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METHOD OF TREATING LEATHER

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The present invention relates to a method of making and finishing leather, and more particularly to such a method susceptible of employment in the conversion of the green hide into tanned leather.

The usual process of making leather comprises essentially two stages which have been employed throughout the development of the industry. In the first or preliminary stage the hide is scrubbed, trimmed, washed, plumped, bated, pickled and tanned. The preliminary operations are merely intended to prepare the skin for the best reaction between the hide substance and tanning liquors. These tanning liquors as generally used are of the vegetable type commonly called oak or the mineral or chrome tan. The oak tanning process requires many months for completion, but produces a relatively firm, dense, heavy, strong and desirable rough leather. The chrome process is relatively short in duration, requiring perhaps as many hours or days as months for the oak process, but the rough leather resulting is flabby, porous, light-weight, brittle (if dried), undesirable in color and feel, and difficult to finish.

The second stage of leather manufacture is intended to produce a "finish" on the rough tannery product. The methods employed for this purpose embody many variations, but all seek to accomplish the same result, namely, filling of the intersticial space between the fibres with various ingredients (such as, resins, salts, sugars, uncombined tannins, etc.) in requisite quantity to adjust the density, firmness, and superficial finish of the resulting product. The leather may also be treated with various materials, such as, greases, waxes, etc. in amounts sufficient to produce the desired degree of hardness or pliability and other physical properties which it is intended to impart. Subsequently the whole fibre structure is stretched and massaged (jacked, rolled, etc.) in a variety of ways to produce the finished leather sheets of commerce. Not only do these operations as commonly carried out require much time and labor, but the resulting qualities imparted to the finished leather lack permanency. This is due in part to the fact that the filling and weighting materials commonly employed are readily soluble in water, and the greasy stuffing materials also have a comparatively low melting point. In other words, the commercial demand for leather having definite and permanent characteristics cannot be practically met with existing methods.

The purpose of my invention is to produce leather having all of the desirable physical properties commonly expected or found therein to an equal or greater degree, and permanent or unchangeable throughout the usual life of articles manufactured of leather. It is a further purpose of my invention to develop an expeditious and economical treatment susceptible of employment in the conversion of the green hide into finished leather, permitting the use of the comparatively rapid mineral tanning liquors, for example, and with a resulting product comparable to that produced by other and slower methods.

I accomplish my result by tanning the green hide in a manner best suited to my purpose, which may, generally speaking, be a method such as chrome tanning, and thereafter filling the leather with any suitable stuffing ingredient, whether soluble or insoluble, best suited to the production of finished leather from the tanned hide. I propose to seal the filling or stuffing ingredients within the tanned hide by employment of agents capable of penetrating the hide, and subsequent conversion into cementitious substances not soluble in the usual solvents with which the leather comes in contact and substantially unaffected by the ordinary temperatures to which the product may be subjected. These agents upon conversion serve as strengthening, sealing and protecting media permanently incorporated in the finished product.

These convertible agents may be in the form of synthetic resins in a suitable solvent, which depending on type may or may not be later removed from the product, which are subsequently or partly cured in the leather, or China wood or linseed oil which may be subsequently oxidized and/or polymerized by heat. By the term "synthetic resins" I refer to the condensation products, such as phenol-aldehyde, urea-aldehyde, phthalic anhydride, or equivalent types.

In one method for practising my process, I may take a hide which has been completely tanned by either a vegetable or mineral process, and thereafter properly filled, and impregnate this hide with a solution of the synthetic resin which after curing yields a product which is pliable and leather-like in its characteristics. In employing the synthetic resin I may use either one of the new flexible synthetic resin compounds, or add to a solution of one of the older brittle synthetic resins a softening material or plasticizer, such as castor oil, China wood oil, degras, or other oils, greases and waxes, or chemical plasticizers, such as dibutyl phthalate, etc. After evaporation of the solvent, the impregnated leather is cured by heat and possibly pressure to produce the flat, smooth sheets of commerce. If

desired, this curing of the impregnated leather may be partially accomplished in the hot air chamber and partially between the heated platens of a press or heated rolls of a calender, or it may be accomplished by either method alone. If my process is carried out directly on a completely tanned but unfilled hide, a larger percentage than otherwise of impregnated material can be picked up by the hide and cured therein. However, it is entirely feasible with my process to stuff or fill the hide before treatment with the synthetic resin or other sealing agent with any desired stuffing ingredient which may be of the relatively cheaper water-soluble type now in general use, thus partially or completely filling the voids between the fibres and requiring the employment of less sealing ingredient. Thereafter, if the stuffed hide is subjected to treatment with the impregnating solution, the otherwise soluble stuffing ingredients are sealed therein and the finished product is rendered substantially impervious to the action of water or other solvents, heat, etc. with which the leather normally comes in contact. By impregnating a filled or stuffed product, a minimum quantity of sealing ingredient is required, the latter serving simply as a sealing and protective agent to avoid subsequent dissolving or extraction of soluble stuffing ingredients.

