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ARTIFICIAL LEATHER SUBSTITUTE

Carl Ludwig Nottebohm, Weinheim, Baden, Germany, assignor to the firm Carl Freudenberg, Weinheim, Baden, Germany

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The invention relates to the manufacture of unwoven products in the form of bands or sheets, resembling artificial leather, by the impregnation of loose, carded fibre fleeces with binding agents.

It is already known to impregnate carded fibre fleeces in various ways. Such fibre fleeces have been placed between perforated plates and immersed in an impregnating bath, pressed and further treated. Furthermore, fibre fleeces have been passed between endless perforated bands running through an impregnating bath and then between pressing-off rollers. The impregnating operation has also been carried out by means of rollers and the fibre fleece has been introduced into the impregnating rollers between two endless perforated bands or wire gauzes, or the loose, impregnated fibre material, before introduction, has been compacted by felting, so that the material is not harmfully affected on the surface, by the rollers.

In the impregnation of fibre fleeces, it is furthermore known to spray on the surface of the fleeces small quantities of agglutinating substances and thereby to form as it were an artificial sieve built up by means of the fibres, and to consolidate the surface of the fibre so that during the impregnating operation between rollers, the surface of the fibre and the inner structure of the fibre fleece are not affected. In this process, the fibre fleeces are impregnated in a plurality of layers placed either in the same direction or cross-wise one upon the other.

In addition to the processes referred to, in which the fleece is impregnated from the outside inwardly, it is also known to impregnate fibre fleeces from the interior outwardly. In this case, for example, two fibre fleeces are introduced into cold or heated vertical rollers and foils of impregnating substance, such as raw rubber, guttapercha or balata, are introduced between the said fleeces.

According to another process, thin and loose fleeces are assembled in large numbers and are passed through presses, the solution of a binding agent being introduced between the fleeces.

In all these processes, solutions, emulsions or dispersions of binding agents of the maximum possible fluidity, or solid binding agents are employed.

According to the present invention, unwoven sheet products resembling artificial leather are manufactured by treating carded fibre fleeces on one side with agglutinating, water-insoluble, preferably water-repelling and/or lacquer-binding substances in such quantities that, after dry-

ing, there is formed the closest possible surface, preventing as far as possible the penetration of the binding agent employed in impregnation, passing two fleeces thus pre-treated and dried together between a pair of rollers in such a manner that the pre-treated sides of the fleeces are on the outside and introducing the binding agent between said fleeces.

As starting material for the new process, fleeces of natural or artificial fibres or the like products of felted fibres are employed. It is possible to employ animal hair such as wool, animal fibres such as silk, skin or leather fibres, vegetable fibres such as cotton, bast fibres, wood fibres, mineral fibres such as asbestos fibres, or artificial fibres such as artificial silk. By the new process, fleeces from fibre waste can be worked better than by the known process.

These fibres are passed through a carding engine or like apparatus and are thereby worked up into continuous fleece of more or less considerably felted fibres.

It is also possible, however, to start with fibre fleeces containing the fibres in an almost parallel condition in which therefore the fibres are only felted to an extent such that the fleece is self-supporting.

One side of such fleeces is closed as far as possible by treatment with suitable agents. This treatment is effected by applying water-soluble and/or water-insoluble substances having a consolidating and agglutinating action. It is possible to employ substances such as rubber emulsions, in particular latex, solutions of cellulose derivatives, for example nitro-cellulose, solutions or emulsions of polymers of unsaturated organic compounds, particularly polymers of unsaturated hydrocarbons, polyvinyl compounds, polyacryl compounds or polystyrols or mixed polymers for instance polymers of unsaturated hydrocarbons with vinyl or acryl compounds. It is also possible to employ, however, water-repelling substances, such as paraffin emulsions, e. g. the preparations on the market under the names "Ramasil" and "Prädigen." Furthermore, swollen masses and solutions of tragacanth, tragasol, casein and so forth may be used. It is also possible, however, to employ mixtures of various suitable substances. The solutions or emulsions employed may be charged with known fillers such as kaolin, talc, bentonite, asbestine, wood meal, cork meal, gelatin, factice and the like. The application of these solutions or emulsions is effected by foam rollers after the manner of wadding sizing or by means of sprays.

During application, care should be taken to ensure the maximum possible closing effect of the agglutinating substances, so that after the subsequent drying, a uniform closed surface is produced. In order to attain a closed surface, it is expedient to employ at least 20 grams of the closing substance per square metre of surface to be closed. Preferably, 30 to 50 grams per square metre will be employed. The application of quantities greater than 100 grams per square metre is generally not desirable, but this depends upon the thickness or weight of the fleece to be impregnated.

