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2,885,303

COATED FABRIC

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Fig. 1

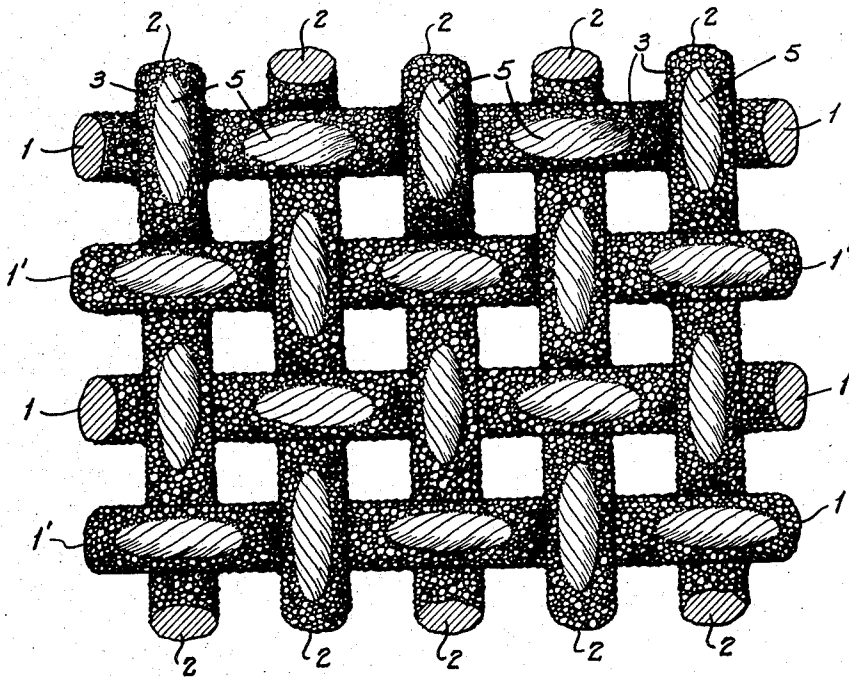
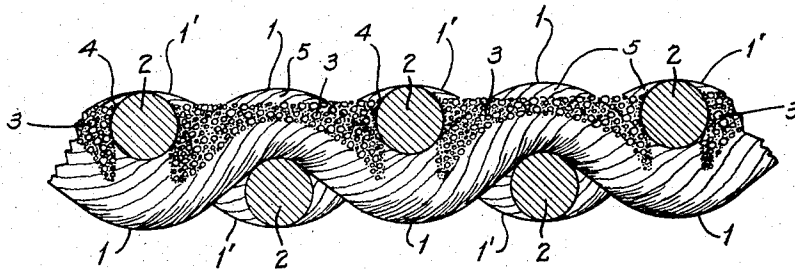


Fig. 2

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2,885,303

COATED FABRIC

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8 Claims. (Cl. 117—37)

This invention relates to an improved lightweight heat-insulating fabric and to a method for the production of such fabric.

Previous attempts to produce a satisfactory lightweight heat-insulating fabric by treating said fabric in various manners have failed, either completely or to the extent of being no improvement over the untreated cloth. Frequently the result of any gain in decreasing the rate of one type of heat transfer was at the cost of increasing the rate of another type. One of the most efficient coatings developed failed because it not only cut down the rate of heat transfer through the fabric but eliminated entirely the ability of the fabric to breathe, preventing the evaporation of perspiration or even the removal thereof by the capillary action of the cloth fibers.

My invention comprises the treating of a cloth fabric by coating one face or, if desired, both faces of a piece of cloth with an insulating layer of hollow microspheroids formed from plastics such as urea-formaldehyde resin or phenolic resins, or from glass, and caused to adhere to the fabric and to each other by means of a binder. The coating is applied to the fabric in the form of a suspension of the hollow microspheroids in the binder solution, which also acts as a vehicle for the application of these hollow microspheroids. It is further to be noted that this composition is applied in such a manner that the insulating materials in the binder are deposited in the interstices made by the weave of the cloth. The method of application is such that it prevents the deposition of the composition on the raised curved surfaces of the yarns of the fabric. The avoidance of such deposition on the raised curved surfaces of the fabric yarns insured the porosity and capillarity necessary for the proper breathing of the fabric with which the persons are attired.

