

UNITED STATES PATENT OFFICE.

SADAKICHI SATOW, OF SENDAI, JAPAN.

ARTIFICIAL LEATHER AND PROCESS OF MAKING THE SAME.

1,245,977.

Specification of Letters Patent.

Patented Nov. 6, 1917.

No Drawing.

Application filed December 11, 1916. Serial No. 136,297.

To all whom it may concern:

Be it known that I, SADAKICHI SATOW, a subject of the Emperor of Japan, residing at Sendai, Japan, have made a certain new and useful Invention in Artificial Leather and Processes of Making the Same, of which the following is a specification.

This invention relates to artificial leather or leather substitute having all the properties of leather, and the process of making the same.

The object of the invention is to provide an artificial leather or a substitute for leather, and an economical process for making the same.

A further object of the invention is to provide an artificial leather or a leather substitute which may be used for all purposes for which leather is adapted, and which is made from vegetable proteid substances.

Further objects of the invention will appear more fully hereinafter.

Heretofore in the manufacture of artificial or substitute leather, textile or fibrous material to afford tensile strength is coated in order to give necessary body, with a mixture of sticky, viscid substances, such as oxidized castor oil, collodium solution, rubber solution, viscose, and the like. It has also been proposed to employ waste portions of natural leather in fibrous or powdered form with a suitable binding material such as starch paste to produce artificial leather. These methods are open to many and serious objections. The presence of collodium in the artificial leather product renders such product inflammable. It is expensive and difficult to apply a thick layer of the required substance to the cloth, textile or other fabric as the operation requires successive applications of layers or coatings, each application or coating being dried before the next succeeding application is made. The material employed cannot be rolled into a thick sheet to produce the artificial leather, and the hardness or softness of the product cannot be easily controlled.

It is among the special objects of my present invention to provide an artificial leather, or a substitute for leather and a process of making the same which avoids the objections referred to and which product is not inflammable, can be quickly, easily

and economically made and rolled into any desired thickness with any desired degree of hardness or softness.

In carrying out my invention I employ vegetable proteids or proteidal substances which are glutinized with suitable agents into a sticky viscid mass. This mass may be used as a coating for cloth textile or other fabric; or it may be transformed into proteidal condensation products by the action of an active methylene compound, and rolled into sheets or applied to the fabric; or to the glutinized mass, whether or not treated with the active methylene compound, may be added suitable fibrous matter, to give tensile strength or body to the mass which may then be applied to the fabric or be rolled into sheets or other form of the desired thickness for use as an artificial leather. Suitable pigments or coloring matter may also be employed, as well as viscous substances such as oxidized oils, triphenyl-glycerin, viscose, hydrated cellulose of gelatinized celluloses, or the like.

The proteids are procured from any suitable raw proteid-containing material such as beans, peas, wheat, corn or other leguminous, cereal or grain products.

The proteid-containing raw material is crushed to break down the cellular structure thereof, and if it contains an undesirable percentage of oil, the oil content is removed. This may be effected in any suitable manner, as, for example, by treating the mass with an oil solvent such as benzine. The oil solvent is then removed from the mass. The proteidal substances contained in the "meal" or "proteid meal" thus produced, are separated therefrom to produce a refined proteid product. This separation of the proteidal substances from the proteid meal may be effected in various ways. According to one method the "meal" is treated with an alkaline solution, such as a dilute solution of caustic or carbonated alkali, or caustic or carbonated ammonia, and the proteidal substances, either with or without further purification of the resulting liquid, are precipitated therefrom. The further purification referred to may be accomplished by filtration, centrifuging, or the like, by fractional precipitation, fractional solution of precipitated impure proteids, or by con-

verting one or more components into other chemical compounds having different properties which enable their separation to be effected, or one or more of these various purifying methods may be employed in combination with the others. The precipitation of the refined proteidal substances is accomplished by adding a suitable acid such as sulfuric, sulfurous, acetic or phosphoric, or by adding a suitable ferment, such as lactic or acetic.

