Patented Oct. 22, 1946 2,409,703

UNITED STATES PATENT OFFICE

2,409,703

PREPARATION OF LAMINATING FABRIC

Arthur Lyem, Cumberland, Md., assignor to Celanese Corporation of America, a corporation of Delaware

No Drawing. Application September 3, 1943, Serial No. 501,150

6 Claims. (Cl. 8—131)

1

This invention relates to the production of composite fabrics, and relates more particularly to the preparation of a laminating fabric for adhesively uniting the components of the composite fabric.

An object of my invention is to provide a process for the preparation of plasticized laminating fabrics containing yarns, filaments or fibers of a thermoplastic organic derivative of cellulose and nonthermoplastic yarns whereby the plasticizer applied thereto will be selectively absorbed by the thermoplastic materials.

Another object of my invention is the provision of a process for preparation of plasticized laminating fabrics containing yarns, filaments or fibers of an organic derivative of cellulose and nonthermoplastic yarns which will materially shorten or eliminate the usual ageing period employed.

Other objects of my invention will appear from the following detailed description.

In accordance with my invention, I prepare laminating fabrics having these desirable properties by applying a plasticizer comprising triethyl citrate in the form of an aqueous dispersion or emulsion, the emulsifying agent comprising a long chain alkyl sulfate, to a fabric made of or containing organic derivative of cellulose filaments or fibers. When the plasticizer is applied to the fabrics, in the form of the aforesaid aqueous emulsion, the plasticizer is strongly absorbed from the emulsion by the organic derivative of cellulose filaments and fibers, the latter absorbing from 60 to as much as 80% of their weight of plasticizers in but a single pass through the emulsion. The cellulosic fibers, on the other hand, absorb but a relatively small amount of plasticizer. The plasticizer absorbed by the cellulosic components may, if desired, be caused to migrate largely to the organic derivatives of cellulose in the fabric by a short ageing treatment thus yielding an excellent, locally plasticized laminating fabric which produces strongly adherent composite fabrics when employed in laminating processes.

The long chain alkyl sulfate emulsifying agents may contain from 12 to 16 carbon atoms in the alkyl chain, which chain may be straight or branched. The emulsifying agents are generally employed as sodium salts and may, advantageously be compounded with other materials, for example, mineral oil and the like.

While the process of my invention will be more particularly described in connection with laminating fabrics containing cellulose acetate, it may be

2

employed in connection with the plastification of fabrics containing other thermoplastic organic derivatives of cellulose. Examples of other organic derivatives of cellulose are cellulose esters such as cellulose propionate and cellulose butyrate, mixed esters such as cellulose aceto-propionate and cellulose aceto-butyrate, and cellulose ethers such as ethyl cellulose and benzyl cellulose. Laminating fabrics containing other thermoplastic materials such as, for example, synthetic linear polyamide condensation products, e. g. polyhexamethylene adipamide, may also be plasticized in like manner.

The emulsion of triethyl citrate may be prepared by adding a small amount of the alkyl sulfate emulsifying agent say 0.3 to 0.5% by weight, to the desired amount triethyl citrate, and from 1 to 3% by weight to the desired amount of water. The water may comprise 60 to 70% by weight of the emulsion, say 65%, and the triethyl citrate from 30 to 40%, by weight, say 35%. The triethyl citrate containing the alkyl sulfate emulsifying agent is then added gradually to the water containing the emulsifying agent, and the mixture is strongly agitated during the addition as by a high speed stirrer. A highly stable, aqueous milky emulsion of the plasticizer and the water is produced, which emulsion may be padded on the laminating fabric, or applied by any other convenient form of mechanical impregnation, for example, spraying. Padding is preferably employed, however.

The aqueous emulsion of plasticizer may be applied to the laminating fabric at temperatures of from 25 to 40° C. Following the application of the emulsion the plasticized laminating fabric is dried. The laminating fabric may be employed immediately after drying in the formation of composite fabrics and the composite fabrics obtained are of excellent adherence. To improve the adhesion, the plasticized, laminating fabric may, if desired, be aged for from 1 to 3 days at temperatures of 40 to 55° C. and a relative humidity of 40 to 50%. In certain instances a relatively short treatment at a temperature of from 120 to 150° C., say about 140° C., following ageing renders the plasticized laminating fabric less tacky and more easily handled.

The laminating fabric treated in accordance with my novel process is preferably a fabric containing filaments or fibers of cellulose acetate together with filaments or fibers of a non-thermoplastic material, more preferably a fabric containing about 25 to 35% of cellulose acetate filaments or fibers and from 75 to 65% of non-

thermoplastic filaments or fibers. The fabric may be formed in any manner as by weaving, knitting, netting or knotting the filaments or yarns of the cellulose acetate with filaments or yarns of non-thermoplastic materials to form a fabric. The fabric is preferably formed in such a manner that the cellulose acetate filaments or yarns are dispersed uniformly throughout the fabric. The non-thermoplastic component of the fabric may be a textile material such as cotton, linen, regenerated cellulose, and like non-thermoplastic materials.

