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PROCESS FOR MAKING AND FINISHING ARTIFICIAL HIDES OR LEATHERS

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The present invention relates to a process for making and finishing artificial hides or leathers.

This application is a continuation-in-part of my copending application Serial No. 475,318, filed December 14, 1954.

The main object of this invention is to produce a material having characteristics similar to natural leather. Porosity is a distinctive feature of natural leather and is the feature of natural leather which makes same preferred over plastic materials for many uses. I have found that by bonding and coating natural or synthetic fibers with a natural or synthetic latex, in the hereinafter described manner, useful materials can be attained, the characteristics of feel and porosity of which are practically the same as those of natural leather.

In accordance with the process of this invention, textile fibers, such as cotton, rayon, nylon, acetated fibers, etc., and their waste or combinations of same, are formed into webs, e.g., in a carding engine, and by laying the webs one over the other a lap is made of the desired thickness. This lap may also be prepared in a machine commonly called a Curlator. Then, in a continuous system, the lap of the desired thickness is dipped into a latex bath which is characterized by the ability to coagulate at a temperature in the range of from about 60° to about 80° C. and is of approximately the following composition:

	Parts by weight (dry)
Natural or synthetic latex of approximately 60% concentration; 166 parts correspond to	100
Zinc oxide	3 to 5
Sulphur	1½ to 2½
Accelerator	1
Antioxidant	1 to 2
Filler (kaolin, lithopone, bentonite, calcium carbonate, etc.)	0 to 100
Stabilizer	3 to 5
Wetting agent	2 to 10
Water	500 to 2000

In accordance with the present method, the latex-impregnated lap obtained from the immersion in the latex bath then is heated to a temperature in the range of from about 60° to about 80° C. for a time period requisite to effect the coagulation of the latex and to bond the fibers of the lap together. Any suitable means can be employed to effect the coagulation-effecting heating of the lap. In one technique of the heating step, the latex-impregnated lap is passed continuously through an oven, the inside temperature of which is maintained at about 200° to 300° C., at a rate which allows the latex-impregnated lap to be heated to the afore-mentioned latex-coagulation conditions. Coagulation can also be obtained by means of dielectric heating, hot contact, or infrared rays, etc. The object of the invention is not affected by the means for heating the impregnated lap.

In accordance with the invention, a latex bath having substantially the above-characteristics is employed in order to achieve a final leather-like product of uniform properties. Latices which coagulate much below 60° C., e.g., at about 40° C., are difficult to utilize in that premature coagulation in the latex bath preliminary to

the impregnation of the lap is a problem. On the other hand, latices which coagulate at much above 80° C., e.g., at about 95° C., suffer from the disadvantage that during the coagulation heating step the increased tendency of water in the latex-impregnated lap to evaporate sets up convection currents in the latex solids dispersion which causes rubber particles therein to tend to migrate to the surface of the impregnated lap and coagulate there. This migration deprives the fibers located within the interior of the lap of intended bonding material, whereby an inferior product which is likely to delaminate is obtained.

In the method of this invention, during the heating step for coagulating the latex in the latex-impregnated lap, the impregnated lap loses part of its water by evaporation, but it still contains an appreciable proportion of that initially present, e.g., about 100 to about 300% by weight, based on the dry weight of the bonded lap, and the resultant water-containing bonded lap is squeezed through rolls or by press, neither the rolls nor the press being heated, to reduce the water content of the bonded lap, after which operation the material of reduced water content is dried at a temperature not above 120° C. For the implementation of the present invention, it is indispensable that the material, after squeezing and before drying, shall contain an amount of water of from 20 to 50% of the total weight of such material so that, upon the evaporation of the water in the drying step, the spaces occupied by the water in said bonded material of reduced water content are superseded by air cells which, in the resultant dry artificial leather product, impart to it the characteristic of porosity.

In one embodiment of the present invention, when the porous, bonded material is dry it is coated by means of aerographing, brushing, calender spreading or analogous methods, the coating, or paint, being prepared with casein containing plasticizers such as sulphoricinated oil, glycerine, dibutyl phthalate, etc., pigments to impart the desired color such as synthetic iron oxides, loading or filling materials to provide appropriate feel, such as titanium dioxide, lithopone, barium chloride, barium sulphate, kaolin or bentonite, etc.

Coating materials prepared with the foregoing elements lack bonding power and resistance in order to avoid premature aging; and their abrasive resistance also usually has to be increased. All of these necessary properties are obtained by adding to the said coating materials aqueous dispersions of resins such as acrylonitrile-butadiene copolymers, butadiene-styrene copolymers, polyvinyl chloride, polymethyl-methacrylate, other polymeric derivatives of the acrylates, mixtures of said resins, and other resins of similar effects.

