

UNITED STATES PATENT OFFICE

2,231,050

METHOD OF PREPARING AN ADHESIVE

George M. Bierly, Columbus, Ohio

No Drawing. Application April 26, 1939,
Serial No. 270,204

3 Claims. (Cl. 134—23.4)

This invention relates to a method of preparing adhesives and more particularly to adhesives of the type utilized, among other widely varying uses, as sizings for the warp threads of rayon and other fabrics.

It is customary in the weaving of rayon, acetate and other synthetic yarns to coat and bind together the filaments or fibers of the warp yarn with a water soluble adhesive, known in the art as sizing. A sizing is applied for the purpose of (a) strengthening the threads comprising the yarn, (b) to protect them from wear as they contact the moving parts of the loom, (c) to equalize any differences in tension of the warp yarn by a moderate stretch and produce a smooth uniform sheet of warp ends and prevent loose ends.

Strength is imparted to fibers—wool, cotton, silk or rayon—by twisting them. In the synthetic fibers, however, too much twist may harshen the fabric and change its appearance. The objective sought is a minimum twist for softer and more pliable threads, and this can only be obtained by sizing, or coating threads with a solution which protects them from the rapid rough treatment they receive in the loom. Another important requirement for an effective sizing solution is that it shall be easily removable from the thread or yarn after the latter has been woven into desired fabric form.

Among the most satisfactory of the sizings for synthetic yarns now in use are those in which gelatine is the basic ingredient. Such sizings, however, are relatively expensive and add considerably to the cost of production. It is, therefore, one of the outstanding objects of the present invention to provide a sizing possessing the desirable characteristics of the best sizings now employed on synthetic warp yarns but which will be materially less costly to produce and utilize.

Among the most promising of these substitutes with which I have experimented are converted starches. The latter, however, as customarily compounded have not proved to be entirely satisfactory. For instance, a sizing for the purposes set forth must be water soluble in order that it may be cheaply and conveniently removed from the fabrics following weaving, and most starches are water insoluble. Soluble starches, or conversion products, such as dextrine or British gum, are also objectionable, as well as certain insoluble starches, in that when applied to the threads in the form of dry, thin, film-like deposits, they are undesirably brittle and tend to crack or flake, thus losing their continuity and are lacking in

the continuous flexible film-like qualities of the sheathing produced on the threads by the customary glue sizing.

I have discovered that the salts of lactic acid exert a plasticising effect on starch films, so that when starch is prepared for use as an adhesive or sizing by heating with water, the addition of a salt of lactic acid results in imparting to the starch film a tough, continuous and flexible quality when the starch paste composing the film is allowed to dry in the form of a thin section.

Another object of the invention is to provide a starch textile sizing having the above-named plasticising characteristics and which, in addition, is quite readily water soluble so that it may be removed from the textile following the weaving of the latter.

A further object of the invention is the provision of a textile sizing which may be manufactured and used at a lower cost than sizings now commonly employed for the same and similar purposes and which possesses the same valuable characteristics and properties as the more expensive and commonly used sizing.

In accordance with the present invention, my improved sizing is obtained by reacting an oxidizing agent with starch in the presence of lactic acid. Lactic acid is an aliphatic acid having the following classification:

Aliphatic monobasic acids—propionic $\text{CH}_3\text{CH}_2\text{COOH}$.

Hydroxy monobasic aliphatic acids—lactic—hydroxypropionic $\text{CH}_3\text{CHOHCOOH}$.

For the starch, I preferably employ a dry wheat starch having a moisture content of approximately 2% to 3%, although other suitable starches may be used. To each one hundred pounds of such a starch, there is added twenty-five pounds of 80% lactic acid, in which has been dissolved one pound of sodium chlorate as a suitable oxidizing agent. The resultant mixture is heated to temperatures of the order of 110° C. and held at such temperatures until the starch has adsorbed the acid and been converted by the oxidizing reaction into a water soluble compound. That is, the conversion is carried on to the extent that a paste, prepared by heating the mixture with water added thereto and allowing the resulting product to dry, is soluble in hot water. The moisture content of the mixture may be suitably adjusted to the usual commercial standard of 12% by weight and, likewise, the acid of the mixture is neutralized to the desired pH value by adding a solution of ammonium hydroxide of required concentration. The resulting prod-

uct, prior to mixing with hot water, is a dry, white powder, similar in appearance to commercial starch.

5 The adhesive or sizing is prepared from this product by heating the same in the presence of added water so that a paste or viscous fluid is produced which may be applied in thin layers to various textiles in order to set or stiffen the same, particularly during weaving or other operations.
10 My improved sizing differs from others of which I am aware by the fact that it does not tend so readily to crack, harden or disintegrate after application or drying thereof, but on the contrary maintains thin films or layers thereof in a tenacious and flexible state after extended exposure to drying and hardening conditions.

A sizing formed in accordance with the present invention may be more economically produced and utilized than any other satisfactory
20 sizing of which I am aware. Among other desirable properties, my improved sizing possesses the following characteristics: simplicity in use and composition; will not permanently stain or discolor the yarn to which it is applied; is readily and quickly absorbed by the yarn; readily
25 coats the yarn and binds the filaments thereof together; does not shed or dust off during weaving; is capable of being washed out of the fabric during a final finishing or washing operation; may be easily and quickly prepared; reduces the
30 chafing effect on yarn in a loom to a minimum, as well as reducing breakage of the warp yarns in the loom; and is chemically inert and does not affect rayon.

35 The plasticising effect of the salts of lactic acid may be utilized with sizings or adhesives other than starch modified in the above manner. Various amounts may be added to any of the starches, dextrines, gums and glues or gelatines
40 used for adhesives and textile sizings and/or for other purposes. Therefore, my invention should not be construed as limited to starches and compounds thereof, nor to textile sizings,

inasmuch as it is applicable to adhesives generally.

What is claimed is:

1. The method of producing a water soluble starch sizing which comprises forming a mixture
5 of starch, lactic acid and sodium chlorate, heating said mixture to a temperature of the order of 110° C. and holding the mixture at such temperature for a sufficient period of time to convert the starch into a compound soluble in hot water,
10 the amount of sodium chlorate being sufficient to convert the starch into a compound which is soluble in hot water and the amount of lactic acid being sufficient to react with the sodium released during the conversion process and act as
15 a plasticizer.

2. The method of producing a water soluble starch sizing which comprises forming a mixture of starch, lactic acid and sodium chlorate,
20 heating said mixture to a temperature of the order of 110° C., holding the mixture at such temperature for a sufficient period of time to convert the starch into a compound soluble in hot water, and regulating the water content of said mixture so that it will equal approximately
25 12% of the weight of the mixture, the amount of sodium chlorate being sufficient to convert the starch into a compound which is soluble in hot water and the amount of lactic acid being sufficient to react with the sodium released during
30 the conversion process and act as a plasticizer.

3. The method of producing a water soluble sizing which comprises forming a mixture of starch, lactic acid, and sodium chlorate in substantially the following proportions: 100 parts of
35 starch, 25 parts of lactic acid, and 1 part of sodium chlorate, heating said mixture to a temperature of the order of 110° C. and holding the mixture at such temperature for a sufficient period of time to convert the starch into a compound soluble in hot water.
40

GEORGE M. BIERLY.