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(54) GLUE COMPOSITION

(71) We, EXTRACO AB, a Swedish Body Corporate, of S-264 00 Klippan, Sweden, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to flexible glue compositions. More particularly, the invention relates to compositions containing animal bone glue and one or more quaternary ammonium compounds for decreasing the brittleness of films or lines of the dried glue composition.

Animal glues are collagen-based products obtained, for example, from bones and hides. These glues are primarily used for bookbinding, as binders for matches, for gluing of abrasive paper, labels, etc. Animal glues have an advantage over synthetic adhesives in that they rapidly become tacky, which, among other things, makes it possible to speed up the run-through time of sizing machines. A disadvantage of animal glues, particularly bone glue, is that they are not sufficiently flexible and thus give glue lines and glue films which tend to become brittle after some time. In order to make animal glues and thereby glue lines and glue films more flexible, hygroscopic substances such as glycerol and sorbitol have mainly been used. A disadvantage of these substances is their tendency to migrate from the glue whereby no permanent effect is obtained.

According to the present invention it has been found that flexible compositions of animal glues, which give glue lines and glue films which do not become brittle on ageing, are obtained by the addition of quaternary ammonium compounds to the glue preferably in amounts exceeding 1 per cent by weight based on dry glue. Quaternary ammonium compounds do not have a tendency to migrate from the glue.

The present invention thus provides an animal adhesive glue composition which contains bone glue of at least 0.5 percent by weight based on the weight of dry glue of at least one quaternary ammonium compound containing at least one aliphatic group of from 6 to 24 carbon atoms for reducing the brittleness of films and lines formed from the glue composition.

The compositions of the invention contain at least one quaternary ammonium compound in an amount of at least 0.5 percent by weight, based on dry glue, and preferably exceeding 1 per cent by weight. The amounts of quaternary ammonium compound that are used naturally depend upon the intended field of utilization. The upper limit is not critical but suitably up to 25 per cent by weight is used as higher amounts tend to give the resulting glue compositions excessively long open times. It has been found suitable to use amounts of quaternary ammonium compounds of from 2 to 15 percent by weight, based on dry glue, and preferably from 5 to 15 per cent.

Suitable quaternary ammonium compounds for use in the present compositions contain at least one higher carbon chain, i.e. a straight or branched, substituted or unsubstituted aliphatic group having from 6 to 24 carbon atoms. Very good results have, for example, been obtained with quaternary ammonium compounds containing one or two higher aliphatic groups such as alkyl groups of from 10 to 18 carbon atoms. Compositions according to the invention have been found to be very flexible and to give considerably reduced brittleness. It has also been found that these compositions give considerably more permanent flexibility as well as improved strength to glue lines and glue films than conventional bone glue compositions containing e.g. glycerol or sorbitol.

Compositions according to the invention are conveniently prepared in connection with the production of animal bone glue whereby the quaternary ammonium compound(s) is/are mixed in to an aqueous solution of glue which is then dried. The quaternary ammonium compound(s) can also be mixed into a solution of animal glue before the application thereof. The gel strength which is essential to the glue is not influenced to any great extent by the addition.

For gluing, the compositions are generally used as aqueous solutions having dry contents of from 30 and 50 per cent by weight and at temperatures above about 40°C.

It is also within the scope of the present invention that the compositions can contain one or more conventional additives such as de-foaming agents, preservatives, inert fillers, dyestuffs, etc. The present glue compositions can of course also contain known softeners and may be used in combination with synthetic adhesives.

The invention will now be further illustrated and described by way of the following Examples.

Example 1

Glue compositions of about 12 per cent were prepared from bone glue (200 g Bloom) and water. To these, different quaternary ammonium compounds were added with agitation. The amount of added substance was 10 per cent by weight based on dry glue in all cases. The effect of the additives was evaluated by tensile tests on glue films made from the resulting compositions.

Conditioned glue films (storage at 20°C and 60% RH for 15 hours) of dimensions 0.1×10×150 mm were tested with Alwetron TCS 5 kN whereby elongation and tensile force at rupture were measured. The figures given in the table are averages of 10 tests.