Two fleeces pre-treated in this way are passed between a pair of rollers in such a manner that the pre-treated sides of the dried fleeces are on the outside. The rollers are preferably horizontal. If desired, they may be heated. The binding agent is introduced between the fleeces.

As binding agents, solutions, preferably however aqueous emulsions or suspensions of rubber, such as latex, reclaimed rubber, rubber-like substances, nitro-cellulose, natural or synthetic resins, in particular thermo-plastic resins, polymerisation products of unsaturated organic compounds, in particular polymers of unsaturated organic hydrocarbons, polyvinyl compounds, polyacryl compounds or polystyrols or mixed polymer for instance polymers of unsaturated hydrocarbons with vinyl or acryl compounds are employed. The binding agents also may be charged more or less with various colloidal, crystalline or fibrous fillers, such as kaolin, bentonite, talc, asbestine, wood meal, tragacanth, factice.

The process according to the invention permits the use of viscous mixtures charged with considerable quantities of fillers, the feel and touch of the finished product being thereby improved. Furthermore, vulcanisation agents and vulcanisation accelerators, softeners and colouring matter may be added to the binding agents.

By adjusting the width of the gap between the rollers or the viscosity of the impregnating composition or the speed at which the two fibre fleeces pass through, it is possible to effect impregnation only up to the outer surface which has been closed to the maximum possible amount by pre-treatment.

On the other hand, however, it is possible by the new process to employ an excess of impregnating agent by using perforated rollers of the type of extractor rollers, whereby the excess of liquid may be discharged during the pressing operation after it has transferred the impregnating agent dispersed or emulsified in it to the fibre fleece with uniform impregnation. In addition, it is also possible in this case easily to remove accumulations of air which otherwise would interfere with the impregnating operation and would give rise to the formation of blisters, tongues and the like. The use of perforated rollers is not possible by any of the processes heretofore known.

The fibre fleeces leave the pair of rollers as a single sheet or band-like product which is dried and pressed. The resulting product may be treated further as desired, for example, it may be pressed by the methods customary in the leather industry.

By the process of impregnating two fleeces according to the invention from the interior outwardly with previous closing of the outer surfaces, complete penetration of fibre fleeces of any desired thickness in a single impregnating operation is possible. It is hereby possible to pro-

duce products resembling artificial leather with a thickness of layer only obtainable in the known processes by doubling the individual impregnated layers. Due to the fact that the fibre fleeces are provided with a consolidated outer surface by the closing pre-treatment, they may be subjected even to very great stress without altering the inner layer of the fibres, so that impregnation with viscous masses may be effected with the application of correspondingly high pressures. It is possible, for example, to mix the binding agents employed with considerable quantities of fillers.

Furthermore, by the new process, due to the pre-treatment of the external surfaces, the latter may be dressed even before the actual impregnation. In the usual impregnating processes operating from the outside inwardly, this is not possible, as in this case the impregnating liquid would coat the dressed outer surfaces and render after-treatment necessary.

According to a form of carrying out the invention, the pre-treatment of the outer surfaces is carried out with substances which exert not only an agglutinating action but also a coagulating action on the binding agent to be employed. It is possible, for example, to add to the substances having an agglutinating action, according to the binding agent, acids, bases or solutions of salts of divalent or trivalent elements, which effect the coagulation of the binding agent selected. By this means, it is possible to increase the concentration of impregnating agents in the layers of fleece adjacent the closed outer layer. A further advantage of this form of carrying out the invention is that it is possible to employ heated rollers, since the impregnating liquid, even in the event of an alteration in its viscosity, cannot emerge through the closed outer layer provided with the coagulating agents, in consequence of the coagulation of the binding agent. Furthermore, the fibre material has such a poor thermal conductivity that penetration of the heat from the heated rollers to the interior of the fibre fleeces is prevented.

In some cases it is advisable, for facilitating impregnation, to treat with wetting agents before the impregnation with binding agents, those surfaces (inner surfaces) of the fleeces that are brought together between the rollers. In this case, the various known wetting agents, more particularly Turkey red oils or other sulphonation products of fats or oils, fatty acids or fatty alcohols may be employed. By this treatment, the inner surfaces of the fleeces are opened to the impregnating liquid in such a manner that, even in the case of thick fibre fleeces, a complete, thorough impregnation may be ensured. The impregnation of thick layers without doubling, which is not possible by other processes, is attained precisely in the form of carrying out the invention.