The impregnating bath employed may be a solution of synthetic resin in the nature of a resin varnish, which after curing is practically insoluble, unaffected by heat, strongly cementitious, supple, and pliable all in controllable degree. I have also found it possible to employ such resins in an earlier stage of manufacture, as while still water soluble. If the resins are used in a water solution, impregnation may be accomplished by brushing or spraying the surface of the damp, rough leather, and wholly or partially drying and curing the resultant product in hot air.

The amount of impregnating material picked up by the tanned hide may be controlled by its concentration in the solution, by the duration of the operation, by the pressures employed, by the aggregate size and type of the material, and to some extent by the character of the solvent. As an indication of the permissible variation, the content of impregnating material in the final product may range upwardly to 65 per cent., although percentages varying from 10 to 25 per cent. now appear to be satisfactory. The rate of impregnation of the product may be governed by the size of the aggregate, by mechanically flexing the leather as in a tumbling barrel, by the temperature of the bath, and the nature of the solvent, and impregnating material. A temperature of about 60° C. has been found satisfactory with the employment of the usual solvents, but acceptable products have also have been made with room temperatures. The use of tumbling in connection with the impregnation is desirable as it not only hastens the operation but permits the desired impregnation to be secured with thicker or more viscous solutions than otherwise, and in consequence with reduced quantities of solvent. It follows, therefore, that if the solvent is not to be recovered in the operation, impregnation in this manner promotes economy in the process.

After the desired degree of impregnation has been obtained, the treated hide is allowed to drain, and may then be placed in a hot air chamber at a temperature of about 125° F. for a period of 24 to 48 hours, which may be varied. Thereafter, the hide, either whole or in sections, is placed between the smooth platens of a press or between the rolls of a calender, and subjected to pressures on the order of 300 pounds per square inch. In either case the presser members are heated to temperatures which may correspond to team pressures of 20 pounds or thereabouts.

The method of impregnation with linseed and China wood oils or other drying or polymerizing oils is the same in its essential aspects as the method described for impregnation with synthetic resins. The oils may be used either with or without the addition of solvents, the latter serving to increase the rate of penetration. The amount and rate of impregnation may be controlled by temperature and concentration of the bath and by the nature of the material, or the surface of the leather may be coated with the material to be subsequently driven in by heat. After impregnation the hide is thoroughly drained and placed in a hot air chamber at about 125° F. for a sufficient period of time to oxidize or polymerize the oil to the desired stage. The temperature is adjusted to suit the nature of the material and any dryers or catalysts may be employed. If desirable the oil may be partially polymerized by heating or other means before incorporation into the leather.

Although, as previously stated, various stuffing and filling materials, such as spruce extract, salts, sugars, waxes, greases, and oils are preferably added to the tanned hide before impregnation with the sealing agent. Nevertheless, it is possible to add a part or all of these ingredients during impregnation, especially ingredients which may conceivably be soluble in the impregnating bath. Obviously, unless such ingredients are added before curing of the resin, the proper sealing function of the resin will not be attained.

The advantages of my process are particularly apparent when combined with chrome or mineral tanning, as the rough leather of diminished weight and strength produced by the chrome tanning operation can be satisfactorily filled with relatively inexpensive stuffing materials and subsequently sealed within the leather by the impregnating agent. By the proper utilization of filling materials, tanned leather of commercial strength, weight, thickness and finish may be produced in a minimum of time and with resultant permanent qualities comparable to or better than those of leather produced by the more laborious vegetable tanning method.

In the employment of my method for the impregnation of leather where substantial drying would be a distinct detriment, as may be the case in chrome tanned leathers, I have found that the synthetic resin solutions formulated with proper water-repellant solvents, such as gasoline, may be used directly on the moist or wet leather, the solvent displacing the water and carrying the resin into the leather mass evenly and uniformly. Thereafter, the product may be cured immediately following the solvent and moisture removal without injury to the leather fibre. Water solutions of the resins may be conceivably employed as well as the polymerzing oils when properly applied and driven into the leather structure by heat. In view of the unsatisfactory condition resulting from substantial dehydration of leather fibres, it must be evident to those skilled in the art that the exercise of care is necessary in the practical application of this method to avoid a complete or substantially complete expelling of moisture from the leather fibres. This

can be satisfactorily controlled by suitable regulation of the time, temperature, and humidity of the curing operation to maintain the necessary moisture content in the individual fibres.

