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BACK-SIZING COMPOSITION FOR FLOOR COVERINGS

Emory P. Mersereau, Jr., White Plains, N. Y., assignor to Alexander Smith & Sons Carpet Company, Yonkers, N. Y., a corporation of New York

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This invention relates to floor coverings. More particularly, it relates to a back-sizing composition for floor coverings and floor coverings sized therewith.

Axminster rugs or carpets are one of the well-known types of floor coverings. A typical Axminster construction has three double shots for each row of pile yarns and three chain yarns. The pile or tufts are held in place partially by their position in relation to the backing yarns, but primarily by the adhesive action of a back-sizing composition applied to the back of the fabric. The back size binds the tufts in position by causing adjacent contacting yarns, which are accessible to the size upon application to the back of the floor covering, to adhere to each other.

In addition to binding the tuft yarns and backing yarns together, the size should also improve the quality of the floor covering and impart desirable characteristics thereto. More specifically, the size should also produce a floor covering having the following properties:

Flexibility.—The sized fabric should be sufficiently pliable to lie flat on the floor but stiff enough to prevent rippling in use.

Resilience.—The sized fabric should be limp enough to be rolled for storage and transportation but sufficiently springy to recover from the deformation produced in order to return to a flat position on unrolling.

Extensibility.—The sized floor covering should be non-stretching whereby it has dimensional stability in the longitudinal and diagonal directions.

Density.—The sized floor covering should be of such low density as to produce a luxuriant feel without creating an excessive weight which would make handling difficult.

Surface appearance.—The appearance of the sized floor covering must be neither messy-looking nor glossy.

Surface friction.—The sized floor covering should possess a certain amount of surface friction whereby when the covering is laid on a floor it will not skid, and, in addition, it must not adhesively adhere to or dissolve the standard types of floor varnishes with which it may come in contact.

Strength and toughness.—The size coating on the floor covering must possess sufficient strength and toughness to prohibit it from becoming brittle and flaking off under service conditions of flexing, compression, and other external action.

Shedding.—The adhesive action and penetration of the size should improve the resistance to shedding out of individual fibers in the tufts under service conditions.

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Sizes containing hydrolyzed starch as the essential adhesive agent have been used for back sizing of floor coverings. Such sizes have been applied to the back of the floor covering by a process commonly known as "back sizing." In one embodiment of such process, the back of the floor covering was passed over a roller rotating in a pan containing the size, the speed of the roller being controlled so that the desired amount of size was carried up on the face of the roller and deposited on the back of the fabric and, after the excess size was removed from the floor covering by a conventional doctor blade, the coated fabric was passed through a drier. In another embodiment of the back-sizing process, the size was applied by passing the back of the fabric beneath a fixed knife edge in front of which the necessary amount of the size composition was continuously supplied. Occasionally, back sizing was applied by a brush similar to the technic of painting.

The use of back-sizing compositions wherein hydrolyzed starch constituted the principal adhesive agent required the step of hydrolyzing the starch with an enzyme prior to its formation into the sizing composition.

During the course of research, attempts were made to utilize waste sulfite liquor, which is abundantly available and cheap, as a back size for floor coverings. However, it was found that such waste sulfite liquor and concentrated waste sulfite liquor were unsatisfactory for the reason that they did not possess the necessary flexibility, toughness, and adhesive power, and additionally could not be applied satisfactorily by the roller-coating process.

An object of this invention is to provide a new and improved back-sizing composition for floor coverings.

Another object of this invention is to provide a back-sizing composition wherein the principal adhesive agent is waste sulfite liquor solids.

An additional object of this invention is to provide floor coverings back-sized with a sizing composition in which waste sulfite liquor solids is the principal adhesive agent.

Other and additional objects of the invention will become apparent hereinafter.

The objects of the invention are accomplished, in general, by applying a floor covering back-sizing composition comprising an aqueous composition consisting essentially of waste sulfite liquor solids dissolved therein and a thickening agent, and drying the sized floor covering in a conventional hot air drier operating at 200° F. to 280° F. In one embodiment, the sizing composition also contains a flexibilizing material (plasti-

cizer), and in another embodiment the sizing composition includes both a flexibilizing material and a finely divided inert filler.

The waste sulfite liquor solids can be used as such or dissolved in water. Preferably, the waste sulfite liquor solids are utilized in the form of an aqueous solution containing 50% of such solids.

