

Nov. 25, 1941.

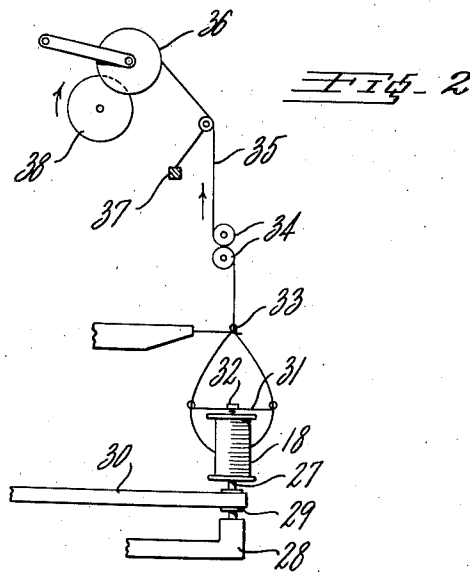
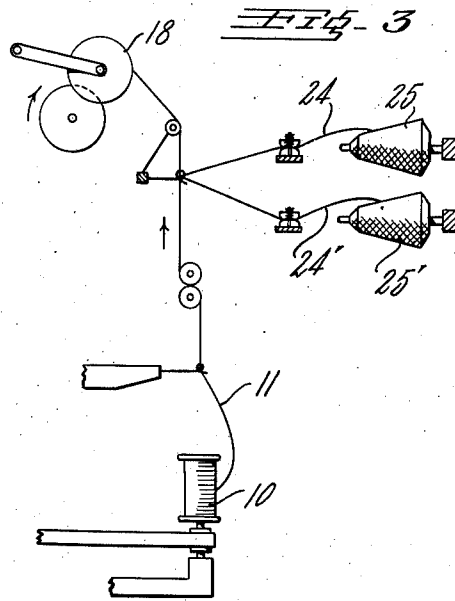
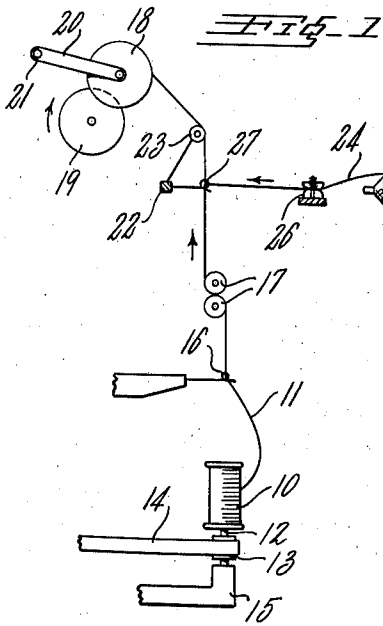
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2,263,612

METHOD OF MAKING ELASTIC YARN

Filed Nov. 13, 1940

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

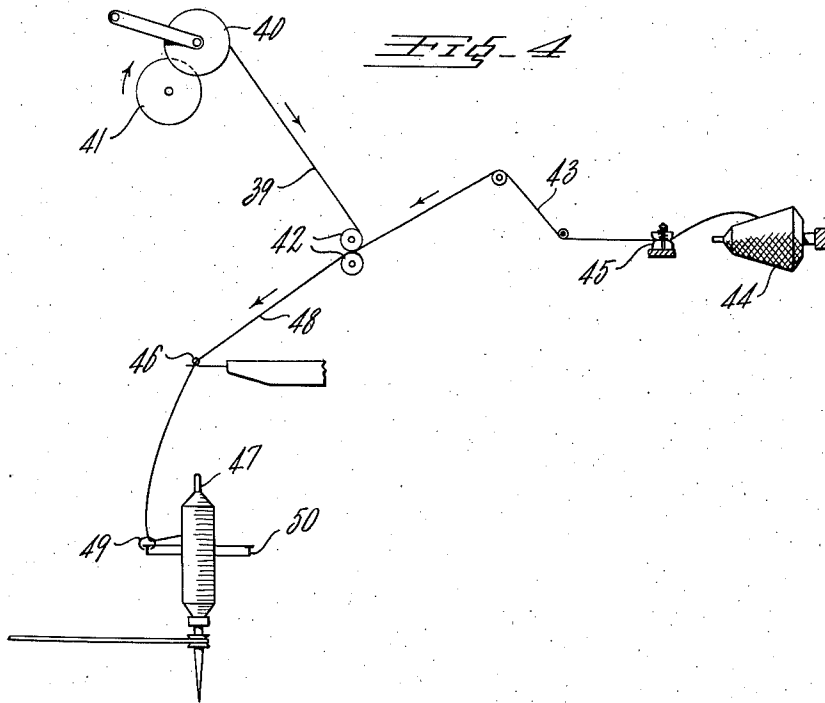


FIG-5

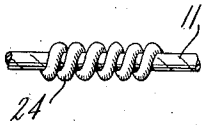
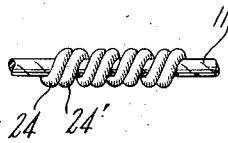


