UNITED STATES PATENT OFFICE.

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VEGETABLE GLUE AND PROCESS OF MAKING THE SAME.

1,311,965. Specification of Letters Patent. Patented Aug. 5, 1919.

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To all whom it may concern:

Be it known that I, WILLIAM M. GROSVENOR, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Vegetable Glue and Processes of Making the Same, of which the following is a specification.

My invention relates to improvements in vegetable glue and processes of making the same, the main objects being to produce a glue in which the water repellent quality is materially increased, so that joints made with the glue when dry are less likely to be affected by water or moisture, and, if desired at the same time, to render the glue more neutral while still retaining substantially the qualities of animal glue for gluing up veneers.

In U. S. Reissue Letters Patent, #13436, dated July 2, 1912, and in U. S. Letters Patent #1,020,656, 1,078,691, 1,078,692 and 1,200,488, there are disclosed methods of making vegetable glue by dissolving a starchy carbohydrate with a solvent of starch cellulose, such as caustic soda, the resulting glue being markedly alkaline. Even if the percentage of caustic alkali be reduced to about 3%, based on the dry weight of the starch, and heat be used to aid the solution of the starch, the resulting glue is sufficiently alkaline, so that when applied to very thin veneers of certain woods, it will cause a discoloration of the wood veneer, which discoloration may appear disadvantageously on the opposite side of the wood layer from that on which the glue is applied. In many cases, this discoloration is not a serious disadvantage, but in other cases where very thin layers of fine wood are being glued together, this discoloration or staining may be a detriment which it is desirable to avoid.

While also the glue is more water repellent or water resistant when dry than animal glue, nevertheless, it is important to increase the water repellent quality of the glue as much as possible. In order that those skilled in the art may more clearly understand the invention, I will describe in detail several ways in which the invention may be carried out.

In producing the new glue, I take a suitable starchy carbohydrate, preferably the glue base degenerated or adjusted as to viscosity, in accordance with any of said U. S. Letters Patent. However, certain starches appear on the market which require no preliminary treatment to adjust the viscosity, and these may be used if desired. Whether such starch is suitable may be easily determined by testing the same. I preferably use cassava starch or tapioca flour.

According to one method, I take a suitable starchy carbohydrate and dissolve it with about 3 parts or less by weight of water and about 3% by weight of caustic soda, the caustic soda being added in the form of a 33% solution. The starch is first thoroughly mixed with the water and then the caustic soda solution added gradually with continual stirring and heat to 140–160° F. until the batch is transformed from a mixture of suspended starch in water to a homogenous colloidal solution of starch, alkali and water, having substantially the adhesive and other properties of good animal glue for gluing up high grade wood veneers as described in said Letters Patent. The resulting glue, although thick and viscous, is capable of flowing through pipes 2 inches in diameter and of being spread by glue applying machinery, similar to animal glue.

After the starch has come across to produce the glue, as above described, and while still hot, I add thereto ordinary commercial rosin in the form of a fine powder, preferably so fine that it will pass through a one hundred mesh sieve. The rosin is added gradually and evenly, so as to be worked in throughout the glue. The amount of rosin required will depend on its quality, varying with what is known as the acid constant of the rosin. The addition is preferably continued until the glue is substantially neutral. The rosin reacts with the caustic of the glue to produce sodium resinate, which, upon the glue drying and being exposed to the action of air, breaks up into rosin and sodium carbonate and bicarbonate, so that the rosin not only acts to neutralize the alkaline glue,

but also as a water repellent material in the glue to increase the water repellent quality thereof.

Instead of introducing the rosin in the form of a powder, it is preferred to introduce it by adding an emulsion of rosin in a solution of ammonium resinate. For this purpose, a mixture of 3 parts by weight of strong ammonia water and two parts of rosin is first made by heating the two together, after which three more parts of rosin are added in the form of a fine powder and thoroughly worked into the mass until it becomes completely emulsified. This emulsion is then added to the glue and thoroughly worked in as above described. However, due allowance in making up the original glue should be made for the water contained in this emulsion. In making up the emulsion, caustic soda or potash may be used cold, or carbonates may be used hot, instead of ammonia, but proportionately more of the emulsion is required to produce the same degree of neutrality.

