Patented Oct. 1, 1935 2,015,796

UNITED STATES PATENT OFFICE

2,015,796

WATERPROOFING COMPOSITION AND METHOD OF MAKING AND APPLYING THE SAME

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No Drawing. Application February 3, 1931, Serial No. 513,225

9 Claims. (Cl. 134—26)

This invention relates to waterproofing materials or compositions and methods of preparing the same and more particularly relates to a waterproofing material formed by the treatment of resin obtained from coal tar naphtha or the like. This resin, generally known as paracoumaron resin, is usually produced by the polymerization of the polymerizable constituents, such as coumaron and indene, of coal tar naphtha or similar coal tar derivatives containing them. For the sake of brevity this resin will be referred to in the following specification by the usually accepted trade designation of "cumar" or "cumar resin".

One object of the invention is to provide an economical and effective waterproofing material which may be inexpensively prepared and conveniently applied.

Another object of the invention is to provide a waterproofing material or composition containing a relatively large proportion of cumar resin, in which the resin is maintained in a permanently suspended condition.

A further object of the invention is to provide a material, having the above characteristics, which is particularly advantageous in the sizing of paper so that the paper is not only rendered substantially impervious to moisture but at the same time is stiffened and strengthened and rendered readily capable of effective bonding with similarly treated sheets of the same material or with sheets of the same or different materials treated with phenolic condensation products.

A still further object of the invention is to provide a waterproofing composition capable of concurrent use with other waterproofing and sizing materials such as rosin, wax, starches and the like without substantially affecting the usual methods of application of such other sizing materials.

Other and more specific objects of the invention will become apparent as the description proceeds.

In the production of paper and paper products it has been proposed to employ preparations containing cumar resin for stiffening and strengthening the fibres and rendering them waterproof. This has been attempted by grinding the resin into a finely comminuted condition after which the comminuted resin is mixed with various ingredients and water so that a temporary suspension will be formed. Other ingredients facilitating the attachment of the particles of cumar to the fibres are also intermixed therewith. While this suspension is satisfactory for certain purposes it has the disadvantage that it cannot be allowed to stand for any length of time and cannot be transported to any distance without causing the cumar to settle in a dense gummy mass at the bottom of the container so that the work of emptying the container is very tedious.

After numerous experiments we have devised a novel method of preparing a composition containing cumar combined with other ingredients whereby an emulsion is formed capable of convenient use either together with or as a substitute for other commonly used sizing materials.

In preparing the composition of our present invention a mixture is made of a suitable alkali, a fatty acid and water and to this mixture is added a quantity of finely powdered cumar. One formula according to which these ingredients may be combined to produce a satisfactory suspension is as follows:

		Parts by weight
Example 1.	Cumar resin	300
	Water	290
	Sodium silicate	12 to 16
	Oleic acid	9 to 10

A certain amount of variation in the proportions of the sodium silicate and the oleic acid is permissible as indicated above, but most desirable results are obtained where a sufficient quantity of the sodium silicate is included so as to completely saponify the oleic acid and render the entire mixture slightly alkaline.

Example 2.—If desired there may be substituted for the sodium silicate the hydroxide of an alkali metal such, for example, as sodium or potassium hydroxide; and instead of the oleic acid there may be used any of the common fatty acids such as stearic, palmitic and raw linseed oil (linoleic acid). When the hydroxide of an alkali metal is used the proportion required is about three parts in the above formula, or, in other words, about 1% of caustic based on the amount of cumar present. In this example, as well as in Example 1, there should be sufficient caustic to completely saponify the fatty acid and render the entire mixture alkaline.

Among the grades of cumar resin found particularly satisfactory for use in the above examples are those having commercially designated melting points of from 212° to 245° F. A good commercial grade of distilled fatty acid is preferably employed; and where sodium silicate is to be used as the alkali saponifying agent a grade

of silicate is preferably employed having a specific gravity between 42° and 42.5° Baumé.

The alkali, the fatty acid and water in substantially the above proportions are first thoroughly mixed after which the cumar resin in a finely disintegrated form is introduced, preferably while the mass is kept agitated by moderate stirring. Any suitable grinding or disintegrating mechanism may be employed in reducing the cumar to a finely divided state but the best results have been obtained by so comminuting the cumar that about 90% will pass through a screen having 200 meshes to the linear inch.