FIG-6



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METHOD OF MAKING ELASTIC YARN

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7 Claims. (Cl. 57—163)

This invention relates to an improved method of making a balanced elastic yarn comprising a rubber core having a textile yarn wrapped hellically about the core as a cover.

It has been proposed heretofore to make a balanced single cover elastic yarn on a core covering machine by feeding a twisted rubber thread through the hollow spindle which supports and revolves the package of textile yarn about the thread, to thereby wrap this yarn about the rubber thread in a direction opposite to that of the twist previously imparted to the thread to produce a balanced elastic yarn. Such a construction is described by the Foster Patent No. 2,024,155, Elastic yarn, and the elastic yarn contemplated by this Foster patent is of great commercial importance because it is cheaper to produce than the conventional double covered type of elastic yarn, and for many uses is equally satisfactory.

The present invention contemplates a novel method whereby a balanced single cover elastic yarn similar to that disclosed by the Foster patent may be made on standard textile twisting equipment instead of the more expensive conventional core covering equipment contemplated by said patent. The use of textile twisting equipment to manufacture elastic yarn, as herein contemplated, will reduce the cost of such elastic yarn because textile twisting equipment provided with a solid rotating spindle is cheaper to build and operate than the hollow spindle equipment contemplated by said Foster patent, and is readily available whereas the conventional type of rubber covering equipment employing a hollow spindle is expensive to build and operate, and is less readily available on the market because its use is confined largely to the covering of rubber thread.

There are a number of types of textile twisters in general use which are capable of being employed as herein contemplated to wrap a textile yarn about a pre-twisted rubber core as a cover. These twisters all twist the rubber thread as they wrap the cover about the same and may be divided into two general classes as follows:

(1) Up stroke twisters such as commonly used for twisting silk and rayon, in which the yarn is advanced axially in an upward direction from a revolving spool containing the supply of yarn. These twisters usually employ a flyer at the upper end of the spool; and

(2) Down stroke twisters such as commonly used for twisting cotton and wool in which the yarn to be twisted is fed in a downward direction

from a source of supply to a revolving spindle provided with a ring and traveler.

Either of these general types of twisters may be employed in carrying out the present method as will be apparent from the following description when read in connection with the accompanying drawings illustrating how a balanced elastic yarn may be produced in accordance with the present invention on an up stroke twister and also on a down stroke twister.

In the drawings:

Fig. 1 is a conventional diagrammatic view of one form of up stroke twister employed to twist the rubber core preparatory to forming the balanced elastic yarn.

Fig. 2 is a conventional diagrammatic view of an up stroke twister as employed to twist the rubber core and yarn together so as to form the desired elastic yarn, following the operation of Fig. 1.

Fig. 3 is a view similar to Fig. 1 showing two ends of covering yarn being laid along side the twisted rubber thread in place of the single end of covering yarn of Fig. 1.

Fig. 4 is a conventional diagrammatic view of a down stroke twister employed to twist the pre-twisted rubber core and textile yarn together to form the desired elastic yarn.

Fig. 5 is a side view on an enlarged scale of an elastic yarn produced on the apparatus of Figs. 1 and 2 or upon the apparatus of Fig. 4; and

Fig. 6 is a similar view of an elastic yarn having two ends of covering yarn, such as may be produced by employing the apparatus of Figs. 2 and 3.

Various forms of apparatus may be employed to carry out the method of the present invention provided it is capable of performing the steps of (1) pre-twisting the bare rubber thread, (2) bringing the pre-twist rubber thread and textile yarn together and (3) twisting them together to wrap the yarn about the core as a cover. The steps of bringing the pre-twisted rubber thread and textile yarn together in position to be twisted one about the other may be performed in two separate and distinct operations as is done by employing the up twister equipment of Figs. 1 and 2, or it may be done in one continuous operation by using the down twister equipment of Fig. 4.