According to another method the meal is treated with water and the refined proteidal products are precipitated out of the resulting liquid, either with or without purification thereof, as above explained, the precipitation being effected with an acid or a ferment as above described.

According to still another method the meal is treated with an aqueous salt solution, such as sodium chlorid, ammonium sulfate, or the like, and the resulting liquid either with or without further purification, as explained, is subjected to dialysis.

The proteidal substances obtained, as above described are suitable and highly efficient for use in making artificial leather or leather substitute in accordance with my invention.

In the preparation of the artificial leather the proteidal substances, obtained as above described, are subjected to the action of a glutinizing agent to produce a sticky viscid mass. I have found the following to be suitable proteid glutinizing agents, namely, (1) inorganic acids, such as phosphoric acid, sulfurous acid, and the like; or (2) fatty or oxy-fatty acids, such as formic, acetic, propionic, phenyl-propionic, malonic, lactic, tartaric, citric, malic, and the like; or (3) aromatic acids, such as salicylic, benzoic and the like; or (4) phenols, such as carbolic acid, cresol, resorcin, nitro-cresol, and the like; or (5) organic bases, such as pyridin, urea, glycin, anilin, naphthylamin, or other amino compounds or the like, or (6) inorganic bases, such as caustic alkali, ammonia or the like; or (7) alkali salts of weak acids, such as borax, sodium phosphate, and the like.

The properties of the mass thus obtained which particularly adapt it for use in the manufacture of artificial leather, are greatly improved if one or more of the following compounds are added thereto, namely, sticky or viscid substances, such as oxidized oils, triphenyl-glycerin, or the like; or viscous plastic materials such as hydro-cellulose, oxy-cellulose or cellulose-esters, and which I will herein refer to as cellulose derivatives, or other viscous substances; or active methylene compounds, such as formaldehyde, hexamethylenetetramin, trioxymethylene, or other aldehyde, or aliphatic and aromatic series.

The properties of the mass thus obtained

are still further improved if a small quantity of alkali is added thereto.

If desired, and in order to form a body for and to increase the tensile strength of the artificial leather product, suitable fibrous material, such as waste hemp, cotton, wood fiber, paper, leather waste or other similar material, preferably though not necessarily possessing a long strong fiber, is added. Also, if desired, any suitable pigment or coloring matter may also be added.

The manner in which my invention is carried out is illustrated in the following illustrative examples:

Example 1: The refined proteidal substances, procured as described, are kneaded with cresol, and the mass is kneaded again after the addition of oxidized castor oil. The resulting mass is kneaded a third time after adding thereto a small quantity of concentrated caustic soda solution, and a suitable quantity of fibrous matter such as waste hemp.

Example 2: The proteidal substances, either in the crude or refined state, are kneaded first with anilin, and the mass is again kneaded successively with trioxymethylene and caustic soda, and the resulting mass is applied under a hot roller to cotton cloth or other fabric, and dried.

It is to be understood, of course, that my invention in its broadest scope, as defined in the claims, is not to be limited to the use of any particular raw material containing vegetable proteids, nor to any particular method of recovering or refining the proteidal substances nor to any particular glutinizing agent nor to any particular condensing agent or sticky viscid substance, nor to any particular fiber. It is also to be understood that in carrying out my invention any proteid containing material in its crude state, whether admixed with fibers, carbohydrates or not, can also be used instead of refined proteids.

The artificial leather product produced as above described is non-inflammable. It can be easily rolled into sheets of any desired thickness or size, or applied easily, readily and quickly to any suitable cloth or fabric. It is strong, durable and economical, and can be used in any situation or finished article where leather or leather substitute is now used. By suitably varying the proportion of glutinizing or condensing agents employed the degree of hardness or softness of the finished artificial leather product may be controlled.

Having now set forth the objects and nature of my invention and the method of carrying the same into practical operation, what I claim as new and useful, and of my own invention, and desire to secure by Letters Patent is—

1. In the manufacture of artificial leather

the process which consists in glutinizing vegetable proteids and then mixing fibrous material with the resulting mass.

