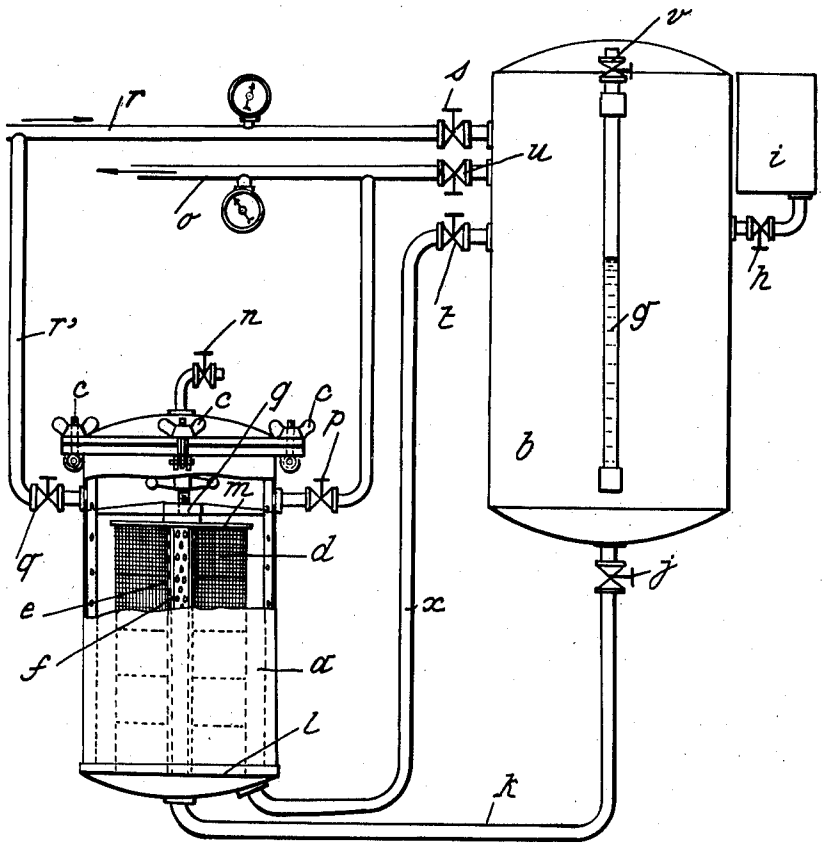
June 26, 1934. J. E. C. BONGRAND ET AL 1,964,658

MANUFACTURE OF THREADS OF TEXTILE MATERIAL

Filed April 11, 1930 2 Sheets-Sheet 1

FIG. 1.



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FIG. 2.

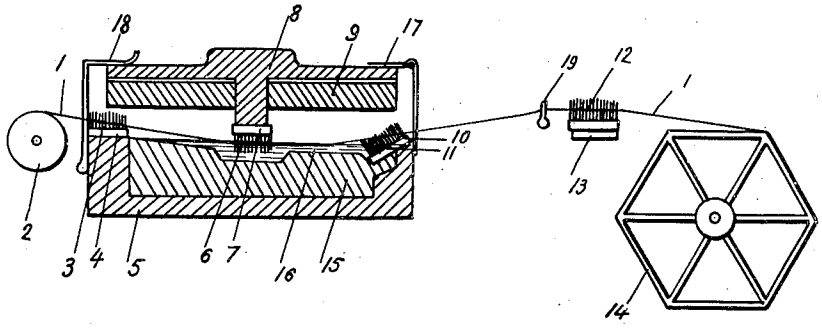


FIG. 3.

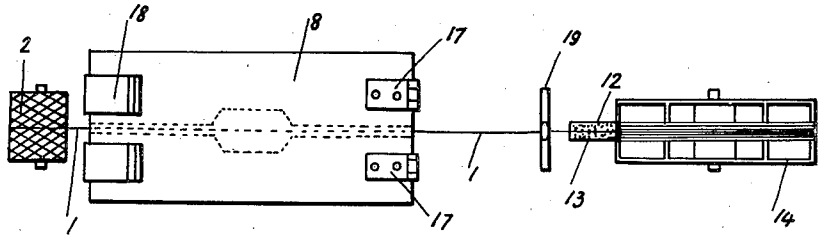
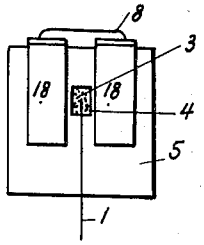


FIG. 4.