An example of a coating mixture, or paint, employed in the present invention may be prepared according to the following composition:

	Parts by weight (dry)
Resins (anyone or combination of those given above)	100
Casein (15% solution in ammonia)	15 to 100
Filler (those previously mentioned, for example, titanium dioxide, lithopone, barium chloride, etc.)	25 to 100
Pigments (for example, synthetic iron oxides, cadmium, etc.)	10 to 20
Zinc stearate	10 to 200
Sulphoricinated oil	25 to 50
Water	150 to 600
Wetting agent (on the total volume of water)	0.2 to 0.5
Glycerine	10 to 25
Dibutyl phthalate	20 to 35

After applying one coat of the paint on the porous artificial leather, another coat is applied, or two or three as circumstances require, in the latter instances with a paint similar to that described above but free of wetting agent and characterized by a substantial or total reduction in glycerine or dibutyl phthalate content. As the coats are applied they are dried. When these coats are dry a lustre coat is applied which may be as follows:

	Parts by weight (dry)
Casein (dissolved in water, 15%)	100
Resin (any one or a combination of those given above)	50
Plasticizer (sulphoricinated oil, for example)	25 to 60

Approximately 2% of formaldehyde or other antiferment is added to all these compositions to avoid posterior decomposition of the casein. When the lustre coating is dry, the resulting coated material is treated again with a 15% to 20% formaldehyde solution and thereafter dried at room temperature or in a drying chamber with hot air at 50 to 80° C. After such drying, the material is ironed at 70 to 80° C. for 5 to 30 seconds at a pressure of approximately from about 25 to about 50 kgs./cm^2.

In certain of such embodiments of the invention, excellent results are obtained by reducing the amount of the filler and increasing the proportion of zinc stearate. The articles thus produced are characterized, on rubbing, by a natural gloss which is hardly distinguishable from that of natural leather. This is why in the basic mixture of the foregoing examples a proportion of zinc stearate ranging broadly from 10 to 200 parts is mentioned. When proportions of zinc stearate of from 50 to 150 parts are used, the percentages of fillers referred to, i.e., lithopone, titanium dioxide, barium chloride, etc., are totally or nearly totally suppressed.

In another embodiment of the present invention, a coating, e.g., based primarily on plasticized polyvinyl chloride free of casein, is applied to the porous, dry bonded lap prepared by the aforementioned impregnating, coagulating, squeezing and drying steps to provide an excellent leather-like product.

An example of the polyvinyl chloride coating layer is the following:

	Parts
Polyvinyl chloride	From 55 to 62
Dioctyl phthalate	From 12 to 16
Dioctyl adipate	From 12 to 16
Filler (for instance, $CaCO_3$)	From 0 to 12
Epoxy resin (plasticizer)	From 1 to 3
Pigments	From 1 to 4
Cadmium barium laurate	From 0.25 to 0.75
Epoxy resin (synergistic stabilizer)	From 1 to 2

After coating, the resultant material is heated at a temperature of 170° C. for approximately from 2 to 5 minutes so that gelification of the coating is produced, then the material is pressed and eventually engraved.

With the method of my invention, the latex contained in the agglomerating mixture present in the impregnated fiber lap is coagulated by means of heat, and then the material is squeezed, eliminating water contained in the coagulated mass in a proportion which may represent from one to three times the weight of the artificial leather in dry condition. After squeezing, the material must still contain from 20 to 50% of its weight in water. The pressure exerted by the press or squeezing cylinders for squeezing the material after coagulation has to be adjusted so as to leave in the material a water content varying from 20 to 50% of the weight of the material, according to the end uses for which the artificial leather is intended.

After the squeezing step the material is dried, and once the drying is totally completed the material is suitable for receiving a coating of a weight ranging from 70 to 300 grams per square meter, approximately, and

by means of such a coating layer a finish very similar to that of natural leather is obtained, with the coated material retaining practically all the porosity necessary for it being a suitable leather substitute.

By means of the present invention the troublesome industrial processes devised for imparting porosity to PVC films or other plastic coatings, which processes entail a piercing technique, are avoided.

If the ultimate use of the artifical leather of the present invention does not necessarily require that it be porous, over the first PVC coating which is perfectly anchored on the agglomerated fibers to provide a material possessing the precisely desired degree of porosity, other coating layers may be applied, thus increasing the thickness thereof as desired.

With either of the two described methods, artificial hides and leathers having porous and resistant finishes are obtained which are excellently adapted for use in industries and applications such as footwear and upholstery requiring the porosity or finish of natural hides or leathers.