The product of my new process is essentially a sheet of whole leather which may be handled, cut, flexed and otherwise treated or used, as is the case with prior art leather, and in this respect is to be sharply distinguished from bakelite or other synthetic resin compositions, either rigid or flexible, which have compounded therein certain filling ingredients of a fibrous nature, such as leather fibre. In all of these synthetic resin compounds, a unitary, impermeable and solid mass of material free from voids is obtained, whereas in my new product the resultant leather sheet consists of a multiplicity of fibres interspersed with cells or voids, partially or wholly filled with stuffing materials and surrounded, sealed and bonded by the cured impregnating material. The stiffness of the resulting leather is governed largely by the character and amount of materials used for stuffing, to some extent by the percentage of impregnating material picked up and very largely by its character and cure. I have nevertheless found that the leather can successfully pick up a minimum of 10 to 20 per cent. of plasticized resin, or resin which is flexible and pliable when completely cured or polymerizing oils, without imparting undesirable qualities of stiffness which are in any way detrimental to the normal use of the product. In fact, in the treatment of hides for the production of sole leather, and for other and similar purposes, considerably greater concentration of the impregnating materials within the leather may be had without objectionable effects.

In this connection it will be evident that the character of the impregnating materials and its concentration within the hide may be governed by a variety of factors: first and foremost, the qualities which it is desired to impart to finished leather, and secondly, the cost of the operation and the effect which more economical use of solvent may have on the qualities of the finished product. It will furthermore be evident that certain aspects of my method are applicable to the treatment of what otherwise might be designated as finished leather which has been made in accordance with existing methods, in this case the sealing and finishing ingredients, such as phenolic resin or drying oil, being added either with or without other ingredients to impart a permanent and desirable finish to the sheet of leather.

What is claimed is:

1. A method of converting green hides into leather which consists in mineral tanning the hide, subsequently impregnating the tanned hide with soluble stuffing and sealing ingredients, and subjecting to heat to convert the sealing ingredient into material normally insoluble in media with which the leather may come in contact and serving to protect the stuffing ingredients against action of such media, and to strenghen and reinforce the finished leather.

2. A method of making leather which consists in mineral tanning the hide, impregnating the tanned hide with an oil capable of oxidation or polymerization, and thereafter converting the oil in the leather into a normally insoluble product by heat.

3. A method of making leather which consists in treating the green hide by a mineral tanning process, filling the hide with soluble stuffing ingredients and a sealing agent, and converting the sealing agent by heat into an insoluble substance within the hide.

4. A method of making leather which consists in tanning the hide, impregnating the tanned hide with soluble stuffing ingredients and a solution of synthetic resin, and curing the resin in the leather.

5. A method of treating leather which consists in impregnating the leather with a solution of synthetic resin, and curing the resin in the leather.

6. A method of making leather which consists in first converting certain natural ingredients of the hide in a chrome tanning bath, drying the hide, penetrating the tanned dried hide with soluble stuffing ingredients, treating the tanned hide with a solution of a phenolic resin, and finally curing the resin in the leather.

7. A method of treating leather which consist in impregnating the leather with a solution of a phenolic resin, and finally curing the resin in the leather to an elastic insoluble condition by heat.

8. A method of treating tanned hides which consists in stuffing the hide with normally soluble ingredients, sealing the hide by impregnation with a liquid sealing agent, and converting the sealing agent in the hide to an insoluble substance by heat.

9. A method of treating tanned hides which consists in impregnating the hide with a solution of a phenolic resin, expelling the solvent, and thereafter curing the resin within the leather by heat.

10. A method of treating leather which consists in impregnating the leather with a solution of a phenolic resin to which a plasticizer has been added, and curing the resin within the leather by heat.

11. A method of making leather which consists in mineral tanning the green tanned hide, impregnating the hide by agitation with a solution of a synthetic resin, and converting the resin within the hide by heat to an insoluble condition.

12. A method of making leather which comprises the impregnation of the hide or leather with a sealing agent in fluid form capable of effectually penetrating the hide and subsequent conversion by heat of the sealing agent within the hide into an insoluble cementitious substance.

13. A leather sheet having the characteristic fibrous structure of leather with intercellular spaces, the latter being filled with normally soluble stuffing ingredients, and sealed by phenolic resin in a manner to reserve the normal flexible and pliable characteristics of the leather.

ROBERT W. CHANDLER.

CERTIFICATE OF CORRECTION.

Patent No. 1,930,158. October 10, 1933.

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It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, line 124, claim 11, strike out the word "tanned" and insert the same before "hide" in line 125; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 27th day of February, A. D. 1934.

F. M. Hopkins

(Seal) Acting Commissioner of Patents.