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## PREPARATION OF GLUE AND THE PRODUCT THEREOF

Edward F. Christopher and Frank L. De Beukelaer, Chicago, Ill., assignors to Swift & Company, Chicago, Ill., a corporation of Illinois

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This invention relates to improved animal glue, glue-like substance, gelatine, or mixtures of these, particularly characterized by its liquid consistency at temperatures lower than the natural setting point for crude glue, such as ordinary room temperatures.

The invention further relates to a novel and improved process by which the glue substances above referred to may be produced.

Ordinary bone glue or gelatine possesses the characteristic of gelatinizing at temperatures somewhat above ordinary temperatures, whereby the liquefication thereof requires the application of heat.

It is accordingly an object of this invention to lower the setting temperature of ordinary bone glue or gelatine, and produce a glue which is liquid at ordinary temperatures.

It is a further object to provide a glue or gelatine which has a high degree of flexibility and is hygroscopic when dried. This characteristic makes for considerable advantage in practice, as illustrated in the common use of glue in securing two materials, one or both of which is subject to an appreciable expansion and contraction under temperature changes, such for example, as the application of labels to glass bottles or the like. In such instances, when the glue dries out completely and possesses no flexibility, or has no tendency to be hygroscopic, the glue film becomes brittle and cannot respond to the expansions and contractions produced by the thermal changes in the materials joined by the glue. The inevitable result is a separation of the glue from one of the surfaces of contact, with a failure of the adhesive joint. This objection is frequently noticed in attempting to secure labels to glass bottles where, due to the lack of flexibility and hygroscopic property, the adhesive fails and the glue falls off.

Accordingly, another object is to provide a glue which is free of the above enumerated objection, possessing instead a high degree of flexibility and hygroscopic property when dried so as to render it completely serviceable in securing materials subject to expansion and contraction under thermal conditions.

A further object of this invention is to provide a glue which may be applied to a surface of a non-rigid material, such as paper, cloth, or the like, without causing the material to curl when the glue is dried. The glue of this invention possesses that degree of flexibility which eliminates the tendency for non-rigid materials to curl when the glue is dried.

It is a further object of this invention to provide a glue which is superior to ordinary animal or other glue in that it withstands the destructive effects of low temperatures on flexibility and the consequences thereof. This property is found to be particularly valuable in uses where glued objects are placed in refrigerators or coolers or other atmospheres of relatively low temperature.

This invention is based upon the discovery that dried glue, dried gelatine, or mixtures of glue and gelatine, or their solutions, may be treated with urea or derivatives thereof, for the production of an improved glue, liquid at a much lower temperature than such untreated glue materials.

In preparing the glue of this invention, it is preferable to first dissolve the desired quantity of urea in water, which is added directly to a liquid hide or bone glue or gelatine. If it is desired, the urea may be added directly to a solution of glue or gelatine, but in either case, after the urea and glue are mixed, the mass is then concentrated to the desired consistency.

The amount of urea employed will vary according to several factors, depending upon the particular results desired. As a matter of information, the setting temperature of the resulting glue will be lowered substantially proportionally to the increase in the amount of urea employed. As a matter of illustration, the following figures are given as a guide in determining the altering effect of different quantities of urea or its derivatives on various types of glue.

In considering these figures, it should be borne in mind that the liquefying effect of the urea or its derivatives depends upon the concentration of the glue or gelatine solution, the jellying property of the crude glue, and the final setting point desired for the finished glue product.

With bone glue having a jelly test of 70 grams, the results shown in the following table have been obtained:

| Per cent of urea by weight based on dried glue used | Setting temperature |
|---|---|
| | *Degrees Fahrenheit* |
| 20 | 64 |
| 30 | 58 |
| 40 | 50 |
| 50 | 45 |

With bone glue having a jelly test of 120

grams, the results shown in the following table have been obtained:

| Per cent of urea by weight based on dried glue used | Setting temperature |
|---|---|
| | *Degrees Fahrenheit* |
| 30 | 56 |
| 20 | 64 |

With bone glue having a jelly test of 31 grams, the result shown in the following table has been obtained:

| Per cent of urea by weight based on dried glue used | Setting temperature |
|---|---|
| 25 | 55° F. |

As a matter of illustration regarding the derivatives of urea, a compound known as biuret, which is formed by heating urea, may be used in place of urea, and is found to produce a liquid glue or gelatine similar to that above described.

After the treatment with urea or its derivatives, the crude glue, which would ordinarily have a relatively high setting point, will be rendered liquid in accordance with the results indicated in the above table, whereby the glue is ready for use at ordinary room temperatures without previous heat treatment while possessing the additional advantageous characteristics of flexibility and hydroscopic quality.

From the above description, it will be apparent that this invention provides a glue possessing the advantages enumerated therefor, and also a process by which this novel glue may be produced. The present disclosure is given merely by way of example, and should not be considered as limiting the invention in any respect, as the scope of this invention may be determined from an understanding of this disclosure and an appreciation of the advantages which the invention produces therein.

We claim:

1. An animal glue possessing the properties of existing in a liquid state at ordinary temperatures and being hygroscopic when dried which consists of animal glue and a reagent selected from the group consisting of urea and biuret.

2. An animal glue possessing the properties of existing in a liquid state at ordinary temperatures and being hygroscopic when dried which consists of animal glue and urea.

3. An animal glue possessing the properties of existing in a liquid state at ordinary temperatures and being hygroscopic when dried which consists of animal glue and biuret.

4. An adhesive possessing the properties of existing in a liquid state at ordinary temperatures and being hygroscopic when dried, which comprises animal glue and urea, the urea being in amount not less than twenty per cent nor more than fifty per cent of the amount of dried glue used, the percentage calculation being by weight.

5. An adhesive comprising animal glue and a reagent selected from the group consisting of urea and biuret, the reagent producing in the adhesive the properties of existing in a liquid state at ordinary temperatures and of being hygroscopic when dried.

6. An adhesive comprising animal glue and urea, the urea producing in the adhesive the properties of existing in a liquid state at ordinary temperatures and of being hygroscopic when dried.

7. An adhesive comprising animal glue and biuret, the biuret producing in the adhesive the properties of existing in a liquid state at ordinary temperatures and of being hygroscopic when dried.

EDWARD F. CHRISTOPHER.
FRANK L. DE BEUKELAER.