2. In the manufacture of artificial leather the process which consists in glutinizing vegetable proteids and then forming the resulting mass into a sheet.

3. In the manufacture of artificial leather the process which consists in glutinizing vegetable proteids then adding a sticky viscid agent to the mass, and finally forming the resulting mass into a sheet.

4. In the manufacture of artificial leather the process which consists in glutinizing vegetable proteids then adding a sticky viscid agent to the mass, and finally adding a fibrous material to the mass.

5. In the manufacture of artificial leather, the process which consists in glutinizing vegetable proteids, then adding cellulose derivatives to the mass and finally forming the resulting mass into a sheet.

6. In the manufacture of artificial leather, the process which consists in glutinizing vegetable proteids and then adding cellulose derivatives and oxidized oil to the mass and finally adding fibrous material to the mass.

7. In the manufacture of artificial leather the process which consists in glutinizing vegetable proteids with a phenol in the absence of heat and then forming the resulting mass into a sheet.

8. In the manufacture of artificial leather the process which consists in glutinizing vegetable proteids with a phenol, and then mixing fibrous material with the resulting mass.

9. In the manufacture of artificial leather the process which consists in glutinizing vegetable proteids with a phenol, and then mixing a sticky viscid agent to the mass and forming the mass into a sheet.

10. In the manufacture of artificial leather the process which consists in glutinizing vegetable proteids with a phenol, then mixing a sticky viscid agent with the mass, and finally mixing fibrous material with the mass.

11. In the manufacture of artificial leather the process which consists in glutinizing vegetable proteids with a phenol, then mixing viscose with the mass, and finally mixing fibrous material with the mass.

12. In the manufacture of artificial leather the process which consists in glutinizing vegetable proteids with a phenol, then mixing gelatinized cellulose with the mass, and finally mixing fibrous material with the mass.

13. In the manufacture of artificial leather the process which consists in glutinizing vegetable proteids, and mixing an active methylene compound with the mass and forming the mass into a sheet.

14. In the manufacture of artificial leather the process which consists in glutinizing vegetable proteids, and mixing an active methylene compound with the mass and finally mixing fibrous material with the mass.

15. In the manufacture of artificial leather the process which consists in glutinizing vegetable proteids, and mixing a sticky viscid agent with the mass and finally mixing a condensing agent with the resulting mass.

16. In the manufacture of artificial leather the process which consists in glutinizing vegetable proteids with a phenol, and mixing a sticky viscid agent, cellulose derivatives, an active methylene compound and fibrous material with the mass.

17. In the manufacture of artificial leather the process which consists in glutinizing vegetable proteids with a phenol, and mixing an oxidized oil and fibrous material to the resulting glutinized mass.

18. In the manufacture of artificial leather the process which consists in glutinizing vegetable proteids with a phenol, and mixing an oxidized oil, an active methylene compound and fibrous material with the mass.

19. In the manufacture of artificial leather the process which consists in glutinizing vegetable proteids with a phenol, and mixing an oxidized oil, gelatinized cellulose, an active methylene compound and fibrous material with the glutinized mass.

20. In the manufacture of artificial leather the process which consists in glutinizing vegetable proteids and then adding an oxidized oil and fibrous material to the mass.

21. In the manufacture of artificial leather the process which consists in glutinizing vegetable proteids and then adding an oxidized oil and cellulose derivatives to the mass.

22. In the manufacture of artificial leather the process which consists in glutinizing vegetable proteids and then adding cellulose derivatives to the glutinized mass.

23. In the manufacture of artificial leather the process which consists in glutinizing vegetable proteids and then adding gelatinized cellulose to the glutinized mass.

24. In the manufacture of artificial leather the process which consists in treating vegetable proteids with a phenol to glutinize the same, and mixing an oxidized oil and gelatinized cellulose with the glutinized mass.

