July 5, 1938. T. L. SHEPHERD 2,122,728

RUBBER PROCESS AND PRODUCT

Filed Feb. 28, 1936

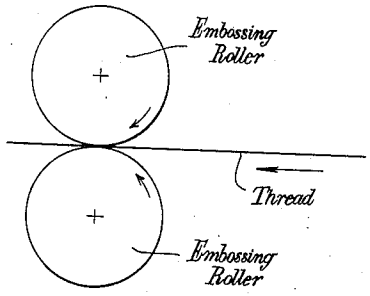


Fig. 4.

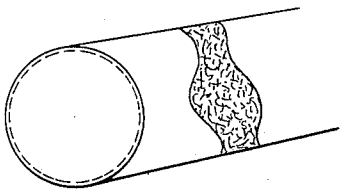


Fig. 7.



Fig. 1.

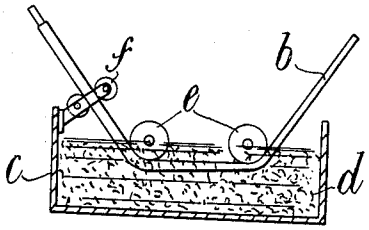


Fig. 2.

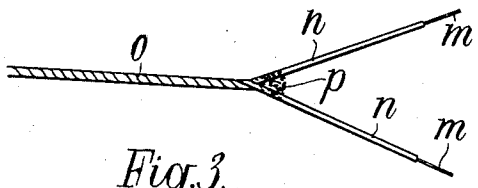


Fig. 3.

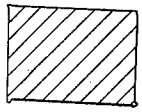


Fig. 5.

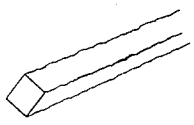


Fig. 6.

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UNITED STATES PATENT OFFICE

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RUBBER PROCESS AND PRODUCT

Thomas Lewis Shepherd, London, England

Application February 28, 1936, Serial No. 66,309
In Great Britain March 21, 1934

5 Claims. (Cl. 117—2)

This invention is a continuation in part to my main application No. 11,720 filed the 18th March, 1935, and relates to elastic rubber threads which are intended to be subsequently used in the manufacture of fabric, clothing, lacework and the like or parts thereof or for wearing apparel of any description.

Such a thread is usually made by first forming a core of a rubber filament which has been either extruded into a coagulating or spinning bath, or has been cut from a sheet of rubber, and such filament is then covered with a double helical winding of cotton, silk and the like of relatively opposite twist so as to form as it were a fibrous jacket or covering to the rubber core. This fibrous covering will constitute a protection to the core when the threads are laid across one another as will result when the thread is being woven or knitted into a fabric, so that the intercrossing cores will not cut into one another.

Such a fabric covering is not altogether successful in practice, because the twisted convolutions of the fibrous covering may slip with respect to the core and interfere with its even contractibility back to normal size. The application of the fibrous covering is expensive and requires to be very carefully executed.

Moreover, when uncovered rubber threads are to be led into a loom or knitting machine so as to be formed into a fabric, it is very often difficult to control the rubber threads because of the extensive and variable stretch that they possess and the result of this capacity of the thread results in the fabric when completed having a non-uniform surface appearance or causes shirring and other defects in the finished material.

The object of the invention is to provide, for overcoming the above disadvantages, a covering which has substantially no tendency to move relatively to the core and which is simple to apply.

According to the present invention a rubber thread is first slightly roughened, knurled or grooved, and is then covered with a coating which is insoluble or is rendered insoluble in water.

The invention will now be described by way of example with reference to the accompanying drawing in which:—

Fig. 1 is a view in section of a coated thread, such coating being made of insoluble material;

Figure 2 is a diagrammatic view of a device whereby a rubber thread may be coated as will hereafter be described.

Figure 3 illustrates two coated threads being twisted together.

Figure 4 represents two embossing rollers with a thread running between, this thread taking on the knurling, roughening or grooving engraved on these two rollers.

Figure 5 shows a cross section of cut thread which seen under a microscope has roughened edges, which in themselves are sufficient to hold firmly any coating applied to this thread.

Figure 6 shows a magnified piece of cut thread showing irregular edges.

Figure 7 shows a cut thread with part of the coating dissolved and exposing finely sub-divided material.

Referring to Figure 1, instead of the fibrous covering usually employed on a rubber thread there is employed a coating *a* (Figure 1) of an adhesive-like character which will be applied to an elastic rubber thread *b* in the form of a varnish or viscous liquid that will rapidly dry and will be insoluble in water. Such an adhesive coating will, when dry, present a tough covering or skin which possesses a certain amount of elasticity and will firmly attach itself to the core, the surface of which is slightly roughened, knurled or grooved.

The filament, thread or core *b* of rubber may be prepared in any suitable way as by cutting, extruding or otherwise and in the example shown the thread is shown as being a single one, but two or more such threads may be twisted together and in addition filaments, threads or cores may be formed from an aqueous dispersion of rubber or latex.

When the thread is treated as in Figure 4, it is essential to treat the thread between these rollers in an unvulcanized condition; when vulcanized the embossing would have no effect on the thread surface.

The varnish-like coating may be applied in any suitable way as by painting, spraying, or otherwise, or the filament may be passed through a bath of the desired liquid so that it picks it up in transit therethrough somewhat in the manner shown in Figure 2 where the bath *c* containing the desired varnish or viscous liquid *d* is shown. The rubber thread *b* with or without tension is conducted into the bath and led under the rollers *e* which are immersed in the solution *d*, the coated thread being led out of the bath again in its coated condition between a pair of rollers *f* by which any excess solution will be removed and at the same time the solution will be consolidated upon the rubber thread *b*.

