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WARP SIZING MATERIAL

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This invention relates to textile warp sizing compositions comprising starch.

Various starch-containing warp sizing materials are known and are in common use. Either thick boiling or thin boiling starches or mixtures of the two types are used in concentrations of from ½ to 1 lb. per gallon of aqueous dispersion. Generally, these are made up from aqueous dispersions of the conventional starches, such as corn starch. They are fluid when hot, but upon cocling they become very thick or congeal.

One of the serious drawbacks of the usual warp sizing of the above type is that the films thereof are too brittle. The brittleness of the film causes fiber and size shedding in the slashing operation and in the weaving operation. Therefore, certain softening agents are usually added to the compositions. These agents result in weakening the film strength of the sizing. In the weaving operation, the yarn is flexed rapidly and repeatedly at sharp angles, thus the sized film must be flexible enough to enable it to bend with the yarn and yet have sufficient strength to withstand the repeated flexing. The usual softeners that are added include oils, fats, ester waxes, and sulfonated derivatives thereof. These are generally present in not over 5% of the starch content of the size, in order that the film will not be too soft. If the film is too soft, it will not give the yarn sufficient protection against abrasion in the loom. Such abrasion results in the yarn clogging the loom.

Another important characteristic of the sizing composition is that its viscosity must remain uniform, and no gelling, congealing or skin formation should occur during the application of the warp size. The usual starch compositions tend to congeal or gel if not maintained at elevated temperatures or kept in continuous motion. Because of this characteristic, any of the sizing composition which is left at the end of the day must be discarded. After congealing it is difficult to bring the composition back to a fluid state. If the sizing composition congeals during the application process, it tends to clog the pipes and valves through which it passes on its way from the make up kettles to the storage tanks and from there to the size boxes. This necessitates stopping the sizing operation, and blowing the system with live steam, or clearing it in some other way.

It has now been found, in accordance with the invention, that all of the foregoing drawbacks can be eliminated by the use of novel compositions containing no ordinary softening agents such as oils, fats, and the like, and which at the same time have the desired strength and flexibility and also do not congeal even if allowed to cool to room temperature, such as 60° to 70° F. These novel compositions can be prepared readily and from available materials.

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The objects which are achieved by the invention include the provision of warp sizing compositions of high film strength and flexibility; the provision of warp sizing compositions which do not gel or congeal at room temperatures; the provision of warp sizing compositions which do not contain softening agents such as fats, oils, waxes, and the like; and other objects which will be apparent as the invention is more fully developed hereinafter.

Surprisingly indeed, it has been found that compositions containing one of the usual starches, such as corn, wheat or potato starch, and a waxy starch do not congeal on cooling and are admirably adapted to be used in warp sizing compositions. The resulting film strength is very high and the film is flexible but not brittle. The warp is not impaired in elasticity. The sizing compositions of the usual solids content have a viscosity in the desired range and do not congeal or gel when allowed to cool to room temperatures.

The novel sizing compositions eliminate the need for shutting down of the sizing machinery to clean out clogged pipes or valves. Any made up composition remaining at the end of the work day may be kept until another day and then used; thus, a saving of material will result. Since the compositions do not require added softeners, the cost of such softeners is also saved and any special problems in washing or removing the softeners after the cloth is woven is also eliminated.

Despite the fact that the addition of a waxy starch to ordinary starch achieves a lowering of viscosity or non-gelling at room temperature, the sizing characteristics are not impaired; on the contrary, are markedly improved in many respects. This is unpredictable from the known characteristics of the components of the composition.

For the preparation of the sizing compositions, any of the usual so-called amylose starches may be used. Those most readily available include starches from corn, potato, wheat, tapioca, and the like. Those mentioned all have more or less objectionable congealing characteristics on cooling.

The other starch component is known as "waxy" starch, an example of which is "waxy maize," which is an amylopectin type starch now being produced from a hybrid corn in this country. It was developed from a Chinese waxy corn first brought to this country in 1908. Geneticists of the Iowa Agricultural Experiment Station in cooperation with the U. S. Department of Agriculture started a cross-breeding program in 1936–37. The first commercial crops were grown in 1942. It is well known and identified in the literature by the name here used. Other waxy starches, such as waxy sorghum, may be used.

