

UNITED STATES PATENT OFFICE

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METHOD OF TREATING COTTON CORD

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This invention relates to the preparation of yarn, or cord which may be used in the manufacture of pneumatic tires, reinforced belts, and the like; and has particular reference to a method of dipping yarn or cord with a resulting increase in tensile strength.

It is an object of this invention to increase the tensile strength of yarn or cord which is to be used in composite rubber-fabric or rubber-cord structures. It is also an object to provide a method of setting yarn or cord after a stretching treatment has been completed. It is a further object to provide a treatment which produces better adhesion between cord or yarn and a body of rubber. It is also an object to combine a dipping and a wet-twisting step in the treatment of tire cord with a resulting increase in tensile strength. Other objects will be apparent from the description which follows:

The objects of this invention are attained by a treatment comprising the steps of impregnating a filamentary material with a solution of a rosin amine salt of a weak organic acid, and then drying the cord while under tension. Any salt of rosin amine with an aliphatic mono-carboxylic acid may be employed, although it is preferred to use rosin amine salts of fatty acids, such as acetic, propionic, butyric, caproic, caprylic, lauric, tridecoic, myristic, palmitic, stearic, oleic, linoleic, linolenic, and the like. Of these, it is preferred to use the lower saturated fatty acids, that is, those containing less than ten carbon atoms. Several combinations of steps may be used but the important and essential steps are those of dipping the cord in a solution such as a water solution of rosin amine acetate, and then drying the cord while a tension is maintained on the cord.

If an aqueous solution of rosin amine acetate is used the solution may vary in strength from about one to about five percent by weight. The best solvent for the rosin amine salt is water, for water not only acts as a solvent for the salt but also tends to soften the fibers of the cord allowing better impregnation of the rosin amine salt solution.

In one embodiment of this invention a cotton tire cord of 1.19 hanks per pound or 0.032 gauge was treated in a continuous process comprising the following steps. First, the cotton tire cord passed through a solution consisting of 15 parts by weight of rosin amine acetate and 500 parts of water. Then the cord passed between two rubber squeeze rolls to obtain good impregnation of the cord with the solution. The cord was

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then introduced into an oven in which a temperature of from 225° to 310° F. was maintained. While the impregnated cord was in the oven, a substantially constant tension of about five pounds was maintained on the cord until the cord was dry, which required a period of from one to ten minutes. This tension of five pounds on a cord of 1.19 hanks per pound is equivalent to 0.5 gram per denier.

Another portion of the same cotton tire cord was treated by the same series of steps as described above except that instead of the solution of rosin amine acetate there was employed an aqueous solution containing 0.5% by weight of an alkyl aryl polyether alcohol and 0.25% of sodium carbonate, a solution now conventionally employed for treating cord or yarn.

The tensile strength of the two treated cords was then measured on a standard Scott tensile machine with the following results:

	Pounds
Rosin amine acetate solution	23.7
Conventional solution	19.1

In addition to the increased tensile strength of the tire cords, improved adhesion between the tire cords and a body of rubber which is vulcanized with the cords embedded in it was obtained when the cords were treated according to this invention.

Similar results are obtained using salts of rosin amine with other weak organic acids, such as other fatty acids, dissolved in water.

The dipped cord may be dried at room temperature with similar results, although of course a longer drying period is required. If tension is maintained on the cord while drying takes place, the cord sets with an increased tensile strength. Therefore, it is preferred to employ the steps of dipping the cord in a solution of rosin amine acetate and then maintaining from two to ten pounds tension on the cord while the cord dries either at normal or elevated temperatures. Elevated temperatures from 225° to 310° F. will accomplish the drying step in a shorter length of time than if normal room temperatures are used and in addition will give a greater increase in tensile strength. For instance, dipped cord may be dried in ten minutes at 300° F. as compared to several hours at 70° F. Therefore, in a continuous system where a short drying time would be advantageous, an elevated temperature should be used.

Yarns may be wet twisted from the dip solution into a final cord and the final cord then stretched and dried at room temperature with

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a resulting increase in tensile strength. It is not necessary to have a drying step or a drying period as such, since in normal mill practice the cords will dry at normal room temperature by the time the cords are completely processed. The rosin amine acetate dip may be used at any stage in the manufacture of cotton tire cord; the roving, yarn or cord may be impregnated by using a dip solution or by treating the filamentary material in any other satisfactory manner. For instance, cotton yarn may be dipped in a rosin amine acetate solution, wet-twisted, stretched, and dried while under tension.

The method outlined herein makes it possible to further strengthen the tire cords to be used in pneumatic tires, reinforced belts, or other composite rubber fibrous structures, while at the same time the adhesion between the rubber and the fiber is increased.

Although we have herein outlined specific embodiments of our invention, we do not intend to limit ourselves solely thereto, but to include all of the obvious modifications and variations falling within the spirit and scope of the appended claims.

We claim:

1. In a method of manufacturing cotton cord for reinforcing rubber material, the steps comprising impregnating the fibers of said cord with a three per cent by weight aqueous solution of rosin amine acetate, and drying the impregnated cord at a temperature of 300° F. for ten minutes while maintaining a tension of 0.5 gram per denier on the said cord.

2. A method of manufacturing cotton cord for reinforcing rubber material which comprises impregnating said cord with a 1 to 5% by weight aqueous solution of rosin amine acetate and drying the impregnated cord at a temperature of from 225° F. to 310° F. while maintaining said cord at a tension from 0.2 to 1.0 gram per denier.

3. A method of manufacturing cotton cord for reinforcing rubber material which comprises dipping said cord in a 1 to 5% by weight aqueous solution of rosin amine acetate and drying the impregnated cord at a temperature of 300° F. while maintaining said cord at a tension of about 0.5 gram per denier.

4. A method of manufacturing cotton cord for reinforcing rubber material which comprises impregnating said cord with a 1 to 5% by weight aqueous solution of a rosin amine salt of an aliphatic mono-carboxylic acid, and drying the im-

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pregnated cord while maintaining a tension from 0.2 to 1.0 gram per denier on said cord.

5. A method of treating cotton cord for reinforcing rubber material which comprises impregnating said cord with a 1 to 5% by weight aqueous solution of a rosin amine salt of a saturated fatty acid containing less than ten carbon atoms, and drying the impregnated cord while maintaining a tension of 0.2 to 1.0 gram per denier on said cord.

6. A method of manufacturing cotton cord for reinforcing rubber material which comprises impregnating said cord with a 1 to 5% by weight aqueous solution of rosin amine acetate, and drying the impregnated cord at a temperature from room temperature to 310° F. while maintaining a tension of 0.2 to 1.0 gram per denier on said cord.

7. A method of treating cotton cord for reinforcing rubber material which comprises impregnating said cord with a 1 to 5% aqueous solution of rosin amine acetate, and drying the impregnated cord at about room temperature while maintaining a tension of 0.2 to 1.0 gram per denier on said cord.

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