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UNITED STATES PATENT OFFICE

1,964,658

MANUFACTURE OF THREADS OF TEXTILE MATERIAL

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Application April 11, 1930, Serial No. 443,470
In France November 8, 1929

6 Claims. (Cl. 117—2)

The present invention has for its object an improved process for the manufacture of threads of textile material, resulting in threads in which every textile fibre is entirely enveloped and in part penetrated, those at the center of the thread as well as those at the periphery thereof, by an elastic substance such as natural or artificial aqueous dispersion (latex) of rubber or balata or gutta.

It has already been proposed to impregnate textile threads by means of a solution of rubber or of latex, but the means proposed for carrying out such an impregnation have not been sufficient to impregnate right through the core of the thread and to envelop or penetrate the individual fibers of the thread.

By means of this invention a complete penetration right through the core of the thread or yarn is accomplished, and the process consists in subjecting the fibrous mass or roving, before twisting or cording, to contact in a closed container with the treating dispersion (latex) under the action of a fluid under pressure. The percentage of the treating material absorbed by the fibrous mass or roving depends upon the time during which the contact is effected and upon the degree of the pressure exerted. The degree of pressure and the duration of treatment required to effect the complete interpenetration and impregnation and intimate envelopment of the elementary fibers will depend somewhat upon the character of the particular fibrous mass undergoing treatment; but those operating conditions are readily determined by trial. After having been penetrated with latex the fibers are twisted and corded together and then dried.

In the threads or yarns obtained according to our invention, the elementary fibres are connected to their neighbours by the impregnating material, for instance rubber, which forms an elastic bond between them having remarkable mechanical properties, so that for one and the same quality of fibres, a smaller twist gives the same strength, and with the same twist and even with a smaller twist, shorter fibres may be used.

Even in the case of twisted or cabled threads, according to the invention the elementary fibres are deeply enveloped and impregnated. In such threads, the complete coating with rubber of each of the elements isolates or separates each of the elements from the others, which is very advantageous for certain applications (for instance threads for pneumatic tyres).

The threads or yarns obtained by the present invention differ from the known threads coated outside with a rubber solution or relatively incompletely coated with latex and used for forming the thread framework in outer covers of pneumatic tyres, called "cord", by the fact that the rubber impregnates them deeply in order closely to connect the fibres to one another and then the thread or yarn is coated, whilst in the case of the outside rubber application by the usual processes, not only are the elements constituting the "cord" and formed by twisted threads stranded or corded together, not impregnated to their centre, but are not even isolated by the rubber from one another.

According to the invention each thread is impregnated and coated with latex before twisting and cording and the threads are twisted and corded together before drying.

We have found that when the twisting of the impregnated roving is done before drying, the impregnation of the individual fibers is more thorough and the adhesion of the fibers one to another is more tenacious; the effect of the twist upon the yet moist fibers being to render the penetration thereof by the rubber more complete and the union of the latter with the individual fibers more perfect.

The threads according to the invention differ also by the fact of their impregnation and of the nature of the impregnating and covering material from threads finished with starch in solution or with other adhesives.

The treatment under pressure may be, if desired, completed by a superficial treatment at atmospheric pressure in winding off the threads in a bath of an elastic substance, for instance latex, concentrated or not, the threads being subjected to the action of brushes before and also after immersion in said bath.

The accompanying drawings show diagrammatically by way of example an apparatus suitable for carrying the present process into practical effect.

Fig. 1 shows an apparatus for the treatment under the action of a fluid under pressure, a vacuum being used for accelerating the circulation of the bath.

Fig. 2 is a similar view, partly in section of the apparatus for the complementary treatment.

Fig. 3 is a plan of the same and

Fig. 4 an end elevation.

The apparatus shown in Fig. 1 is constituted by a container *a* with autoclave closing device for receiving the fibrous mass to be treated and by another container *b* for the impregnating liquid; *i*

is a filling vat and *h* a cock. The fibrous strands in substantially untwisted condition are preferably placed on bobbins *d* with flexible and perforated spindles *e* affording passage to the liquid. The said bobbins are threaded on a perforated tube *f* and held close together by a clamping device such as *g*. If the fibrous mass is in hanks, these hanks are placed in packets and arranged round the central tube *f*.