25. In the manufacture of artificial leather the process which consists in treating vegetable proteids with a phenol to glutinize the same, and mixing an oxidized oil, gelatinized cellulose and an active methylene compound with the glutinized mass.

26. In the manufacture of artificial leather the process which consists in treating vegetable

table proteids with a phenol to glutinize the same, and mixing an oxidized oil, gelatinized cellulose, an active methylene compound and an alkali with the glutinized mass.

5 27. In the manufacture of artificial leather the process which consists in glutinizing vegetable proteids and then mixing a sticky viscid agent and fibrous material, and an active methylene compound with the glutinized mass.

10 28. In the manufacture of artificial leather the process which consists in separating the vegetable proteids from proteid containing material, then glutinizing the separated proteids and mixing fibrous material with the glutinized mass.

15 29. In the manufacture of artificial leather the process which consists in separating in a liquid the vegetable proteids of proteid containing raw material, then precipitating the proteidal substances from the liquid and glutinizing the precipitated proteidal substances and adding fibrous material to the resulting mass.

20 30. As a new article of manufacture, artificial leather consisting of glutinized vegetable proteid substances having fibrous material incorporated therein.

25 31. As a new article of manufacture, artificial leather consisting of glutinized vegetable proteid substances containing an active methylene compound.

30 32. As a new article of manufacture, artificial leather consisting of glutinized vegetable proteid substances containing an active methylene compound and fibrous material.

35 33. As a new article of manufacture, artificial leather consisting of glutinized vegetable proteid substances containing an oxidized oil and fibrous material.

40 34. As a new article of manufacture, artificial leather consisting of glutinized vegetable proteid substances containing a sticky viscid agent.

45 35. As a new article of manufacture, artificial leather consisting of glutinized vegetable proteid substances containing a sticky viscid agent and fibrous material.

50 36. As a new article of manufacture, artificial leather consisting of glutinized vegetable proteid substances, an active methylene agent, an oxidized oil and fibrous material.

55 37. The process of manufacturing artificial leather which consists in treating vegetable proteids with a proteid glutinizing agent to glutinize the same and then adding fibrous material to the resulting mass.

38. The process of manufacturing arti-

ficial leather which consists in treating vegetable proteids with a phenol to glutinize the same and then adding fibrous material to the glutinized mass.

39. In the manufacture of artificial leather the process which consists in glutinizing vegetable proteid substances, then treating the glutinized mass with an active methylene compound and an alkali, and finally adding fibrous material thereto.

40. In the manufacture of artificial leather the process which consists in glutinizing vegetable proteid substances, then treating the glutinized mass with an oxidized oil, an active methylene compound and an alkali, and finally adding fibrous material thereto.

41. In the manufacture of artificial leather the process which consists in glutinizing vegetable proteid substances with a phenol and adding an active methylene compound and an alkali to the glutinized mass, and adding fibrous material to the resulting mass.

42. In the manufacture of artificial leather the process which consists in treating vegetable proteid substances with phenol to glutinize the same, then adding an oxidizing oil, an active methylene compound and an alkali to the glutinized mass and finally adding fibrous material to the resulting mass.

43. As a new article of manufacture, artificial leather consisting of glutinized proteids and cellulose derivatives.

44. As a new article of manufacture, artificial leather consisting of glutinized vegetable proteids and gelatinized cellulose.

45. As a new article of manufacture, artificial leather consisting of glutinized vegetable proteids and cellulose derivatives and a sticky viscid substance.

46. As a new article of manufacture, artificial leather consisting of glutinized vegetable proteids and cellulose derivatives, a sticky viscid substance and fibrous material.

47. As a new article of manufacture, artificial leather consisting of glutinized vegetable proteids and cellulose derivatives, a sticky viscid substance, fibrous material and a condensing agent.

48. As a new article of manufacture, artificial leather consisting of glutinized vegetable proteids and cellulose derivatives, a sticky viscid substance, fibrous material, a condensing agent and an alkali.

In testimony whereof I have hereunto set my hand on this 1st day of December, A. D. 1916.

SADAKICHI SATOW.