The apparatus shown in Fig. 1 serves to impart the desired initial or pre-twist to the bare rubber core and also to lay the textile yarn along side this core in position to twist them together. When the apparatus of Fig. 4 is used it will be

necessary to pre-twist the bare rubber thread by any suitable mechanism such for example as that shown in Fig. 1 provided the covering yarn is omitted from the apparatus of Fig. 1 so that the twisted rubber core alone will be wound upon the take-up spool.

Now turning to a more detailed description of the drawings and starting with Figs. 1 and 3, there is shown in these figures an up stroke twister provided with a let-off spool 10. Upon this spool is wound an untwisted rubber thread 11 formed of natural or artificial rubber or other rubber like material having the desired strength, elasticity, durability and other required properties. The spool 10 is mounted upon a spindle 12 to be rotated rapidly thereby and this spindle may be driven by any suitable means such as the pulley 13 and belt 14. The spindle 12 is rotatably supported by any suitable means such as the bracket 15.

Above the rotating spool 10 is provided a pigtail 16 in axial alignment with the spindle 12 and adapted to guide the rubber thread 11 as it is unwound from the spool 10 and passes upwardly therefrom. It is contemplated that the spool 10 will be rotated at high speed say 10,000 R. P. M. or higher and therefore the rubber thread may balloon considerably, but the size of this balloon may be controlled to a considerable degree by varying the distance of the pigtail 16 from the upper end of the spool 10.

It is highly desirable to provide feed means for the rubber thread 11 adapted to pull the thread from the spool 10 at a definite speed relative to the R. P. M. of the spindle 12 to thereby control the number of twists that are imparted per inch to the thread 11. This may be accomplished by providing the power driven feed rolls 17 arranged to have the rubber thread passed therebetween. The twisted rubber thread 11 upon leaving these feed rolls passes upwardly in the construction shown to a take-up spool 18 which may be driven at the desired speed irrespective of the amount of material wound thereupon by causing this spool to rest upon a power driven roll 19. The swinging arms 20 pivotally supported at 21 serve to support the spool 18 so that it may rest by gravity on the driving roll 19. As the twisted rubber thread 11 approaches the take-up spool 18 it is wound evenly thereupon by the traverse mechanism 22 which is shown as having an upwardly extending arm that carries a thread guide or roller 23.

The apparatus of Fig. 1 serves not only to twist the rubber thread 11 and wind it upon the take-up spool 18 but also to perform a doubling operation in which it lays the cover forming yarn 24 alongside of the rubber thread 11 to be wound therewith upon the spool 18. This is accomplished in the construction shown by providing a supply of the covering yarn 24 such as the cone 25 from which the yarn may be pulled off endwise as shown. It is then subjected to the desired tension by passing through the tension device 26 which may consist of a fixed lower disc and a floating upper disc that rests by gravity upon the yarn. The yarn 24 then passes through a pigtail 27 carried by the traverse rod 22, and passes upwardly from the pigtail to the guide 23 alongside of the twisted rubber thread 11. In this manner the twisted thread 11 and covering yarn 24 are wound side by side upon the take-up spool 18 under the desired tension, the tension of the rubber thread and covering yarn being independ-

ently controlled by the tension mechanism 17 and 26 respectively.

This completes the first series of steps when the apparatus of Figs. 1 and 2 is employed. Should it be desired to provide a rubber core with two ends of covering yarn instead of a single end as shown by the construction of Fig. 1, then the construction of Fig. 3 may be employed wherein one end of yarn 24 is supplied by the cone 25 and a second end 24' is supplied by the cone 25'.

After the rubber thread 11 has been twisted and wound upon the take-up spool 18 with one or more ends of covering yarn, then this spool 18 may be transferred to the apparatus of Fig. 2 where it is mounted upon a rotating spindle 27 to be rotated thereby. This spindle may be rotatably supported by the bracket 28 and driven by the pulley 29 and belt 30. The purpose in transferring the spool 18 to the apparatus of Fig. 2 is to twist the rubber thread 11 and covering yarn 24 together by a yarn plying operation as they are drawn axially from this spool. It is found desirable to momentarily separate the rubber core 11 and yarn 24 as they are unwound from the spool 18 and to this end the flyer 31 is provided pivotally mounted at 32 upon the upper end of the spindle 27. The flyer 31 may have oppositely extending arms as shown each of which has a thread guide so that one may guide the rubber core 11 and the other the yarn 24 as they are unwound from the spool 18. The thread and yarn then pass through a pigtail guide 33 at which point they are twisted together by the rotation of the spool 18. The thread 11 and yarn 24 are preferably drawn axially at the desired rate of speed from the rotating spool 18 by the power driven rolls 34. The elastic yarn 35 produced by the twisting apparatus just described upon leaving the feed rolls 34 may be wound onto a take-up spool 36 and is guided thereupon by the traverse mechanism 37. The spool 36 is preferably driven by a roll 38 similar to the roll 19 of Fig. 1.