The containers *a* and *b* are connected by the pipe *k* and cock *j* on the one hand and by the pipe *x* and cock *t* on the other hand.

In the container *b* opens a compressed gas pipe *r* which may be closed by the cock *s* and the same pipe opens into the container *a* through the pipe *r'* and the cock *q*. A vacuum pipe *o* opens into the container *b* (cock *u*) and into the container *a* (cock *p*), the vacuum being used for accelerating the circulation of the liquid.

The operation is as follows:

The apparatus being first completely empty, the bobbins *d* are placed in the container *a*; the latter is closed by a number of tightening screws *c* and all the cocks are then closed; the container *b* is filled, through the intermediary of the filling vat *i*, with the impregnating dispersion, the cocks *h* and *v* (air escape) being opened; when the container *b* is filled, the cocks *h* and *v* are closed and the cock *p* opened so that a certain vacuum is created in the container *a*. The cocks *n* and *j* are then opened to cause the passage of the liquid from *b* to *a*, and at the same time the compressed gas cock *s* is opened; when the liquid has reached a determined level the cock *n* is closed. The threads are now in contact with the impregnating material under a determined pressure of the compressed gas (nitrogen for instance). After a suitable time of contact the cocks *s* and *j* are closed and the cock *v* opened for the air escape. When the pressure has fallen to zero in the container *b*, the cock *u* is opened to create a certain vacuum in the said container and then the cock *t* is opened to allow the liquid which is in *a* to return into *b*. On the other hand the cock *q* is opened in order to accelerate, by the pressure, the back flow of the liquid from *a* to *b*.

The operations as described may be repeated several times if desired. The percentage of the impregnating liquid absorbed by the thread depends upon the time of the contact under pressure and upon the degree of the pressure. The bobbins are then unwound by hand and dried, preferably in vacuum in order to hasten the drying and to enable the work to be done at higher temperatures.

To the aqueous dispersion we may add mineral or organic substances. These fillers and the like must not produce coagulation, but must be in a colloidal state or as much dispersed as possible. Any suitable agent (such as ammonia) is added for avoiding premature coagulation.

If necessary, to the aqueous dispersion may be added sulphur, polysulphide and also a vulcanization accelerator.

When latex is used as the impregnating substance in carrying out the present process, special advantages are obtained, particularly in that the rubber adheres more closely, it is much more tenacious than the rubber obtained from an evaporated solution. The rubber coming from latex is, as is well known, in an undepolymerized condition, and to this it seems are due the special properties mentioned. Under the action of heat, the rubber of the latex coagulates. The coagulation of the latex may be rendered more complete by the action of dilute acetic acid, for instance.

The yarns impregnated with latex of rubber or balata or gutta in the manner described, or may be then assembled into a twisted thread by the ordinary spinning processes, before the coagulation and drying. These twisted threads are then stranded or corded if necessary, before the coagulation and drying. They may be twisted or corded after drying, but the result is not so good.

The threads thus obtained may be utilized in the rubber industry as insertion textiles in the form of web cord for pneumatic tyres or of cords for hose-pipes or in the form of fabrics. To that end, the impregnation rubber may be given suitable fillers and the like and vulcanization elements.

These threads unite much better with the mass of rubber of the manufactured article than the ordinary threads coated with rubber on the surface.

The threads according to the invention may be woven, the fabric being thereupon vulcanized either hot or cold by the usual means. These fabrics formed of absolutely impermeable threads, may themselves be also waterproof whilst remaining permeable to the air. Such fabrics may also be obtained by the weaving of previously vulcanized threads.

As stated in the foregoing, the deep impregnation with the assistance of pressure, may be carried out with fibrous strands previously wound on perforated warp beams (for obtaining for instance the web cord used in the manufacture of pneumatic tyres) or also of ribbons and the like.

In this case the perforated warp beams are threaded on perforated tubes similar to the tubes *f* of Figure 1 and placed into the autoclave container *a*. The liquid latex placed under pressure passes through the warp beams from the inside outwards, and the resistance opposed to the passage forces the liquid to penetrate completely into the threads and envelop the individual fibers. The proceeding is similar also for ribbons or tapes. The warp beams are then unwound and submitted to drying which brings about the coagulation, and if necessary to vulcanization. In that way are prepared directly web cords for pneumatic tyre industry, waterproof fabrics for clothing, insulating tapes for electricity for instance.