The fatty acid and the alkali react to form a water-soluble soap, and upon the addition of the finely comminuted cumar the particles thereof are enveloped and retained by the soap so that a permanent suspension is formed.

The temperature of the mixture of the fatty acid, water and alkali is preferably maintained substantially below the point at which the cumar resin begins to soften and partly melt. In working with one grade of cumar having a melting point of 212° to 239° F. it has been found that the temperature of the mixture of water, fatty acid and alkali can vary from about 70° to 135° F. with best results obtained between 110° to 135° F. For another grade of cumar having a melting point of about 230° to 245° F. good results have been obtained by liquid temperatures varying from 90° to 160° F., with best results between 130° to 160° F. If the mixture is made up with the liquid ingredients at a temperature approaching the lower limits of 70°, with the lower melting point cumar, or 90° F. with the higher melting point cumar, it is found that the cumar particles are held less in the form of a permanent suspension and more in the form of a temporary suspension. Below these limits the cumar is no longer retained in the form of a permanent suspension, practically all of it being in a temporarily suspended form causing it to settle more or less rapidly.

If the temperature of the mixture is above 135° F. for the lower melting point cumar and above 160° F. for the higher melting point cumar, the heat begins to soften the particles, causing them to agglomerate or begin to stick together in chunky masses. The upper range of temperature of the liquid ingredients is further determined by the character of the soap formed by interaction of the alkali and fatty acid. If the temperature is increased substantially above 160° F. the character of the soap becomes such that it loses its ability to retain the cumar particles which thereupon will begin either to settle or agglomerate or both.

The proportion of water to the other ingredients may be varied, in making up the above formula, from about 290 parts to about 285 parts without producing undesirable effects. In general, the amount of water required for the mixture is somewhat greater where the lower melting point grades of cumar are used.

After the suspension is prepared as above set forth it may be drawn off for immediate use directly from the vessel in which it is prepared; or it may be stored in containers for use as needed of for shipment to the point at which it is to be used. The emulsion thus obtained may be diluted for use by adding substantial quantities of water. The dilution should not, however, be carried much below a consistency of 10% to 15% solids for the reason that, at this point, the affinity of the soap solution for the cumar particles appears to break down.

In applying the suspension of the present invention to paper making processes the suspension may me introduced in diluted form into the pulp at any convenient place as a continuous process or it may be introduced directly into the beater either with or without prior dilution. After introducing the suspension into the paper stock, while in the beater, chest or other desired place, it is preferably given a sufficient interval in which to become mixed with the stock after which there is added a quantity of paper-maker's alum, sufficient to render the mixture slightly acid. This will cause the breaking up of the soap and the formation of a precipitate which will entrap or enmesh the cumar particles with the fibres and retain them so attached to the fibres until the pulp reaches the paper machine and is formed into a sheet.

Upon drying the sheet thus treated, as by means of heated drying cylinders, the cumar resin in the sheet will be partially melted or softened sufficiently to cause the coalescence of the particles into substantially a continuous film throughout the sheet and will also increase the attachment of the cumar particles to the fibres. This effect is further increased by running the paper through the usual calender stack.

A suspension of cumar made in accordance with the present invention has distinct advantages over ordinary rosin size as used in sizing paper pulp for the reason that good results may be obtained when sizing stock at temperatures considerably higher than is practicable when ordinary rosin size is used. As satisfactory suspensions can be made up which are stable up to approximately 160° F. it is possible to size stock at temperatures ranging this high.

Another advantage of the present suspension as a size for paper is due to the fact that the cumar is substantially neutral in effect and inert with respect to the use of the ordinary chemicals employed in the manufacture of paper and similar products. This fact finds particular use in making paper which is intended to be arranged together in layers by silicate of soda adhesive. Where the alkalinity of the silicate destroys ordinary rosin sizing because of its acid character it has no adverse effect of any kind on cumar sizing.

