral 23.

Both the aluminum base coat and the colored top coat may be applied as a plastisol, which is a dispersion of resin and pigment in plasticizer only, with no volatile liquids being present, or as a lacquer in which case the resin binder is actually dissolved in volatile solvents rather than being dispersed in volatile liquids which are non-solvents for the resin. The plasticizer, stabilizer, filler and pigment are added to the resin solution. The lacquer is knife-coated as in the case of the organosol or plastisol but the "fusing" operation is not necessary as a continuous film is formed by evaporation of the resin solvent.

What is claimed is:

1. A process for preparing a heat-insulated fabric suitable for use in wearing apparel which comprises coating an initially uncoated base fabric with a first organosol containing from about 5 to about 20% aluminum powder, heating the coated fabric at a temperature of about 250°

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F. for about 1¼ minutes to drive off the volatile liquid from the organosol and leave a heat-insulating coating on the fabric, coating said insulating coating with a second organosol containing from about 10% to 20% non-metallic coloring pigments, and then heating the thus coated fabric in two stages, one at about 290° F. for about 35 seconds and the other at about 400° F. for about 35 seconds first to drive off the volatile liquid from the second organosol and then to interfuse the resin and plasticizer in both organosols.

2. A process for preparing a heat-insulated fabric suitable for use in wearing apparel which comprises coating an initially uncoated base fabric with a first organosol containing from about 5% to about 20% aluminum powder, heating the coated fabric at a temperature of about 250° F. for about 1¼ minutes to drive off the volatile liquid from the organosol and leave a heat-insulating coating on the fabric, coating said insulating coating with a second organosol containing from about 10 to about 20% non-metallic coloring pigments, and then heating the thus coated fabric in two stages, one at about 290° F. for about 35 seconds and the other at about 400° F. for about 35 seconds first to drive off the volatile liquid from the second organosol and then to interfuse the resin and plasticizer in both organosols, and finally embossing the top coating to the desired design.

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