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3,054,712

METAL COATED FIBERS WITH RUBBER TREATMENT

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1 Claim. (Cl. 156—151)

This application is a division of application Serial No. 419,920, filed March 30, 1954 now Patent 2,920,981, in the name of the present inventor.

This invention relates to metal coated fibers and particularly to metal coated fibrous glass and treatments for enhancing the properties thereof.

In an attempt to adapt fibrous glass for certain new uses, the fibers have been coated with metals and alloys of metals such as have been described in copending applications. One or more of the following metals and alloys are applied by a suitable method as disclosed in copending applications having Serial Numbers 380,868; 398,544; 317,678; 318,786; 319,388; 391,184; 399,239: lead, zinc, tin, copper, aluminum, silver, Wood's alloy, Rose's alloy, and various other alloys such as zinc-titanium, lead-copper, lead-tin, aluminum-copper, aluminum-gold, aluminum-zinc, aluminum-tin, lead-antimony, cadmium-zinc, copper-cadmium, tin-indium, silver-tin, silver-zinc, copper-zinc, antimony-tin, antimony-zinc, copper-aluminum, Dow metal, brazing and soldering alloys and the like. Metal coated fibers having secondary and tertiary coatings of electrodeposited metal are likewise treated by the methods and materials of this invention. In order to facilitate processing of metal coated fibers, it has been found necessary to treat the fibers with various agents to provide handleability.

Treatments for bare fibrous glass used in the textile arts have been described in the literature and generally comprise the application of size and binder compositions and the like. Some of these compositions are adapted for use with metal coated fibrous glass; however, treatments especially suited for metal coated fibrous glass have been discovered.

It is an object of this invention to provide treatments for enhancing the properties of metal coated fibers.

It is an object to reduce the coefficient of friction of metal surfaces of fibers which slide one over the other.

It is a further object to provide methods of improving the physical properties and handling characteristics of metal coated fibrous glass in the form of textile materials.

It is an object to provide surface protective coatings for metal coated fibers.

The objects of this invention are attained by treating metal coated fibers with specific materials within the classification of lubricants, sizes, coating materials, acids, bases, oxidizing agents, adhesives or mixtures of one or more of these materials.

To improve the handling characteristics of metal coated fibers which are to be used in reinforcing other materials, it is necessary to group together a sufficient number of fibers in the form of a strand, yarn, roving or the like in order to obtain sufficient bulkiness so that the strand

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or other form can be handled in processing steps which follow the forming operation, i.e., twisting, plying and so forth. If a strand comprising a plurality of fibers is to be handled, it is generally necessary that some sort of a size or lubricating material be applied to provide strand integrity. The treating material must hold together individual fibers within a single strand with sufficient strength to provide integrity. However, adjacent strands should not be so firmly adhered one to another within a package that the package cannot be unwound.

Metal coated fibers or bundles of fibers which may or may not have been treated with a size are coated with adhesive compositions before they are combined with rubber, resin or other materials which are to be reinforced. Rubber adhesives comprising a rubbery component and a resinous component in solvent systems are utilized to treat metal coated fibers before they are combined with rubber to produce glass reinforced rubber products. Conventional rubber adhesives comprising resorcinol-formaldehyde latex are used likewise to achieve the desired bonding effect between the reinforcing fibers and the body or carcass of rubber.

Rubber adhesives are readily applied by dipping the metal coated fiber in a latex or cement bath or by spreading a cement bath upon a fabric woven of metal coated fibers. The cement which comprises compounded rubber in an organic solvent is directed upon the surface of a woven fabric or a weftless fabric and the excess removed by a doctor blade. The cement is then dried by applying heat to remove the solvent.

A strand or a cord comprising metal coated fibrous glass when passed through an adhesive bath picks up sufficient adhesive to fill the interstices of the strand and provide a coating over the strand itself. The rubbery component of the adhesive may be vulcanized at the same time that the glass reinforced rubber product is vulcanized or molded.

Adhesive compositions comprising natural rubber latex, caustic potash, zinc oxide, sulfur and suitable accelerators and the like are used to treat metal coated fibers and these fibers are then combined with rubber by calendering methods or other suitable means and the resulting product is heated for a sufficient time to effect vulcanization of the rubber in the adhesive and that in the body or carcass of the glass-reinforced rubber product.

Chloroprene latex adhesives comprising zinc oxide, accelerator and neoprene latex likewise may be used.

Good adhesion of metal coated fibers to rubber during vulcanization is also achieved as follows. To the metal coated fibers is applied a metal to rubber adhesive such as Ty Ply Q which is a chemical derivative of rubber dispersed in a volatile solvent. The coated metal is then combined with a suitable sheet of natural or reclaimed rubber and the composite product is heated in a mold under pressure to vulcanize the rubber.

Chloroprene and butadiene-acrylonitrile rubbers are bonded to metal coated fibers during vulcanization by using Ty Ply S which is likewise a chemical derivative of rubber in volatile solvents. Ty Ply S is adapted for use with synthetic rubber.

Metal coated fibers are provided with an outer coating of rubber by electrodepositing rubber thereon by the

Sheppard process disclosed in United States Patents 1,589,324 to 1,589,330, inclusive, and others. Rubber is electrodeposited on lead, cadmium, zinc, tin, antimony and alloys of these metals which has been applied to fibrous glass by passing the metal coated fibers through an electroplating bath comprising the following ingredients:

Ingredients:	Percent of total solids
Rubber latex-----	53.3
Sulfur -----	2.0
Zinc oxide-----	10.0
Whiting -----	30.0
Carbon black-----	2.0
Paraffin wax-----	2.0
Tetramethyl thiuram disulfide-----	0.2
Gum arabic-----	0.5

100.0

Rubber so deposited has great strength. Fibers so treated are readily combined with rubber in the carcass of a tire belt or other rubber product.

The metal coating imparts abrasion resistance and greater strength to the fibrous glass and the electrodeposited outer rubber coating which is very strong adds further to the abrasion resistance of the individual fibers and provides an outer surface on fibers, strands, cords, bundles of fibers or fabrics which is very compatible with rubber. Metal coated fibers having an outer layer of electrodeposited rubber are combined with a rubber carcass by conventional methods such as by applying suitable rubber adhesives to the rubber surfaces to be joined followed by a vulcanization step.

Metal coated fibers are provided with an outer coating of plasticized vinyl polymers such as polyvinyl chlo-

ride and the like using calendering or extruding processes. Metal coated fibers are coated with plastisols, highly plasticized vinyl polymers, by drawing the fibers through a bath of plastisol and then stripping the excess plastisol by passing the fiber through a die. Solvent solutions of vinyl polymers may be applied by dipping or other coating processes also. Strands, bundles of fibers, yarns or the like may be so treated.

Various other treatments for metal coated fibers are included within the spirit and scope of the appended claim.

I claim:

In a process of making an integral glass reinforced rubber product, the improvement comprising electrodepositing a rubber coating upon fibers which have been coated with a metal from the group consisting of lead, cadmium, zinc, tin, antimony and alloys of these metals, the electrodeposited rubber coating being applied from a bath comprising the following ingredients expressed in weight percent of total solids, 53.3% rubber latex, 2.0% sulfur, 10.0% zinc oxide, 30.0% whiting, 2.0% carbon black, 2.0% paraffin wax, 0.2% tetramethyl thiuram disulfide and 0.5% gum arabic, combining these treated fibers with a body of unvulcanized rubber, and vulcanizing the rubber to provide a strong, integral product.

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