In order further to illustrate my invention but without being limited thereto the following example is given:

Example

An emulsion comprising 34.6% by weight of triethyl citrate, 64.3% of water and 1.1% of "Duponol OS," a long chain alkyl sulfate dispersing agent, is prepared by adding a small proportion of the "Duponol OS" to the triethyl citrate and a major proportion to the water and then blending the components together with a high speed stirrer by adding the triethyl citrate to the water. A milky, highly stable emulsion is obtained.

A fabric formed by weaving 35% cellulose acetate yarns with 65% cotton yarns is passed through the emulsion at the rate of five yarns per minute and the wetted fabric then nipped and dried for 1½ minutes at 140° C. The cellulose acetate yarns contain 60% by weight of triethyl citrate and the cotton yarns only 19%.

When employed directly in the preparation of laminated fabrics the laminating fabric yields a composite fabric requiring a force of 1¾ lbs. to separate the respective layers when the composite fabric is cut into strips one inch wide. After being aged for three days at 45° C. the laminating fabric yields a composite fabric requiring a pull of 2¾ lbs. to separate the layers. When subjected to a temperature of 140° C. for about 45 seconds the adhesion rises to 3½ lbs.

The process of effecting the lamination of the laminating fabric with one or more layers of fabric may be any suitable method as, for instance, the wet method wherein the assembly of superimposed fabrics are wetted with water or steam and then subjected to heat and pressure, the dry method where the assembly of superimposed fabrics are subjected directly to heat and pressure in the absence of liquids, or the solvent method wherein the superimposed layers of fabric are wetted with a liquid or vapor which is solvent or swelling agent at elevated temperatures for the organic derivative of cellulose. Although any process of effecting the lamination may be employed I prefer to employ a two-step process in which the superimposed articles are first bound together by a dry method of laminating and then the adhesion between the layers is further increased by a wet method of laminating. For instance, the assembly of fabrics bound by the dry method of laminating may be treated with water and then again subjected to heat and pressure.

Employing the process of my invention the necessity for ageing may be eliminated entirely since strongly adherent composite fabrics may be obtained directly after the plasticizer emulsion is applied to the laminating fabric without any ageing whatever. Furthermore, the outer layers of composite fabrics made with laminating fabrics prepared in accordance with my invention do not become discolored due to the fact that there is substantially no superficially-held plasticizer on the laminating fabric and the plasticizer cannot sweat through the outer fabric layers and come to the surface after lamination.

It is to be understood that the foregoing detailed description is given merely by way of illustration and that many variations may be made therein without departing from the spirit of my invention.

Having described my invention, what I desire to secure by Letters Patent is:

1. Process for the preparation of a laminating fabric, which comprises applying to a fabric containing yarns of a thermoplastic material having a basis of an organic derivative of cellulose and non-thermoplastic yarns, an aqueous dispersion of triethyl citrate, whereby a major proportion of the triethyl citrate absorbed is absorbed by the thermoplastic yarns and only a minor proportion by the non-thermoplastic yarns.

2. Process for the preparation of a laminating fabric, which comprises applying to a fabric containing yarns of a thermoplastic material having a basis of an organic derivative of cellulose and nonthermoplastic yarns, an aqueous dispersion of triethyl citrate, the dispersing agent comprising a long chain alkyl sulfate, whereby a major proportion of the triethyl citrate absorbed is absorbed by the thermoplastic yarns and only a minor proportion by the non-thermoplastic yarns.

3. Process for the preparation of a laminating fabric, which comprises applying to a fabric containing yarns of a thermoplastic material having a basis of cellulose acetate and non-thermoplastic yarns, an aqueous dispersion of triethyl citrate, the dispersing agent comprising a long chain alkyl sulfate, whereby a major proportion of the triethyl citrate absorbed is absorbed by the cellulose acetate yarns and only a minor proportion by the non-thermoplastic yarns.

4. Process for the preparation of a laminating fabric, which comprises applying to a fabric containing yarns of a thermoplastic material having a basis of cellulose acetate and non-thermoplastic yarns, an aqueous dispersion of triethyl citrate, the dispersing agent comprising a long chain alkyl sulfate, whereby a major proportion of the triethyl citrate absorbed is absorbed by the cellulose acetate yarns and only a minor proportion by the non-thermoplastic yarns, and then drying the treated fabric.

5. Process for the preparation of a laminating fabric which comprises applying to a fabric containing yarns of a thermoplastic material having a basis of an organic derivative of cellulose and non-thermoplastic yarns, an aqueous dispersion comprising from 30 to 40% by weight of triethyl citrate, from 60 to 70% by weight of water and as a dispersing agent a long chain alkyl sulfate, whereby the organic derivative of cellulose component absorbs about 60 to 90% of its weight and the non-thermoplastic component absorbs about 19% of its weight of triethyl citrate.

6. Process for the preparation of a laminating fabric which comprises applying to a fabric containing yarns of a thermoplastic material having a basis of cellulose acetate and nonthermoplastic yarns, an aqueous dispersion comprising from 30 to 40% by weight of triethyl citrate, from 60 to 70% by weight of water and as a dispersing agent a long chain alkyl sulfate, whereby the cellulose acetate component absorbs about 60 to 90% of its weight and the non-thermoplastic component absorbs about 19% of its weight of triethyl citrate.

ARTHUR LYEM.