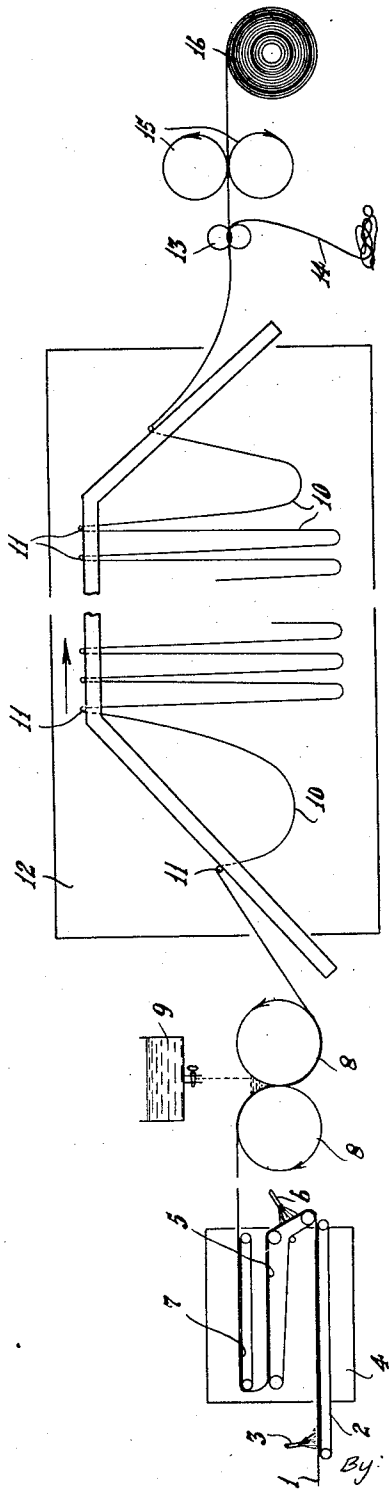
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PROCESS OF MANUFACTURING ARTIFICIAL COMPOSITIONS

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PROCESS OF MANUFACTURING ARTIFICIAL COMPOSITIONS

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It has been proposed to manufacture artificial compositions by impregnating loose fibrous materials, card fleeces, felt fleeces, etc., with binding agents. In manufacturing processes of this character various difficulties occur and the products obtained generally do not have the mechanical properties desired for certain purposes, e. g. for leather substitutes. In most cases impregnation is effected by immerging the fibrous material in a bath of the impregnating liquid and subsequently passing the impregnated material to the pressing cylinders used for removing the excess of the impregnating liquid. One of the drawbacks of this process is that the fibres of the material impregnated with the liquid binding agent often adhere to the cylinders used for expressing the liquid.

It has further been proposed to pour the binding agent on the material supplied by a conveyor belt, or to mix the fibres and the binding agent uniformly in a mixing device, to dry the mixture and to press the same if desired.

According to other prior processes the fibrous material is felted so as to obtain a certain coherence between the fibres, in order to prevent the same from adhering to the cylinders. In this case, however, impregnation is not so satisfactory because the impregnating liquid does not penetrate in the felted material as easily as in the loose fibrous mass.

In some of the prior processes the material is impregnated, e. g. with latex, to such an extent, that the final product contains a large proportion of the binding agent, e. g. 40–50% rubber.

The invention relates to a process of manufacturing artificial materials containing 38–60% of the binding agent from a loose cohering body of fibres and a dispersion or solution of the binding agent, which is characterized by the feature that the fibrous material is impregnated two or more times by means of cylinders, and that the impregnated fibrous material is dried and calendered between the subsequent impregnation steps.

In order to obtain a final product with the desired mechanical properties, especially for manufacturing artificial leather of excellent quality from fibres and a rubber dispersion or solution, it is essential that the proportion of the binding agent is between the limits mentioned above. If the final product contains less than 38% of rubber it has substantially the character of a fibrous material, whereas products consisting of more than 60% of rubber have rubberlike properties. In contradistinction therewith products obtained according to the invention and containing from 38–60% of rubber have the characteristical properties of genuine leather.

As starting materials fibres in the form of a loose fleece are used, e. g. a card fleece, a fleece of paper wadding or a very loose, insufficiently felted fibrous material produced by means of a felting willow.

Suitable binding agents are rubber-dispersions or solutions, e. g. latex and rubber emulsions obtained from latex, or the well-known rubber solutions in volatile solvents, and the invention will be described below with a view to manufacturing artificial leather from fibrous materials and rubber dispersions and solutions of this character. However, other binding agents, e. g. tar-like substances, or sodium silicate, may also be used. The artificial compositions obtained according to the last mentioned process are e. g. suitable to be used as packing materials and the invention also covers processes of manufacturing products of this character.