The inner surfaces of the fibre fleeces may be treated not only with wetting agents for facilitating impregnation, but in many cases also with small quantities of agglutinating substances having a consolidating effect. Whereas, however, in the case of the outer surfaces, this treatment should take place with quantities so large that the surface is closed to the maximum possible extent, in the treatment of the inner surfaces only small quantities should be employed, so that impregnation is not prevented but merely the inner surfaces of the fibre fleeces are provided with a certain resistance to mechanical

effects, for example, during transport. For this reason, expediently, water-soluble consolidating substances, for example casein, gelatin, or glue solutions are employed, which during impregnation dissolve again in the impregnating liquid and thereby cannot prevent the impregnation operation. If desired, however, it is possible to employ small quantities of the water insoluble substances referred to for the pre-treatment of the outer surfaces.

Example

Cotton fibre fleeces weighing about 150 grams per square metre, which have been made on the sets of cards customary in spinning works, are sprayed on the surface facing the rollers in the subsequent impregnating operation with emulsions of latex and reclaimed rubber mixtures in the proportion of 1:1 with a content of solid substance of 25% so intensely as to produce a surface which is closed to the maximum extent. For this purpose, about 50 grams of solid substance per square metre are necessary. After the spraying operation, the fleeces thus treated pass through a drying chamber at a temperature of about 80–100° C. and after drying are sprayed uniformly with a 3% Nekal solution on the surfaces facing away from the rollers during the subsequent impregnating operation.

After drying, the fleeces thus treated are rolled up, the surface thus sprayed being preferably covered for transport with a protective covering of extremely thin tissue paper. The fleeces are rolled into rolls of about 25 kilograms and are taken to the impregnating shop.

There two fleeces are introduced between two horizontal rollers in such a manner that the surfaces pre-treated with the latex-reclaimed rubber emulsion face the rollers and the surfaces treated with wetting agents are brought together. Introduction of the fleeces into the gap between the rollers is best effected in such a manner that the fleeces lie as intimately as possible against the surfaces of the rollers in order to present to the impregnating agent as open a surface as possible. In order to make a band of about 0.9 mm. thickness, the gaps between the rollers are adjusted according to the invention to 1.4 millimetres. The impregnating agent is now supplied uniformly from above between the two fleeces, care being taken to see that the quantity is sufficient to impregnate the fleeces sufficiently. Use is made of an impregnating substance consisting of:

	Parts
Latex, 65% thickened.....	165
Nekal, 3%	100
Sulphur.....	2
Zinc oxide.....	3
Accelerator.....	1
Kaolin.....	50
Pactice emulsion known by the trade name of "Faktex".....	25

The binding agent is employed in such quantities that about 80–100 per cent. by weight of the solid matter it contains is brought on to the two pre-treated fleeces. The band issuing from the rollers is passed to a drying apparatus and after drying is cut, calendered and dressed.

I claim:

1. In a process for the manufacture of unwoven sheet products resembling artificial leather by complete, thorough impregnation of carded fiber fleeces with liquid binding agents between rollers, the improvement comprising pretreating

each fiber fleece individually on one side superficially with agglutinating substances in such quantities as to produce after drying, a surface, which is as close as possible and which prevents the binding agent used for the subsequent complete thorough impregnation from penetrating too easily, drying each fiber fleece directly after this treatment individually bringing two dried fleeces together between a pair of rollers in such a manner that the pretreated sides of the fleeces are on the outside, and introducing the binding agent between said fleeces, whereby complete penetration and binding of the fleeces to a substantially single sheet product takes place, which is dried and pressed.

2. In a process for the manufacture of unwoven sheet products resembling artificial leather by complete, thorough impregnating of carded fiber fleeces with liquid binding agents between rollers, the improvement comprising pretreating each fiber fleece individually on one side superficially with water-insoluble agglutinating substances in such quantities as to produce, after drying, a surface which is as close as possible and which prevents the binding agent used for the subsequent complete, thorough impregnation from penetrating too easily, drying each fiber fleece directly after this treatment individually, bringing two dried fleeces together between a pair of rollers in such a manner that the pretreated sides of the fleeces are on the outside, and introducing the binding agent between said fleeces whereby complete penetration and binding of the fleeces to a substantially single sheet product takes place, which is dried and pressed.

3. In a process for the manufacture of unwoven sheet products resembling artificial leather by complete, thorough impregnating of carded fiber fleeces with liquid binding agents between rollers, the improvement comprising pretreating each fiber fleece individually on one side superficially with water-repelling agglutinating substances in such quantities as to produce, after drying a surface which is as close as possible and which prevents the binding agent used for the subsequent complete, thorough impregnation from penetrating too easily, drying each fiber fleece directly after this treatment individually, bringing two dried fleeces together between a pair of rollers in such a manner that the pretreated sides of the fleeces are on the outside, and introducing the binding agent between said fleeces whereby complete penetration and binding of the fleeces to a substantially single sheet product takes place, which is dried and pressed.