The threads or yarns according to the present invention after they have been vulcanized either hot or cold, have a different appearance and feel from those of other textiles. They are impermeable and do not putrefy and possess high dielectric properties. For these various reasons, they are utilized for the weaving for instance of fabrics for umbrellas, for hosiery, trimmings, lace making and in the electric industry for braiding or covering of electric wires.

For these applications it may be advisable to proceed with a surface coating of rubber after the depth impregnation such as described. By this operation the outside fluff, for instance, may be caused to completely disappear. For this rubber surface coating concentrated latex may be used, in place of latex.

This complementary treatment may be effected for instance by means of the apparatus shown in Figs. 2 to 4. The strand 1 to be impregnated, coming from a bobbin 2, passes first between the bristles 3 of a brush 4 secured to a support 5, then between the bristles 6 of a brush 7 secured to a movable cover provided with a support 8 and a joint 9. The strand passes finally through the

bristles 10 of a brush 11 also secured to the support 5 and between the bristles 12 of a brush 13 before being wound on the reel 14. The support 5 has a vat 15 provided with a recess 16 into which is placed the complementary treating liquid. The cover 8 is mounted on the support 5 by means of a hinge 17 and may be held against the said support by means of a closing device 18. Between the brush 10 and the brush 12, the strand passes through an eyelet 19 having a reciprocating motion.

The cover 8 having been raised and the vat 15 filled with latex or concentrated latex 16, the strand is unwound from the bobbin 2 and caused to pass through the bristles 3, 10 and 12 of the brushes 4, 11 and 13 and the end of the thread is attached to the reel 14. The cover 8 is then turned down and locked by the device 18, with the result that the strand is caused to engage with the bristles 6 of the brush 7 and to be immersed in the vat 15. The reel 14 is then started, and the strand is unwound from the bobbin 2 in order to pass successively through the brushes 4, 6, 11 and 13, owing to which it is superficially treated or coated by the liquid the excess of which is removed and regulated by the brush 13, and through the bristles 12 in which the strand rubs not only longitudinally owing to its movement, but also transversely owing to the reciprocating movement of the eyelet 19.

What we claim is:

1. A process for the treatment of textile fibers with an elastic substance consisting in placing the fibers in the condition of rovings, or bobbins in an air tight container in contact with an aqueous dispersion of rubber under the pressure of a gas, then unwinding the impregnated fibers through a bath of latex removing the excess of the impregnating material, drying the thread and imparting to it an additional smoothing.

2. A process for the manufacture of twisted or corded threads in which the rovings are first impregnated with latex in a closed container under gaseous pressure, are then twisted or corded before drying and coagulation, the cords being then covered with an additional quantity of latex, then winding and uniting the threads in web cords.

3. A process for the treatment of textile fibers with an elastic substance, consisting in placing the fibers, in the condition of rovings, on bobbins in an airtight container in contact with an aqueous dispersion of rubber under the pressure of a gas until the fibers are penetrated and impregnated with the rubber, then unwinding the impregnated fibers through a bath of latex, and then drying the thread.

4. A process for the treatment of textile fibers with an elastic substance, consisting in placing the fibers, in the condition of rovings, on bobbins in an air tight container in contact with an aqueous dispersion of rubber under the pressure of a gas until the fibers are penetrated and impregnated with the rubber, then unwinding the impregnated fibers through a bath of latex, drying the thread and imparting to it an additional smoothing.

5. A process for the treatment of textile fibers with an elastic substance, consisting in placing the fibers in the condition of rovings on bobbins in an air tight container in contact with an aqueous dispersion of rubber under the pressure of a gas, exerting successively a vacuum on the aqueous dispersion of rubber and a pressure by a gas onto the said dispersion, then unwinding the impregnated fibers and subjecting them to the action of a strong coagulating agent.

6. A process for the treatment of textile fibers with an elastic substance, consisting in placing the fibers in the condition of rovings on bobbins in an air tight container in contact with an aqueous dispersion of rubber under the pressure of a gas, exerting successively a vacuum on the aqueous dispersion of rubber and a pressure by a gas onto the said dispersion, then unwinding the impregnated fibers and subjecting them to the action of acetic acid.

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