With the expression "impregnating by means of cylinders" I understand a process in which the fibrous material is passed through cylinders between which a certain volume of liquid is maintained or supplied. I have found that this process has substantial advantages as compared with the well-known impregnating methods in which the fibrous material is previously saturated with the liquid, e. g. by immerging the fibrous material in a latex bath and subsequently passing the material impregnated in this way to the cylinders where the excess of liquid is expressed, the coherence of the loose fibrous material being often seriously injured as a result of the pressing operation.

In the process according to the invention the rate with which the fibrous material is passed through the pressing device and the height of the body of liquid between the cylinders or the rate of supply of the said liquid can be easily controlled so as to allow fibrous material of a predetermined absorption power to be impregnated to the centre, just at the point where the impregnated product leaves the cylinder. In case the fleece is not yet fully impregnated in this stage a non-homogeneous product is obtained, as the inner layers do not contain a sufficient amount of the binding agent. If on the contrary the fibrous material is allowed to become thoroughly saturated with liquid before being pressed between the cylinders, the above mentioned drawback connected with the prior impregnation processes arises.

Preferably smooth cylinders rotating with equal

speed are used for the impregnating method according to the invention.

This is illustrated in the accompanying drawing in which the figure represents a diagrammatic side elevation of an apparatus suitable for carrying out the invention.

After being impregnated the product is dried; the water or the solvent is evaporated and I obtain a porous sponge-like mass consisting of fibres each of which is covered with a thin coating of rubber. The first impregnation has the primary object to consolidate the fibrous material so as to form a coherent mass and therefore the rubber dispersion or solution used contains no fillers or only a small amount of fillers. It is, however, advantageous to admix the liquid used for the first impregnation with substances improving the strength and the stiffness of the rubber.

The dried mass is now passed between calenders, the fibres thereby being pressed together to form a strongly cohering mass, owing to the well-known property of unvulcanized rubber layers of being easily united by simple pressing. This intermediate calendering step between the first and the second impregnation and drying is of essential importance for obtaining the desired mechanical properties of the final product.

After being calendered the material has already leather-like properties to a certain extent. Microscopical examination of the material, however, shows that it has a very porous structure and that it contains a large number of cavities, formed by the evaporation of the water of the solvent introduced by the first impregnation. Owing to the said cavities the material still has a very high elasticity, in contradistinction to genuine leather which is characterized by a low elasticity.

In order to improve the product in this respect and produce an altogether satisfactory substitute for leather the material is again impregnated. The second impregnation has the object of filling the remaining cavities with the binding agent. As a high strength and a high elasticity are not required for the rubber introduced into the cavities I preferably use in the second stage a concentrated rubber dispersion, containing at the same time a substantial amount of fillers.

After the second impregnation the material is dried again. The product containing a certain amount of newly formed cavities is again strongly pressed between calenders so as to produce a compact material with a very low elasticity.

Usually two impregnations are sufficient to obtain satisfactory results. In some cases, viz. when a product of exceedingly low porosity is required, it is advantageous to repeat the impregnating, drying and calendering process in order to fill up the cavities still existing after the second stage.

In order to obtain in each impregnating step the proportion of binding agent desired, the distance between the cylinders is controlled so as to maintain a predetermined, relatively large part of the impregnating liquid in the fibrous material. It is therefore necessary to use a rather low pressure of the pressing cylinders. In this case, however, the fibres have a strong tendency to adhere to the cylinders, so that serious difficulties occur during the impregnating process and the final product often has an irregular, locally fibrous surface.

This difficulty can be avoided by treating the fleece to be impregnated with a small amount of an adhesive or binding agent, so as to stabilize the surface layers of the material. Care must be taken, however, that the impregnating process is not impeded by this treatment, and it is therefore necessary that the surface of the fleece remains sufficiently open. For this purpose the adhesive is preferably sprayed or atomized on the fibrous material.

A very suitable adhesive for this preliminary treatment is rubber in the form of a dilute dispersion or solution. Other adhesives, however, may also be used, e. g. starch products, glue, cellulose derivatives and the like. The amount of adhesive used for this preliminary treatment is generally very low.

When using fibres such as sisal, jute, hemp and coco fibres, I have found that a better adhesion between the fibres and the binding agent is obtained by "opening" the elementary fibres before manufacturing the fleece. To this purpose the fibres can be subjected to a preliminary treatment by boiling the same with an aqueous liquid, e. g. with caustic soda. The time and the temperature of boiling are selected so as to obtain a material in which the outer layer of the fibres is more or less destroyed and a part of the elementary fibres is free. A complete destruction of the outer layer, however, must be avoided as this results in a marked reduction of the tensile strength.