This invention represents an advance over lightweight heat-insulating fabrics both past and present in that the application of a heat-insulating layer to the fabric treated, while decreasing the rate of heat transfer by means of conduction, does not open any easier path for the heat to escape by means of convection or radiation as has been the case heretofore. An instance of this occurs in the use of heat-reflective metallic particles which while reducing the heat lost through radiation provided for a greater amount of heat to escape because of the high conductance of the particles in question. The composition of the present invention provides for proper porosity and capillarity of the fabric treated. Prior coated fabrics while giving their attention to proper porosity have overlooked the obvious necessity of providing a means for the removal of superficial body moisture by means of the capillarity of the fabric in contact therewith. The coated fabric produced by this invention is satisfactory for all normal employments of the uncoated fabric. It is suitable for daily use and does not require any special care or maintenance since it is suitable for cleaning in the conventional laundering and dry-cleaning processes.

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It is an object of this invention to provide a lightweight heat-insulating textile fabric the general appearance of which is essentially that of the untreated fabric.

Another object of this invention is to provide a fabric which has adhered to it a heat-insulating coating which retains the desirable qualities of hand, porosity and cleaning properties of the uncoated fabric.

A further object of this invention is to provide a method for producing a lightweight heat-insulating fabric which may be carried out without the use of unique apparatus.

Other objects and advantages of this invention will be obvious to those skilled in the art from the following description read in conjunction with the accompanying figures:

Fig. 1 shows a cross section through the faces of the fabric exposing the intertwined fibers.

Fig. 2 shows a treated surface of a fabric.

Referring now more particularly to the figures, it will be observed the warp 1, 1' is interwoven with the weft 2, the interstices formed by the weave are substantially filled with hollow, inert microspheroids 3 adhered to the yarns by a binder material 4, the curved upper surfaces 5 of the yarns being substantially free of both microspheres and binder. The same numerals are used to designate similar elements in Fig. 2.

Figs. 1 and 2 show separate views of a thin piece of fabric treated according to the method of this invention. They represent the preferred embodiment; that is, the coating of only one side of the fabric which is to be made heat-insulating. The material is coated by means of an apparatus such as a knife-coater, which causes the hollow microspheroids and binder vehicle to be deposited in the interstices somewhat below the plane marked by the uppermost surfaces of the yarns making up the face of the fabric coated. The binder causes the hollow microspheroids to adhere to the exposed surfaces of the threads and to one another, but leaves free the upper surfaces of the yarns in the fabric and the spaces formed beneath said threads. This provides the desired porosity in the fabric treated, as well as a surface which has capillarity of a relatively high order. The area of deposition is more plainly shown in Fig. 2, which is a somewhat exaggerated expansion of a fabric with the warp and weft more widely separated than is apt to be found in actual practice. At each point where a yarn crosses over another, the knife coating method has caused the yarn at this point to be substantially free of the insulating composition, while immediately to the side of this point 5 the insulating composition is packed in below it. Though not shown, any inert pigment such as finely ground mica may be used to modify the appearance of the fabric treated without detracting from the efficiency of the coating as an insulating layer.

The following examples are set forth by way of demonstration and not limitation, and therefore are not to be construed as limiting the scope of the invention to the specific details set forth.

Example 1

In carrying out this invention nitrocellulose lacquer was used as the vehicle and binder for the hollow microspheroids. It weighed 6.46 lbs. per gallon and had a non-volatile content of 43.2%, the volatile portion consisting of 15% ethanol, 35% butyl acetate, and 50% toluol. Into this were incorporated 2.78 lbs. of urea-formaldehyde "Microballoons." The "Microballoons" used have a size range of from 2 to 60 microns or 0.000079 to 0.0024 inch and an average diameter of about 16 microns or .00063 inch. The "Microballoons" are thoroughly blended in the nitrocellulose lacquer. The lacquer is

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then applied to a taffeta fabric by means of a knife-coater, on one side only. This results in a coating which contains approximately 189,000,000 hollow microspheroids per sq. ft. of material. The material thus treated is approximately 140% as effective a heat barrier as the untreated material.