If desired, substantially neutral ammonium resinate may be used in place of the rosin of the first example, to neutralize the glue. In such case, particularly when the glue is treated, hot ammonia is expelled and the caustic is reacted upon by the rosin produced by the expelling of the ammonia from the resinate, to neutralize the caustic. In each of these cases the resinate formed breaks up to produce rosin as a water repellent material in the glue when dry. Other resins or resinous bodies which would tend to neutralize the particular alkaline solvent of cellulose used in making the glue may be used in a similar manner.

If it is not important to provide any neutralizing action for the glue, as may happen in many cases, other waxy bodies or water repellent materials may be used. Thus, for example, paraffin wax may be introduced by forming an emulsion of wax in water with a very small amount of starch. For example, 225 parts by weight of water are mixed with 10 parts of starch and heated to a temperature preferably above 160° F. The mixture is either heated in or placed in a suitable emulsifier, and to this is added, either in the molten form or finely ground form, 15 parts of paraffin and the whole thoroughly emulsified while being kept hot. The proportions of starch and paraffin may be considerably decreased or somewhat increased according to the degree of water resistance desired.

The emulsion kept between 130 and 140° F. preferably, not lower, is used instead of the water for dissolving the starchy carbohydrate with the alkaline solvent of cellulose to form the glue. The starchy carbohydrate is preferably stirred into the paraffin emulsion while still warm, and the temperature gradually raised as the caustic solution is added and then further raised to about 165°. At about this temperature, the batch is continuously agitated until bursting is complete, whereupon it is allowed to cool, but the stirring is preferably discontinued before the temperature falls to that at which the wax begins to solidify. Care should be taken in using a starch of proper viscosity, as when this wax is used, a starch somewhat more degenerated should be used than if rosin is used as the water repellent agent, to produce a glue of the same final viscosity. Or the amount of water may be increased somewhat to accomplish the same end. Indeed, the water may be increased to substantially more than 3 parts, based on the dry weight of starch glue base depending upon the amount of paraffin and quality of the starch base. With certain waxes, a higher temperature is required to liquefy them and the boiling point of the water may be approached or exceeded, in which case it is best to use a closed emulsifier operating under pressure to produce the emulsion.

Other water repellent materials may be used by incorporating them in the glue, either before or after the solution of the starch to form the glue has occurred, and whether or not such materials have the neutralizing action on the glue. Even when a more neutral glue is desired, it is not always necessary that it be made absolutely neutral, as it is only necessary to reduce its alkalinity to such an extent that the staining is reduced to a point where it is not considered harmful for the particular class of wood in hand, and in some cases where the staining is unimportant the material added need have no effect on the alkalinity of the glue. Likewise, if a nearly neutral glue is required and the question of water repellent quality is relatively unimportant, the resinous material added to neutralize need not increase the water repellent quality of the glue.

What I claim and desire to secure by Letters Patent is:

1. The improved vegetable glue comprising a starchy carbohydrate in solution in about 3 parts or less by weight of water and containing a salt of an alkali metal and a resinous body and having substantially the properties of animal glue for gluing up veneers.

2. The improved vegetable glue comprising a starchy carbohydrate dissolved in about 3 parts or less by weight of water by a solvent of starch cellulose and containing a resinous body and having substantially the properties of animal glue for gluing up veneers.

3. The improved vegetable glue comprising a starchy carbohydrate dissolved by an alkaline solvent of starch cellulose in viscous

solution in water and having substantially the properties of animal glue for gluing up veneers, and containing a resinous body capable of substantially neutralizing the alkaline solvent of cellulose and increasing the water repellent properties of the glue when dry.

4. The improved vegetable glue comprising a starchy carbohydrate in viscous solution in water and having substantially the properties of animal glue for gluing up veneers and containing a resinous material capable of increasing the water repellent quality of the glue when dry.

5. The improved vegetable glue comprising a starchy carbohydrate in viscous solution in water and having substantially the properties of animal glue for gluing up veneers and containing material capable of increasing the water repellent quality of the glue when dry.

6. The improved vegetable glue comprising a starchy carbohydrate dissolved by an alkaline solvent of starch cellulose in viscous solution in water and having substantially the properties of animal glue for gluing up veneers, and containing a resinous body capable of substantially neutralizing the alkaline solvent of cellulose.