From the foregoing it is apparent that the present invention provides an inexpensive waterproofing composition or suspension in which cumar resin forms a major portion of the solids entering into the composition. The other ingredients, forming the soap, are required in such comparatively small quantities as to make little difference in cost of the finished suspension over the cost of the cumar alone. As it is unnecessary to use high temperatures or any special apparatus in preparing the suspension the equipment needed may be very simple and consist merely in an open mixing tank located accessible to a supply of warm or moderately hot water.

While the present description sets forth a preferred embodiment of the invention, numerous changes may be made in the process and composition without departing from the spirit of the invention, and it is, therefore, desired that the present embodiment be considered in all respects as illustrative and not restrictive, reference being had to the appended claims rather than to the foregoing description to indicate the scope of the invention.

We claim:

1. The method of making a waterproofing composition which comprises forming a mixture of from 285 to 290 parts of water, 12 to 16 parts of sodium silicate and 9 to 10 parts of oleic acid and then stirring into this mixture approximately 300 parts of comminuted cumar resin (melting point about 230° to 245° F.) while maintaining the liquid at a temperature above 90° F. and not to exceed substantially 160° F.

2. The method of making a waterproofing composition which comprises forming a mixture of from 285 to 290 parts of water, 3 parts of caustic and 9 to 10 parts of fatty acid and then stirring into this mixture approximately 300 parts of comminuted cumar resin (melting point about 230° to 245° F.) while maintaining the liquid above 90° F. and not to exceed substantially 160° F.

3. The method of making a waterproofing composition which comprises forming a mixture of from 285 to 290 parts of water, 12 to 16 parts of sodium silicate and 9 to 10 parts of oleic acid and stirring into this mixture approximately 300 parts of comminuted cumar resin (melting point about 230° to 245° F.) while maintaining the liquid at a temperature of from 130° to 160° F.

4. The method of forming a waterproofing composition which comprises mixing 285 to 290 parts of water, 12 to 16 parts of sodium silicate and 9 to 10 parts of oleic acid, and, while the liquid is maintained at a temperature of from 130° F. to 160° F., stirring into the mixture approximately 300 parts of comminuted cumar resin having a degree of fineness so that 90% will pass through a screen containing 200 meshes to the linear inch.

5. The method of forming a waterproofing composition which comprises preparing a mixture of from 285 to 290 parts of water, 9 to 10 parts of distilled oleic acid, and sufficient sodium silicate to saponify the oleic acid, and stirring into this mixture approximately 300 parts of comminuted cumar resin (melting point about 230° to 245° F. while maintaining the temperature of the liquid above 90° F. but low enough to prevent agglomeration of the comminuted particles of cumar resin and to prevent breaking down of the soap formed by sodium silicate and oleic acid.

6. The method of forming a waterproofing composition which comprises preparing a mixture of from 285 to 290 parts of water, 9 to 10 parts of fatty acid, and sufficient alkali to saponify the fatty acid, and stirring into the mixture approximately 300 parts of comminuted cumar resin (melting point about 230° to 245° F.) while maintaining the temperature of the liquid above 90° but low enough to prevent agglomeration of the comminuted particles of cumar resin and to prevent breaking down of the soap formed by the alkali and fatty acid.

7. A method of forming a suspension of cumar resin which comprises forming a mixture of water, oleic acid and sodium silicate in which the sodium silicate is present in a sufficient quantity to render the solution alkaline, heating the mixture to a temperature above 90° F. but not to exceed approximately 160° F., then stirring in a quantity of comminuted cumar resin substantially equivalent to 30 times that of the oleic acid.

8. The method of forming a suspension of cumar resin which comprises forming a mixture of water, fatty acid and caustic in which the caustic is present in a sufficient quantity to render the solution alkaline, maintaining the temperature of the mixture between 90° F. and 160° F., then stirring in a quantity of comminuted cumar resin substantially equivalent to 100 times that of the caustic.

9. The method of forming a suspension of cumar resin which comprises forming an aqueous alkaline soap solution, maintaining the solution between 90° F. and 160° F., then stirring into the solution a quantity of comminuted cumar resin substantially equivalent to twenty-five times that of the soap in the solution.

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