In carrying out the method of the present invention it is contemplated that a relatively high twist will be imparted to the rubber core 11 by the apparatus of Fig. 1, as part of this twist will be removed by the apparatus of Fig. 2 when the rubber thread and covering yarn are twisted together. The spindle 12 should be rotated in the opposite direction to that of the spindle 27 so that the apparatus of Fig. 2 will serve to remove a substantial portion, say half of the twist that was imparted to the rubber thread 11 by the apparatus of Fig. 1. This will serve to produce a single cover elastic yarn such as shown in Fig. 5 in which the twist of the rubber core in one direction serves to balance the helical wrappings of the cover in the opposite direction.

The down stroke twister of Fig. 4 may be employed in accordance with the present invention to produce in a continuous operation the desired elastic yarn by bringing a pre-twisted rubber core and the covering yarn together in side by side relation as they approach spinning or twisting mechanism, and then twisting the core and cover together to form the elastic yarn.

In accordance with the disclosure of Fig. 4 the pre-twisted rubber thread 39 is supplied by a let-off spool 40 which may be rotated in the unwinding direction at the desired speed by causing this spool to rest upon the power driven roll 41. The rubber thread 39 upon leaving the spool 40 passes between the power driven rolls 42 which are pref-

erably operated at a higher surface speed than the spool 40 to thereby stretch the rubber thread 39 the desired amount. The cover forming yarn 43 may be supplied by the cone 44 and this yarn may be tensioned as desired as it leaves the cone by passing it through the tension device 45 whereupon it passes about suitable guides and is delivered to the nip of the feed rolls 42 in contacting relation with the rubber thread 39.

As the pre-twisted rubber thread 39 and covering yarn 43 leave the feed rolls 42 they are twisted together to form the desired elastic yarn by any suitable means capable of performing a yarn plying operation such for example as twisting mechanisms employing the well known ring and traveler. As shown in Fig. 4 the combined rubber thread and yarn pass from the feed rolls 42 to the pigtail 46 supported in axial alignment with the spinning spindle 47 which may be driven by the usual belt and whirl. The elastic yarn 48 formed of the rubber core 39 and covering yarn 43 passes through the traveler 49 mounted upon the ring 50 and is then wound into a package upon the spinning spindle 47.

The rubber core 39 is preferably kept under sufficient tension during the twisting operation to cause it to take a straight line position at the center of the elastic yarn when the latter is relieved from tension and this, as above pointed out causes the covering yarn to form helical coils about the rubber core. The direction of rotation of the spindle 47 should be opposite to the twist previously put in the bare rubber core. That is the operation of twisting the core and cover together to produce the desired elastic yarn removes a substantial portion of the twist previously put in the bare rubber core, to thereby produce a balanced elastic yarn.

The elastic yarn shown in Fig. 5 having a single end of yarn 24 wound helically about the pre-twisted rubber core 11 is such as may be produced on the apparatus of Figs. 1 and 2, or upon the apparatus of Fig. 4. The elastic yarn of Fig. 6 having two ends of yarn 24 and 24' helically wrapped about the pre-twisted rubber core 11 may be produced by employing first the apparatus of Fig. 3 and then the apparatus of Fig. 2. The elastic yarn shown in Figs. 5 and 6 is in the relaxed or unstretched condition.

Practically any type of textile yarn such as cotton, wool, silk, rayon, Nylon or the like and dyed to any desired color may be employed to cover the rubber core, and various core sizes may be used. The following examples are given as showing several of the many elastic yarns that have been produced by the present method.