7. The improved vegetable glue comprising a starchy carbohydrate in solution in about 3 parts or less by weight of water with an alkaline solvent of starch cellulose and having substantially the adhesive properties of animal glue for gluing up veneers, and containing material capable of increasing the water repellent properties of the glue when dry.

8. The improved vegetable glue comprising a starchy carbohydrate in solution in about 3 parts or less by weight of water, and containing a material capable of increasing the water repellent quality of the glue when dry.

9. The improved vegetable glue comprising a starchy carbohydrate in solution in about 3 parts or less by weight of water and having substantially the adhesive qualities of animal glue for gluing up veneers, and containing a substantially neutral material capable of increasing the water repellent quality of the glue when dry.

10. The improved vegetable glue comprising a starchy carbohydrate dissolved in about 3 parts or less by weight of water and a solvent of starch cellulose and having substantially the adhesive properties of animal glue for gluing up veneers, and being substantially neutral and containing material which renders the product substantially water repellent when dry.

11. The improved vegetable glue comprising a viscous solution of starchy carbohydrate with water and a solvent of starch cellulose, capable of flowing through pipes 2 inches in diameter and of being spread by machinery, the improved vegetable glue comprising a starchy carbohydrate in solution in about 3 parts or less by weight of water, and containing a material increasing the water repellent quality of the glue when dry.

12. The improved vegetable glue comprising a viscous solution of starchy carbohydrate with water and a solvent of starch cellulose, capable of flowing through pipes 2 inches in diameter and of being spread by machinery, and containing material capable of increasing the water repellent quality of the glue when dry.

13. The improved vegetable glue comprising a viscous solution of starchy carbohydrate with water and a solvent of starch cellulose, capable of flowing through pipes 2 inches in diameter and of being spread by machinery and containing a resinous neutralizing agent.

14. The process of making vegetable glue which consists in dissolving a starchy carbohydrate with caustic alkali in about 3 parts or less by weight of water and heat below 175° F., the carbohydrate being such that the resulting solution has substantially the properties of animal glue for gluing up veneers and then adding a resinous body while the solution is still warm, to substantially neutralize the glue and increase its water repellent quality.

15. The process of making vegetable glue which consists in dissolving a starchy carbohydrate with caustic alkali in about 3 parts or less by weight of water, the carbohydrate being such that the resulting solution has substantially the properties of animal glue for gluing up veneers and then adding a resinous body to substantially neutralize the glue and increase its water repellent quality.

16. The process of making a vegetable glue which consists in dissolving a starchy carbohydrate in a solvent of starch cellulose to form a viscous solution having substantially the properties of animal glue for gluing up veneers and incorporating therein a resinous body.

17. The process of making a vegetable glue which consists in dissolving a starchy carbohydrate in a solvent of starch cellulose to form a viscous solution having substantially the properties of animal glue for gluing up veneers, and incorporating in the glue a material capable of increasing the water repelling quality of the glue when dry.

18. The process of making vegetable glue which consists in dissolving a starchy carbohydrate with an alkaline solvent of cellulose to form a viscous glue, having substantially the adhesive qualities of animal glue for gluing up veneers and incorporating

therein material capable of increasing the water repelling quality of the glue when dry and substantially neutralizing the glue.

19. The process of making vegetable glue which consists in dissolving a starchy carbohydrate in about 3 parts or less by weight of water to form a viscous solution having substantially the qualities of animal glue for gluing up veneers and incorporating therewith a material to increase the water repellent quality of the glue when dry.

20. The process of making vegetable glue which consists in dissolving a starchy carbohydrate in about 3 parts or less by weight of water to form a viscous solution having substantially the qualities of animal glue for gluing up veneers, and then adding rosin thereto.

21. The process of making a vegetable glue which consists in dissolving a starchy carbohydrate in a solvent of starch cellulose to form a viscous solution having substantially the properties of animal glue for gluing up veneers, and adding rosin thereto in the form of an emulsion with a resinate.

Signed at New York in the county of New New York and State of New York this 6th day of December A. D. 1917.

WILLIAM M. GROSVENOR.