The liquid *d* may be mixed with any desired solvent or solvents.

The varnish-like coating when applied will be insoluble in water or may be rendered insoluble in water after application and will be preferably of a tough, non-brittle character. When desired, a second coating of such a varnish may be used.

Whilst a number of mixtures or liquids may serve the purpose of such a varnish, any of the following is preferred: A solution of rubber or latex, or of a synthetic resin, a cellulose solution or a solution of a derivative thereof, e. g. cellulose acetate.

Any one of the above or any mixture thereof

may be used so long as the resultant coating is insoluble in water or may be rendered insoluble and possesses a greater or lesser degree of elasticity.

It will depend upon the nature of the coating whether some of the rubber thread's extensibility is destroyed, for instance, with a rather tough and thick coating of varnish some of the extensibility will be lost, whereas when using a flexible rubber protective coating, practically none of the extensibility of the thread will be lost. The application of a cellulose derivative coating will be similar to that of a tough varnish, i. e. it will slightly reduce the flexibility. The extensibility according to the invention is not to be completely destroyed.

The rubber thread, having its surface slightly roughened, knurled or grooved, may be coated with a mixture of finely divided material of a flock-like or finely divided character suspended in a suitable adhesive insoluble in water or capable of being rendered so insoluble. The thread to be covered is drawn or otherwise passed through the mixture in the manner similar to Figure 2 so that it will pick up a coating of the mixture, i. e. the adhesive and the finely divided material. When the thus coated thread leaves the receptacle, it is subjected to a squeezing or pressing action by the rollers *f* to consolidate the coating and bring it into intimate contact with the thread. The coated thread is then led away for drying, after which a vulcanizing or a hardening treatment may be employed.

Such a system of coating thread may be extended to the manufacture of compound threads or yarn according to which and referring to Figure 3, two (or more) threads of rubber *m* in an unvulcanized or tacky condition are brought together and twisted or doubled one upon the other. These threads which have their surfaces slightly roughened, knurled or grooved and which have already been coated as shown at *n* with the finely divided or comminuted material held in suspension in an adhesive insoluble in water or capable of being rendered so insoluble and under tension or not are then twisted together as shown at *o* by any suitable means (not shown) and whilst this twisting proceeds the finely divided material already present on each thread becomes firmly amalgamated and mixed with the doubled thread *o* and it will be understood that an additional quantity of the coating mixture as indicated at *p* may be added at the twisting point as the manufacture of the compound thread proceeds.

The adhesive used may be any kind which is insoluble in water or may be rendered insoluble and may comprise rubber, celluloid, cellulose, a suitable varnish, a resin, synthetic or natural, glue or linseed oil.

Further, it may have a consistency which sets or is stabilized by means of heat, chemical action or otherwise so that it may be left in any desired final condition, that is to say it will be flexible or tough or hard. Moreover, the adhesive may be vulcanizable similarly to rubber and the term "rubber" used in connection with the adhesive and also in connection with the material of the thread should be understood as including rubber in any suitable form, namely, any of those compounds as used for proofing cloth and the like material, any aqueous dispersion thereof, latex or a natural or artificial compound of rubber and in a concentrated or compounded form.

Again, the finely divided material may comprise one or a number of the following substances, flock or wool, cotton or silk fibres or a mineral substance such as asbestos or pulverized cork, rubber, powdered metal, wood flour, paper or other powdered or granulated substances.

It is to be noted that some of the above finely divided materials are substances which are usually treated as waste. Moreover, the subdivided material may be dyed or capable of absorbing a dye so as to impart to the finished product a multi-coloured or speckled appearance and in some cases the coated filament after vulcanization or hardening may be so treated with a solvent that small portions of the outer skin of the coating will be removed or dissolved so as to expose to view the finely subdivided material and thus give the thread a speckled appearance.

The thread may also be wound with a destructible winding, in which case a strip is twisted helically around its exterior, in such a manner as to have the effect of substantially destroying the elasticity. The nature of the strip is such that it may be destroyed or eliminated by chemical or heat treatment after the fabric is completed, in which the wound rubber threads are incorporated.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. A process of making a composite rubber thread which consists in roughening the surface of the constituent threads, applying thereto in fluid form an adhesive coating which is insoluble in water and in which comminuted material is suspended, and twisting the constituent threads together while the adhesive coating is still tacky to form a composite thread, whereby the comminuted material becomes amalgamated with the composite thread.

2. A process of making a composite rubber thread as claimed in claim 1, consisting in applying an additional quantity of coating material at the twisting point.

3. A process of treating rubber thread which consists in roughening the surface of the thread, applying thereto in fluid form an adhesive coating which is insoluble in water and in which comminuted material is suspended, solidifying the coating and removing the outer skin of the coating to a depth less than the thickness of the coating.

4. A process of treating rubber thread which consists in roughening the surface of the thread, applying thereto in fluid form an adhesive coating which is insoluble in water and in which dyed comminuted material is suspended, solidifying the coating and removing the outer skin of the coating to a depth less than the thickness of the coating.

5. A process of treating rubber thread which consists in roughening the surface of the thread, applying in fluid form an adhesive coating which is insoluble in water and in which dyed comminuted textile material is suspended, solidifying the coating and removing the outer skin of the coating to a depth less than the thickness of the coating.

THOMAS LEWIS SHEPHERD.