Example 2

A second formulation was made up using 100 lbs. of the nitrocellulose, 15-40 seconds R.S., 35 lbs. of alkyd polyester resin plasticizer (Paraplex G40), 5.25 lbs. of mica pigment, 37.6 lbs. of microspheroids, and 260 lbs. of solvent of the composition used in Example 1. This was applied to taffeta as before, with a similar decrease in the rate of heat transfer.

Other examples of typical formulations used in coating are:

Example 3

	Pounds
Polyvinyl chloride	100
Tricresylphosphate	25
Mica (pass 400 mesh)	8
Methyl ethyl ketone solvent	100
Glass "Microballoons"	28

Example 4

	Pounds
Vinyl chloride-vinyl acetate copolymer (Vinylite resin VYNS)	100
Diocetyl phthalate plasticizer	45
Mica (pass 400 mesh)	4
Methyl ethyl ketone solvent	300
Urea-formaldehyde "Microballoons"	36

Example 5

	Pounds
Vinyl chloride-vinyl acetate copolymer (Vinylite resin VYNS)	100
Diocetyl phthalate plasticizer	45
Mica (pass 400 mesh)	4
Methyl ethyl ketone solvent	300
Phenol-formaldehyde "Microballoons"	40

Example 6

	Pounds
Nitrocellulose, 15 to 40 seconds R.S.	100
Solvent (alcohol 15%, butyl acetate 35%, toluol 50%)	600
Urea-formaldehyde "Microballoons"	70

Example 7

	Pounds
Vinyl chloride-vinyl acetate copolymer	100
Plasticizer dioctyl phthalate	55
Mica (pass 400 mesh and fines removed)	5
Solvent (diisobutyl ketone 20%, xylene 80%)	80
Phenol-formaldehyde "Microballoons"	17

The advantages resulting from this invention are several over the prior art. My suspension of microspheroids is readily obtained using equipment already in existence. The ratio of binder to microspheroids can be accurately controlled. The composition when applied can be dried using conventional equipment at moderate temperatures. The microspheroid suspension in lacquer is stable and can be stored. The hollow microspheroids each form an in-

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dividual heat block. They are not interconnecting as usually is the case with materials in which voids have been formed by means of blowing agents. The volumes of the voids in the present invention exist within a narrow well-defined range, in contrast to the broad and irregular range of the volumes of the voids formed in materials by means of blowing agents. The coated fabric of this invention is an efficient heat insulator but retains the desirable properties of the untreated fabric.

Various changes and modifications may be made in the materials used and the steps set forth in the specification without departing from the spirit or the scope of the invention.

What is claimed is:

1. A woven textile fabric having adhered on the surface thereof hollow microspheroids of low-heat conductivity by means of a binder.

2. A woven textile fabric as set forth in claim 1 wherein the microspheroids and binder substantially fill the interstices formed by the weave but wherein the uppermost surfaces of the yarns remain free from both the microspheroids and the binder.

3. A woven textile fabric as set forth in claim 1 wherein the hollow microspheroids are made from polymers including glass, wherein the binder is selected from the group consisting of nitrocellulose, polyvinyl chloride, and vinyl chloride-vinyl acetate copolymer.

4. A woven textile fabric as set forth in claim 1 wherein the hollow microspheroids are formed from urea-formaldehyde resin and the binder is nitrocellulose, and which coating also contains therein finely subdivided particles of mica.

5. A woven textile fabric having adhered on one surface thereof hollow microspheroids of low-heat conductivity, by means of a binder.

6. A woven textile fabric as set forth in claim 5 wherein the microspheroids and binder substantially fill the interstices formed by the weave, but wherein the uppermost surfaces of the yarns remain free of both the microspheroids and the binder.

7. A woven textile fabric as set forth in claim 5 wherein the hollow microspheroids are made from polymers including glass, and wherein the binder is selected from the group consisting of nitrocellulose, polyvinyl chloride and vinyl chloride-vinyl acetate copolymer.

8. A woven textile fabric as set forth in claim 5 wherein the hollow microspheroids are formed from urea-formaldehyde resin and the binder is nitrocellulose, and which coating contains therein finely subdivided particles of mica.

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