The thickening agent is a hydrophilic substance which, upon mixing with water, produces a colloidal dispersion capable of increasing the viscosity of aqueous mediums in which it is formed or added and which is not precipitated or coagulated by the presence of ions of the alkaline earth metals, such as calcium and magnesium. Since there are numerous such hydrophilic substances, the invention is not restricted to any specific thickening agent. Corn starch, tapioca starch, methyl cellulose (water dispersible grade) and bentonite clay are illustrative preferred examples of thickening agents which have given satisfactory results.

The flexibilizing material (plasticizer) is, in general, a natural or synthetic resin having a melting point below 70° C., solvent-soluble or dispersible in water, or both solvent-soluble and dispersible in water, and exhibits no objectionable odor or tackiness after drying. Due to the emulsifying action of the aqueous solution of the waste sulfite liquor solids, the plasticizing resins were dispersed throughout the mass. If desired, the plasticizing resins can be dissolved to form high solid content solution and such solution used in the composition. When such solutions are used, they mix directly with the aqueous solution of the waste sulfite liquor solids due to the emulsifying action of the latter. As illustrative examples of flexibilizing agents (plasticizers) which have given satisfactory results are:

(1) Rosin derivatives:
  Ethyleneglycol diabietate, M. P. 61° C.
  Diethyleneglycol diabietate, M. P. 45° C.
  Monoethyleneglycol ester of hydrogenated abietic acid, M. P. 55° C.
  Diethyleneglycol ester of hydrogenated abietic acid, M. P. 40° C.
  Diethyleneglycol ester of polymerized abietic acid, M. P. 61° C.
(2) Air-drying modified alkyd resins melting below 70° C. and soluble in solvent solution or dispersible in water, such as glycerol phthalate modified with semi-drying or fatty oils, such as castor oil and cottonseed oil.
(3) Coumarone-indene resins of the viscous liquid or soft plastic type melting below 70° C. and of light color and slight odor. These are made from polymerized coal tar distillate (150°–200° C. fraction).
(4) Chlorinated paraffins containing 42% and 60% chlorine by weight. These are made by chlorinating paraffin waxes from Pennsylvania crudes, ceresin wax from ozokerite, or montan wax from peat.
(5) Polyterpene resins melting below 70° C. produced by the catalytic polymerization of turpentine.

The filler is primarily for increasing the density and stiffness of the final film. It can be any water-insoluble, inert, finely ground, cheap mineral, and preferably of neutral color. Any of the various types of clay in finely divided form can constitute the filler. The clay may be basic, having large amounts of calcium and magnesium carbonates, or acidic having a constant of silica, or neutral clays containing kaolin or feldspar.

The viscosity of the sizing composition, which is determined by the quantity of thickening agent incorporated therein, is important and depends on the desired properties to be imparted to the product and the process of applying composition to the back of the floor covering. In general, for satisfactory results the rheological properties of the sizing composition must be as follows:

(*a*) A plastic viscosity of from 200 to 2,000 centipoises;
(*b*) A yield value not in excess of 200 dynes per square centimeter. Yield value as herein used is the minimum shearing force which is applied to a plastic material to start laminar flow.

For roller-coating, a plastic viscosity of 200 to 700 centipoises is preferred. For knife-coating, the viscosity should be, for example, not over 1,000 centipoises and preferably less.

The presence of a filler tends to increase the viscosity of a given sizing composition. However, this is not important since the limits of desirable viscosity are relatively wide and the amount of thickening agent is determined with all the components of the composition present, whereby the effect of the filler is taken care of automatically.

The proportions of the solids constituting the back size can vary within limits. In general, satisfactory results can be obtained when proportions of the solids are as set forth hereinafter:

Material	Solids
	Per cent by weight
Sulfite waste liquor (solids)	28–70
Thickening agent	5–35
Filler	0–43
Plasticizer	8–24

The vehicle for the solids is preferably water, in which the sulfite waste liquor solids are soluble to form an aqueous solution which will form a colloidal dispersion with the thickening agent. In general, the total solids concentration of the sizing composition depends on the nature of the solids and the process by which the sizing composition is to be applied. For roller coating, the percent of total solids in the composition can vary from 9% to 25% of the composition.

If desired, appropriate pigments can be also incorporated into the sizing composition in order to impart a desired color to the size coating on the back of the floor covering.

The manner of practicing the invention will become more apparent from the following specific examples of back-sizing compositions which have given satisfactory results for the back sizing by the roller method of Axminster carpets and rugs varying in weave from 4 to 9 rows per inch and wherein the proportions are parts by weight.

Example I

Water	685
Sulfite waste liquor (50% solids)	138
Starch	49
Clay	104
Ethyleneglycol diabietate	24
	1,000

In preparing this composition, all the ingredients were mixed in a large tank and steam was

used to boil the mixture, which caused the starch to swell.