4. In a process for the manufacture of unwoven sheet products resembling artificial leather by complete, thorough impregnating of carded fiber fleeces with liquid binding agents between rollers, the improvement comprising pretreating each fiber fleece individually on one side superficially with lacquer-binding agglutinating substances in such quantities as to produce, after drying a surface which is as close as possible and which prevents the binding agent used for the subsequent complete thorough impregnation from penetrating too easily, drying each fiber fleece directly after this treatment individually, bringing two dried fleeces together between a pair of rollers in such a manner that the pretreated sides of the fleeces are on the outside, and introducing the binding agent between said fleeces whereby complete penetration and binding of the fleeces to a substantially single sheet product takes place, which is dried and pressed.

5. In a process for the manufacture of unwoven sheet products resembling artificial leather by complete, thorough impregnation of carded fiber fleeces with liquid binding agents between rollers, the improvement comprising pretreating each fiber fleece individually on one side superficially with agglutinating substances in such quantities as to produce, after drying, a surface which is as close as possible and which prevents the binding agent used for the subsequent complete thorough impregnation from penetrating too easily, to which agglutinating substances coagulating agents for this subsequently used binding agent have been added, drying each fiber fleece directly after this treatment individually, bringing two dried fleeces together between a pair of rollers in such a manner that the pretreated sides of the fleeces are on the outside, and introducing the binding agent between said fleeces, whereby complete penetration and binding of the fleeces to a substantially single sheet product takes place, which is dried and pressed.

6. In a process for the manufacture of unwoven sheet products resembling artificial leather by complete, thorough impregnation of carded fiber fleeces with liquid binding agents between rollers, the improvement comprising pretreating each fiber fleece individually on one side superficially with agglutinating substances in such quantities as to produce, after drying, a surface which is as close as possible and which prevents the binding agent used for the subsequent complete thorough impregnation from penetrating too easily, drying each fiber fleece directly after this treatment, treating the other side of each fleece with wetting agents, bringing two of such treated fleeces together between a pair of rollers in such a manner that the sides of the fleeces pretreated with agglutinating agents are on the outside and the side pretreated with wetting agents are on the inside and introducing the binding agent between said fleeces, whereby complete penetration and binding of the fleeces to a substantially single sheet product takes place, which is dried and pressed.

7. In a process for the manufacture of unwoven sheet products resembling artificial leather by complete, thorough impregnation of carded fiber fleeces with liquid binding agents between rollers, the improvement comprising pretreating each fiber fleece individually on one side superficially with agglutinating substances in such quantities as to produce, after drying, a surface which is as close as possible and which prevents the binding agent used for the subsequent complete, thorough impregnation from penetrating too easily and on the other side

with such slight amounts of agglutinating substances having a consolidating effect that also this surface of the fleece is provided with a resistance against mechanical effects but impregnation is not prevented, drying the fiber fleeces, bringing two dried fleeces together between a pair of rollers in such a manner that the sides of the fleece pretreated with slight amounts of agglutinating substances are on the inside and introducing the binding agent between said fleeces, whereby complete penetration and binding of the fleeces to a substantially single sheet product takes place, which is dried and pressed.

8. In a process for the manufacture of unwoven sheet products resembling artificial leather by complete, thorough impregnation of carded fiber fleeces with liquid binding agents between rollers, the improvement comprising pretreating each fiber fleece individually on one side superficially with agglutinating substances in such quantities as to produce after drying, a surface, which is as close as possible and which prevents the binding agent used for the subsequent complete thorough impregnation from penetrating too easily, drying each fiber fleece directly after this treatment individually, bringing two dried fleeces together between a pair of rollers in such a manner that the pretreated sides of the fleeces are on the outside, and introducing aqueous emulsions of the binding agent between said fleeces, whereby complete penetration and binding of the fleeces to a substantially single sheet product takes place, which is dried and pressed.

9. In a process for the manufacture of unwoven sheet products resembling artificial leather by complete, thorough impregnation of carded fiber fleeces with liquid binding agents between rollers, the improvement comprising pretreating each fiber fleece individually on one side superficially with agglutinating substances in such quantities as to produce after drying, a surface, which is as close as possible and which prevents the binding agent used for the subsequent complete thorough impregnation from penetrating too easily, drying each fiber fleece directly after this treatment individually bringing two dried fleeces together between perforated rollers of the type of extractor rollers in such a manner that the pretreated sides of the fleeces are on the outside, and introducing the binding agent between said fleeces, whereby complete penetration and binding of the fleeces to a substantially single sheet product takes place, which is dried and pressed.

C. L. NOTTEBOHM.