I claim:

1. A method for producing a substitute leather from a lap of fibers comprising impregnating said lap with a latex selected from the group consisting of natural latex, synthetic latex, and mixtures thereof, heating the resultant latex-impregnated lap at a temperature in the range of from about 60° to about 80° C. for a time period requisite to coagulate said latex and bind the fibers of said lap together and to produce a bonded lap containing water in an amount appreciably above 50% by weight of said latex-impregnated lap, thereafter squeezing said water-containing bonded lap to reduce the water content thereof to a level in the range of from about 20 to about 50% by weight based on the dry weight of the lap, and then drying the resulting bonded lap of reduced water content at a temperature of about 120° C. to provide a porous, bonded lap having free spaces therewithin corresponding essentially to those spaces occupied by said water present in said bonded lap of reduced water content preliminary to said drying step.

2. The method according to claim 1 wherein the water content of said water-containing bonded lap, preliminary to said squeezing step, is in the range of from about 100 to about 300% by weight.

3. A method for producing a substitute leather from a lap of fibers, said method consisting of impregnating said lap with a latex, heating the impregnated lap at a temperature in the range of from about 60 to about 80° C. for a time period sufficient to coagulate the latex and bind the fibers of the lap together and to produce a bonded lap containing water in an amount appreciably above 50% by weight of said latex-impregnated lap, squeezing said water-containing bonded lap to reduce the water content thereof to a level in the range of from about 20 to about 50% by weight based on the dry weight of the lap, drying the resulting bonded lap of reduced water content at a temperature of about 120° C. to provide a porous bonded lap having free spaces therewithin corresponding essentially to those spaces occupied by said water present in said bonded lap of reduced water content preliminary to said drying step, coating the resulting porous, dry lap with at least one coat of a mixture comprising a polyvinyl chloride, a polymer selected from the group consisting of butadiene-acrylonitrile, butadiene-styrene, methylmethacrylate and mixtures thereof, and pigments, stabilizers, fillers, and at least one plasticizer, and heating the coated lap after each coating to a temperature sufficient to gel the coating material, and eventually pressing and engraving the coated lap to thereby provide a product having substantially the porosity and aspect of natural leather.

4. The process in accordance with claim 3, wherein said latex is selected from the group consisting of natural latex, synthetic latex, and mixtures thereof.

5. A method for producing a substitute leather from a lap of fibers, said method consisting of impregnating said lap with a latex selected from the group consisting of natural latex, synthetic latex, and mixtures thereof, heating the impregnated lap to coagulate the latex and bind the fibers of the lap together and to provide a bonded lap containing water in an amount appreciably above 50% by weight of said latex-impregnated lap, squeezing said water-containing bonded lap to reduce the water content thereof to a level in the range of from about 20 to about 50% by weight based on the dry lap, drying the resulting bonded lap of reduced water content at a temperature of about 120° C. to provide a porous, bonded lap having free spaces therewithin corresponding essentially to those spaces occupied by said water present in said bonded lap of reduced water content preliminary to said drying step, coating the resulting porous, dry lap with a plurality of coats, including a first coat, intermediate coats, and a final coat, of a resinous dispersion mixture comprising casein, a polymer selected from the group consisting of butadiene-styrene, butadiene-acrylonitrile, polyvinyl chloride, methylmethacrylate, and mixtures thereof, and pigments, fillers, and at least one plasticizer, heating the coated lap after each coating to a temperature sufficient to dry the coating material and thereby provide a product having substantially the porosity of a similarly coated natural leather.

6. A method for producing a substitute leather from a lap of fibers consisting of impregnating said lap with latex, heating the impregnated lap at a temperature in the range of about 60° to about 80° C. for a time period sufficient to coagulate the latex and bind the fibers of the lap together and to produce a bonded lap containing water in an amount appreciably above 50% by weight of said latex-impregnated lap, squeezing said water-containing bonded lap to reduce the water content thereof to a level in the range of about 20 to about 50% by weight based on the dry lap, drying the resulting bonded lap of reduced water content at a temperature of about 120° C. to provide a porous, bonded lap having free spaces therewithin corresponding essentially to those spaces occupied by said water present in said bonded lap of reduced water content preliminary to said drying step, coating the resulting porous, dry lap with at least one coat containing polyvinyl chloride, fillers, stabilizers, pigments, and a plasticizer, and heating the resulting coated lap after each coating to a temperature sufficient to gel the material in the coating, thereby providing a product having substantially the porosity of natural leather.

7. The process according to claim 6 wherein said latex is selected from the group consisting of natural latex, synthetic latex and mixtures thereof.

8. The process in accordance with claim 6 wherein said coated lap is heated at 170° C. for from 2 to 5 minutes after each coating.

9. The process in accordance with claim 6 wherein said coating material is deposited on said lap in a total amount of from 70 to 300 grams per square meter.

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