Added substance	Elongation %	Force N
Cetyltrimethylammonium chloride	5.1	76
Didecyldimethylammonium chloride	9.6	66
Alkyldimethylbenzylammonium chloride (number of carbon atoms in the alkyl group 12—18)	6.6	73
Dialkyldimethylammonium chloride (number of carbon atoms in the alkyl groups 16—18)	10.4	89
Dialkyldimethylammonium chloride (number of carbon atoms in the alkyl groups 12—18)	13.2	69
Reference (bone glue without additive)	2.8	91

Example 2

Films from bone glue (200 g Bloom) containing a) 10 per cent by weight of dialkyldimethyl ammonium chloride (number of carbon atoms in the alkyl groups 12—18) b) 10 per cent by weight of glycerol and c) unmodified bone glue were stored in a vacuum chamber (about 60 mm Hg) at 43°C for a week. The films were tested in the same manner as in Example 1 without previous conditioning.

Specimen	Elongation %	Force N
a	3.3	134
b	1.3	88
c	1.0	80

From the table it can be seen that compositions according to the invention give glue films with good and more permanent flexibility as well as improved strength when compared to conventional compositions.

The invention includes a method of gluing two or more surfaces together

which method comprises coating at least one of the said surfaces with a composition of this invention and bringing the surfaces into contact.

The invention also includes such a method wherein the coating with the composition is achieved by applying a sufficient quantity, i.e. at least 0.5% by weight of the dry glue, of at least one quaternary ammonium compound containing at least one aliphatic group of from 6 to 24 carbon atoms to a coating of an aqueous animal bone glue composition on at least one surface before drying of the aqueous animal bone glue composition.

The invention includes articles comprising two or more surfaces joined together by these methods.

WHAT WE CLAIM IS:—

1. An animal glue adhesive composition which contains bone glue and at least 0.5 percent by weight based on the weight of dry glue of at least one quaternary ammonium compound containing at least one aliphatic group of from 6 to 24 carbon atoms for reducing the brittleness of films and lines formed from the glue composition.

2. A composition according to claim 1 and containing in excess of 1 per cent by weight, based on the weight of dry glue, of the quaternary ammonium compound or compounds.

3. A composition according to claim 2 and containing from 1 to 25 per cent by weight, based on the weight of dry glue, of the quaternary ammonium compound or compounds.

4. A composition according to claim 3 and containing 2 to 15 per cent by weight, based on the weight of dry glue, of the quaternary ammonium compound or compounds.

5. A composition according to claim 4 and containing from 5 to 15 per cent by weight, based on the weight of dry glue, of the quaternary ammonium compound or compounds.

6. A composition according to claim 1 or claim 4 wherein the or a quaternary ammonium compound contains one or two alkyl groups of from 10 to 18 carbon atoms.

7. A composition according to any one of claims 2, 3 or 5 wherein the quaternary ammonium compound contains one or two alkyl groups of from 10 to 18 carbon atoms.

8. A composition according to any one of claims 1, 4 or 6, which composition also contains a de-foaming agent, a preservative, an inert filler, a dyestuff, a softener or a mixture of two or more of these.

9. A composition according to any one of claims 2, 3, 5 or 7, which composition also contains a de-foaming agent, a preservative, an inert filler, a dyestuff, a softener or a mixture of two or more of these.

10. A composition according to any preceding claim having a dry content of from 30 to 50% by weight.

11. An animal glue composition containing at least one quaternary ammonium compound and substantially as hereinbefore described in any one of the first five runs of Example 1 or run (a) of Example 2.

12. A method for preparing a composition as claimed in claim 1, which method comprises mixing an aqueous solution of an animal bone glue with at least 0.5% by weight based on the weight of dry glue of at least one quaternary ammonium compound containing at least one aliphatic group of 6 to 24 carbon atoms and, optionally, drying the resulting mixture.

13. A method as claimed in claim 12, and substantially as hereinbefore described in any one of the first five runs of Example 1 or run (a) of Example 2.

14. A method of gluing two or more surfaces together, which method comprises coating at least one of said surfaces with a composition as claimed in any one of claims 1 to 11, and bringing the surfaces into contact.

15. A method as claimed in claim 14, wherein the coating with the composition is achieved by applying a sufficient quantity of at least one quaternary ammonium

compound as defined in claim 1 to a coating of an aqueous animal bone glue composition on said at least one surface before drying of the aqueous animal bone glue composition.

16. An article which comprises two or more surfaces which have been glued together by a method as claimed in claim 14 or claim 15.

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