Example II

Water	770
Sulfite waste liquor (50% solids)	154
Starch	54
Ethyleneglycol diabietate	22
	1,000

This composition was prepared by the same method set forth in Example I.

Example III

Water	745
Sulfite waste liquor (50% solids)	150
Starch	52
Clay	38
Ethyleneglycol diabietate	15
	1,000

This composition was prepared by the method set forth in Example I.

Example IV

Water	700
Sulfite waste liquor (50% solids)	150
Bentonite clay	75
Clay	0–40
Ethyleneglycol diabietate	15–25

In preparing this composition, the bentonite clay was swelled in cold water and then added to the remainder of the ingredients.

Example V

Water	750
Sulfite waste liquor (50% solids)	150
Methyl cellulose (1500 cps. grade)	7.5
Clay	0–40
Ethyleneglycol diabietate	15–25

In preparing this composition, the methyl cellulose was dissolved in cold water in the standard method therefor, and the solution was added to the remainder of the components.

Hereinafter, the parts by weight of the solids and the total concentration thereof of the above examples are tabulated:

Material	Solids (parts by weight)						
	Ex. I	Ex. II	Ex. III	Ex. IV	Ex. IV (a)	Ex. V	Ex. V (a)
Sulfite waste	28.0	50.3	41.7	34.9	42.8	50.8	69.7
Starch	20.0	35.2	28.9				
Bentonite				34.9	42.8		
Methyl cellulose (1500 cps.)						5.1	7.0
Clay	42.3		21.1	18.6		27.1	
Plasticizer	9.7	14.5	8.3	11.6	14.4	17.0	23.3
Per Cent Total solids in sizing composition	24.6	15.3	18.0	21.5	16.5	14.7	9.7

The viscosities and yield values of the above examples are set forth in the following table:

Example	Plastic Viscosity (centipoises)	Yield Value, Dynes/cm.²	Temp. of Meas. of
			°F.
I	300–500	25–50	180
II	200–300	5–15	180
III	250–350	10–20	180
IV	250–350	160–200	73
IV (a)	200–300	160–200	73
V	500–700	0.0–2.0	73
V (a)	450–600	0.0–2.0	73

Though in the examples the size is applied to Axminster floor coverings varying in weave from 4 to 9 rows per inch, it is to be understood that the invention is not restricted thereto. The back-sizing composition can be applied to floor coverings of other constructions. When the weave is tighter, i. e. a larger number of rows of pile per inch, the lighter the size required. In general, the weight of the size on the product varies, depending on the grade of the floor covering, from 3 to 10 oz. per square yard.

Floor coverings back-sized with the compositions of this invention not only bind the pile yarns and backing yarns together, increase dimensional stability and produce a desirable handle, flexibility and stiffness, but also impart the necessary density, surface appearance, surface friction, strength, toughness, and resistance to shedding.

The present invention as compared to the prior art back-sizing compositions improves the resistance to shedding of the pile by 40%.

The present composition, and particularly the waste sulfite liquor solids, requires no hydrolysis as did the essential adhesive agent of the prior art back sizes. The sulfite liquor can be pumped into the various batches through permanent piping and be measured by volume whereby the time consumed in handling and dumping of 100 pound sacks of starch is eliminated. Thus, by the present invention, time is saved in the handling of the ingredients constituting the size, whereby production is increased.

Since it is obvious that many changes and modifications can be made in the above-described details without departing from the nature and spirit of the invention, it is to be understood that the invention is not to be limited thereto except as set forth in the appended claims.

I claim:

1. As a back-sizing composition for floor coverings, a homogeneous aqueous composition having a viscosity of 200 to 2,000 centipoises and a yield value not in excess of 200 dynes per square centimeter, the solids of said composition consisting of the following ingredients in the named proportions:

	Per cent by weight
Sulfite waste liquor solids	28.0–50.3
Starch	20.0–35.2
Clay	42.3– 0.0
Ethyleneglycol diabietate	9.7–14.5

2. As a back-sizing composition for floor coverings, a homogeneous aqueous composition having a viscosity of 200 to 2,000 centipoises and a yield value not in excess of 200 dynes per square centimeter, the solids of said composition con-

sisting of the following ingredients in the named proportions:

	Per cent by weight
Sulfite waste liquor solids	28–50
Starch	20–35
Mineral filler	0–42
Plasticizing resin having a melting point below 70° C	8–23

EMORY P. MERSEREAU, JR.

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The following references are of record in the file of this patent:

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