Boiling the fibrous material with caustic soda further has a great advantage, also when using cotton, in that the impregnation speed is substantially increased. A high impregnation speed, however, is very important for the impregnating process by means of cylinders according to the invention, as in this case only a fraction of a second is available for the impregnation.

In the third place the elasticity of the final product is materially decreased when using fibrous materials pretreated by the above mentioned boiling process. As stated above, a low elasticity is a very valuable property for leather substitutes.

If the artificial leather obtained according to the invention is covered with a lacquer coating, this coating can be provided after the second impregnation previous to calendering. This method has the advantage that the lacquer partly penetrates into the cavities formed during the second drying step so that the lacquer coating is firmly united with the material. In this case a grain calender is used which allows various patterns to be impressed in the mass.

The product according to the invention has substantial advantages for this purpose as compared with the well-known leather substitutes obtained by impregnating fabrics as a deeper relief is produced.

For manufacturing rubber compositions I preferably use a self-vulcanizing rubber dispersion or solution; the chemical reaction is initiated by drying the lacquer coating or by impressing the grain at elevated temperatures; the reaction proceeds when maintaining the product at temperatures between 30 and 50° C. In this way the grain is impressed in the unvulcanized material and is made permanent by vulcanizing.

In the drawing the loose coherent fiber fleece in the form of an endless band 1 is conducted to the conveyor belt 2 on which the upper side of the fleece is lightly sprayed with latex by means of the atomizer 3. The fleece passes through the drying chamber 4 to the conveyor belt 5 on which the other surface of the fleece is sprayed by means of the atomizer 6.

The fleece is dried again and conducted by

means of the conveyor belt 7 to the impregnating apparatus consisting of two cylinders 8 which rotate at the same speed. Latex is supplied between the cylinders from the container 9 and the rate of supply is controlled so as to maintain a body of latex of the desired height between the cylinders.

The impregnated fleece 10 is passed through the drying chamber 12 by means of rods 11 on which the fleece is dried in freely suspended condition. The dry product is conducted to the device 13 in which the irregular side portions 14 are cut off by means of knives. The fleece is now compressed between the calenders 15 the pressure of which can be controlled and then wound up into the roll 16.

The last part of the process, that is impregnation-drying-calendering, is preferably repeated one or more times.

I claim:

1. A process of manufacturing artificial leather containing 38% to 60% of rubber by impregnating a loosely coherent fiber fleece with a rubber dispersion, comprising treating the surface of the fiber fleece prior to impregnation with a small amount of an adhesive so as to make the fibers of the surface stick together without substantially reducing the permeability of the surface for the impregnating agent, and subsequently impregnating the material in a plurality of impregnation steps by passing the same between low pressure cylinders between which a body of rubber dispersion is maintained, drying and calendering the material after each impregnation step and vulcanizing the rubber.

2. A process of manufacturing artificial leather containing 38% to 60% of rubber by impregnating a loosely coherent fiber fleece with a rubber dispersion, comprising treating the surface of the fiber fleece prior to impregnation with a small amount of an adhesive so as to make the fibers of the surface stick together without substantially reducing the permeability of the surface for the impregnating agent, and subsequently impregnating the material in a plurality of impregnation steps by passing the same between low pressure cylinders between which a body of rubber dispersion is maintained, drying and calendering the material after each impregnation step, and vulcanizing the rubber, the first impregnation step being carried out with a rubber dispersion which does not contain an appreciable amount of fillers and the further impregnation steps being carried out with rubber dispersions containing a large amount of fillers.

3. A process of manufacturing artificial leather containing 38% to 60% of rubber by impregnating a loosely coherent fiber fleece with a rubber dispersion comprising boiling the fibrous material with an aqueous liquid, drying the same, treating the surface of the fiber fleece prior to impregnating with a small amount of an adhesive so as to make the fibers of the surface stick together without substantially reducing the permeability of the surface for the impregnating agent, subsequently impregnating the material in a plurality of impregnation steps by passing the same between low pressure cylinders between which a body of rubber dispersion is maintained, drying and calendering the material after each impregnation step and vulcanizing the rubber.

4. A process of manufacturing artificial leather containing 38% to 60% of rubber by impregnating a loosely coherent fiber fleece with a rubber dispersion comprising boiling the fibrous material with a caustic soda solution, drying the same, treating the surface of the fiber fleece prior to impregnating with a small amount of an adhesive so as to make the fibers of the surface stick together without substantially reducing the permeability of the surface for the impregnating agent, subsequently impregnating the material in a plurality of impregnation steps by passing the same between low pressure cylinders between which a body of rubber dispersion is maintained, drying and calendering the material after each impregnation step and vulcanizing the rubber.

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