Either one or both components may be modified to result in a modified starch product (so-

called thin boiling) which still contains its amylaceous characteristics. The treatment may be acid hydrolysis, enzyme hydrolysis, oxidation, or other known degradation procedures. The modification of starch is well known in the art. The modification should not be carried on beyond the dextrin stage. In other words, it should not be saccharified to any substantial extent and should retain its amylaceous characteristics. Preferably only one component is modified to give the desired viscosity characteristics when the starch solids content of the size is at the optimum proportions. Generally the ordinary starch is unmodified and the waxy starch is modified.

The waxy starch content of the sizing composition should be sufficient to give a composition which will not congeal on cooling. The ordinary type starch content should be sufficient to give a warp size having good strength and abrasion resistance. One skilled in the art will be able to determine the proportions in view of the disclosure herein and the illustrative examples. The proportions will vary depending on the source of the ordinary starch, the extent of the modification of either or both components, and other factors. The exact composition and the degree of modification of the components will also depend upon the desired viscosity characteristics in the sizing composition and the particular type textile to which it is to be applied. For corn or wheat starch, a preferred range is about 40% to about 70% by weight, dry basis, of total starch in the composition; for tapioca starch, a range of about 55% to about 85% is preferred. The balance is the waxy starch.

In order to illustrate, but in no wise as a limitation of the invention, the following specific embodiments are included:

1. A mixture of 50 weight per cent of thick boiling corn starch and 50 weight per cent of acid hydrolysis dextrinized waxy maize was cooked in aqueous suspension, at a concentration of 1 lb. per gallon, according to usual procedures.

2. A mixture of 60 weight per cent of thick boiling corn starch and 40 weight per cent of acid hydrolysis dextrinized waxy maize was cooked in aqueous suspension, at a concentration of 12 oz. per gallon, according to usual procedures.

3. A mixture of 80 weight per cent of tapioca starch and 20 weight per cent of acid hydrolysis dextrinized waxy maize was cooked in aqueous suspension, at a concentration of 12 oz. per gallon, according to usual procedures.

The resulting dispersions made in accordance with the above examples remained fluid even at temperatures in the range of 60 to 70° F. and was suited for warp sizing without the need of added softeners. Upon application of the sizes to cotton warp, a tough flexible film was obtained. It was not brittle and did not clog or flake off upon repeated flexing.

In view of the foregoing disclosure, variations and modifications thereof will be apparent to those skilled in the art. The invention includes all such modifications and variations as come within the scope of the appended claims.

I claim:

1. A composition comprising as its primary and essential components, from about 40 to 70 per cent of a starch selected from the group consisting of corn and wheat starches and from about 60 to 30 per cent of waxy maize starch, said composition being characterized by giving cooked aqueous dispersions which are substantially non-gelling at room temperature and being adapted for providing a flexible, tough and abrasion resistant warp sizing.

2. A composition comprising as its primary and essential components, from about 55 to 85 per cent of tapioca starch and from about 45 to 15 per cent of waxy maize starch, said composition being characterized by giving cooked aqueous dispersions which are substantially non-gelling at room temperature and being adapted for providing a flexible, tough and abrasion resistant warp sizing.

3. A composition comprising as its primary and essential components, from about 40 to 70 per cent of thick boiling corn starch and from about 60 to 30 per cent of modified waxy maize, said composition being characterized by giving cooked aqueous dispersions which are substantially non-gelling at room temperature and being adapted for providing a flexible, tough and abrasion resistant warp sizing.

4. A composition comprising as its primary and essential components, from about 40 to 70 per cent of modified corn starch and from about 60 to 30 per cent of thick boiling waxy maize, said composition being characterized by giving cooked aqueous dispersions which are substantially non-gelling at room temperature and being adapted for providing a flexible, tough and abrasion resistant warp sizing.

5. A composition comprising as its primary and essential components, from about 40 to 70 per cent of thick boiling wheat starch and from about 60 to 30 per cent of modified waxy maize, said composition being characterized by giving cooked aqueous dispersions which are substantially non-gelling at room temperature and being adapted for providing a flexible, tough and abrasion resistant warp sizing.

6. A composition comprising as its primary and essential components, from about 55 to 85 per cent of thick boiling tapioca starch and from about 45 to 15 per cent of thin boiling waxy maize, said composition being characterized by giving cooked aqueous dispersions which are substantially non-gelling at room temperature and being adapted for providing a flexible, tough and abrasion resistant warp sizing.

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