	A	B	C	D
1 Core-rubber thread.	100's.....	100's.....	75's.....	75's.....
2 Cover.....	1 end 40/1 cotton.	1 end 40/1 cotton.	1 end 20/1 cotton.	1 end 20/1 cotton.
3 Elongation.....	200%	300%	200%	300%
4 Yards per pound.	7000	5500	3600	2900.
5 Length of core per yard.	21"	27"	21"	24"
6 Percentage core.	36.....	37.....	30.....	30.
7 Percentage cover.	64.....	63.....	70.....	70.

Elastic yarn constructed by the present method may have excellent strength imparted thereto by the single end of covering yarn, and the range of stretch may be varied as desired from approximately 100% to 300%. This variation in stretch is secured largely by increasing or decreasing the stretch of the rubber core as it is delivered to the twisting point, and by increasing or decreasing

the speed of the feed rolls, such as 42, relative to the spinning spindle speed to thereby vary the amount of twist that is imparted to the core and cover.

Having thus described my invention, what I claim and desire to protect by Letters Patent is:

1. The method of making elastic yarn which comprises, winding a twisted rubber thread and textile yarn upon a spool under controlled tension, then withdrawing the rubber thread and textile yarn endwise from said spool while this spool is rotated in an opposite direction to the twist of said thread and at a sufficiently high speed to remove a number of twists from each coil of the thread unwound from this spool, to thereby partly untwist said thread and twist the yarn and thread together by a yarn plying operation so that as the thread assumes a central position the yarn will lie helically about the rubber thread as a cover.

2. The method of making elastic yarn on an up twister which comprises, winding a twisted rubber thread and textile yarn upon a spool under independently controlled tensions, then rotating said spool in a direction to remove part of the twist from said thread and drawing the thread and yarn endwise in an upward direction from this rotating spool at a definite rate relative to the speed of spool rotation so as to remove a number of twists from each coil of the thread unwound from the spool to thereby partly untwist said thread and twist the yarn and thread together by a yarn plying operation so that as the thread assumes a central position the yarn will lie helically about the rubber thread as a cover.

3. The method of making a balanced single cover elastic yarn which comprises, winding a twisted rubber thread and textile yarn side by side upon a spool, then withdrawing the thread and yarn endwise from said spool while the latter is rotated in a direction to remove part of the twist of said rubber thread and at a speed to remove a number of twists from each coil of the thread unwound from this spool, to thereby partly untwist said thread and twist the yarn and thread together by a yarn plying operation so that as the thread assumes a central position the yarn will lie helically about the thread as a cover so as to balance the opposite twist of the rubber thread and hold the rubber stretched.

4. The method of making a single cover elastic yarn which comprises, winding a twisted rubber thread and textile yarn side by side upon a spool, then withdrawing the rubber thread and textile yarn endwise from this spool but from the opposite sides thereof while the spool is being rotated in a direction to remove part of the twist of said thread, to thereby partly untwist said thread and twist the yarn and thread together by a yarn plying operation so that as the thread assumes a central position the yarn will lie helically about the rubber thread as a cover.

5. The method of making elastic yarn which comprises, winding a twisted rubber thread and a plurality of ends of textile yarn upon a spool under controlled tension, then withdrawing the thread and ends of yarn endwise from said spool while this spool is rotated in an opposite direction to the twist of said thread and at a sufficiently high speed to remove a number of twists from each coil of the thread unwound from this spool, to thereby partly untwist said thread and twist the ends of yarn and thread together so that as the thread assumes a central position the ends of yarn will lie helically about the rubber thread as a cover.

6. The method of making a balanced single cover elastic yarn having a yarn cover which consists in advancing a pre-twisted rubber thread and a covering yarn under independently controlled tensions to a meeting point to thereby bring the twisted rubber thread and covering yarn into side by side longitudinal relation, and then twisting them together by a yarn plying operation in a direction to remove part of the twist previously imparted to the rubber thread and place one about the other so that as the thread assumes a central position the yarn will lie helically about the rubber thread as a cover adapted to balance the opposite twist of the rubber thread and hold it under longitudinal tension.

7. The method of making a balanced single

cover elastic yarn having a yarn cover on a down stroke twister which consists in advancing a pre-twisted rubber thread and a covering yarn under independently controlled tensions to a meeting point to thereby bring the twisted rubber thread and covering yarn into side by side longitudinal relation, and then twisting them together by a yarn plying operation in a direction to remove part of the twist previously imparted to the rubber thread and place one about the other so that as the thread assumes a central position the yarn will lie helically about the rubber thread as a cover adapted to balance the opposite twist of the rubber thread.

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