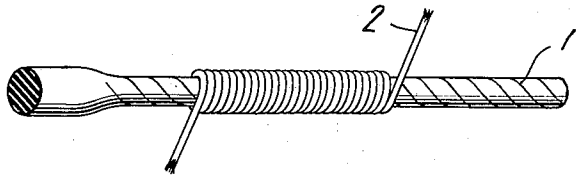
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ELASTIC YARN

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ELASTIC YARN

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1 Claim. (Cl. 117—57)

This invention relates to an elastic yarn.

Until recently it has not been possible to manufacture elastic yarn in sizes small enough to permit its use in commercial knitting machines. Such small knittable yarns are now being produced, but in order to provide a balanced yarn free from kinking, they have been provided with a double fibre covering or wrapping on the elastic core, the coverings being helically wrapped in opposite directions. This double wrapping of course increases the diameter, weight and cost for a given elastic core as compared with a single wrap, and for a given core reduces the yardage per pound of finished yarn.

An object of the present invention is to provide a knittable single wrap elastic yarn which is balanced and free from kinking.

Another object is to provide a knittable elastic yarn which for any given gauge is softer and more pliable than yarns of the same gauge made by previous processes.

Another object is to decrease the cost of making such elastic yarn.

Another object is to increase the yardage obtained per pound of finished knittable yarn for any given size of elastic core.

A further object is to produce a smooth elastic yarn of finer gauge than has heretofore been possible.

A still further object is to simplify the making of small diameter elastic yarn.

The invention broadly consists in twisting a fine gauge elastic core in one direction, feeding the core forwardly under tension, and helically wrapping a single fibrous covering on the core in an opposite direction. It further consists in the product so obtained.

For a complete understanding of the nature and objects of the invention, reference is had to the accompanying specification and drawing, in which latter:

The figure is an enlarged view showing a piece of the elastic yarn of the invention, with a part of the cover broken away.

Any suitable elastic core of rubber or rubber-like material may be employed in carrying out the invention, but it is preferred to employ a rubber core made in accordance with the patent to Hopkinson and Gibbons No. 1,545,257, granted July 7, 1925. Rubber cores made directly from rubber latex by the process disclosed in this patent or other processes are grainless, and have much greater resistance to tearing. Also, the thread is of uniform cross section and can be made round, which is of advantage when it is to be wrapped with a fibrous covering. Moreover, since the rubber thread made according to this patent has no ragged or irregular surfaces, such as are frequently present in cut rubber threads, the liability to tear or break is also greatly reduced by reason of this fact. Such thread has also been found to have exceptional resistance to air and heat ageing, etc. Preferably, the latex used in making the thread is treated to remove non-rubber constituents.

The cores may be made from rubber latex suitably compounded to further increase their ageing qualities and to permit vulcanization at moderate temperatures or rapid vulcanization at higher temperatures, and in general to impart to the rubber any desired characteristics for the purpose in mind, or the cores may be made from a compounded and vulcanized latex.

The fibrous covering to be applied in carrying out the invention may be of any suitable material, such as cotton, linen, silk, rayon, wool, etc., or combinations of two or more of these. It may be in various forms and may consist of one or more ends of yarn or plied yarn depending upon the service requirements of the article to be made from the finished yarn.

An unwrapped rubber thread of good quality has great extensibility, while an elastic yarn suitable for knitting should have only a somewhat limited predetermined stretch, hence in the manufacture of such yarn the elastic core is maintained under sufficient tension during its covering with fibrous material to produce a finished yarn having the desired limited stretch.

In carrying out the invention, the elastic core 1 is fed under proper tension and with a twist imparted to it in one direction, while the covering yarn 2 is helically wrapped around the elastic core in an opposite direction. Any suitable apparatus may be used for producing the twist in the elastic core and wrapping the covering yarn upon it. For instance, a machine now in use for placing two oppositely wound fibrous coverings on an untwisted elastic core may be

used for carrying out the present invention, with a slight rearrangement of parts. Instead of feeding the elastic core successively through two aligned hollow rotating spindles from which latter in ordinary practice the two fibrous covers are fed and helically wrapped in opposite directions on the core, the elastic core itself may be disposed on the first of these spindles instead of a first covering yarn, and a twist imparted to the core by feeding it from the rotating spindle through the rotating traveller ordinarily employed for guiding the first helical wrapping of yarn. This will impart the desired twist and torque to the elastic core and as it travels through and beyond the second spindle, the single helical wrapping of covering yarn of the present invention may be applied from the position in which ordinarily the second wrapping of yarn would be applied, and in an opposite direction to the twist of the core.

The tension and number of twists per inch of the elastic core and the pitch of wrap and number of wraps per inch of the covering yarn, will, of course, be varied depending upon the size of the elastic core, the nature and form of the covering yarn and other variables, as apparent to those skilled in the art. These variables may be varied so as to produce a single covered elastic yarn which is balanced and free from tendency to kink, that is, one in which the helically wrapped covering substantially exactly counteracts the torque of the twisted elastic core. Preferably, however, there should be at least fifteen turns per inch in the tensioned wrapped twisted core.

As illustrating the invention, the following tables give the structure characteristics of nine specimens of elastic yarn made according to the invention. In considering the data in these tables, it is to be noted that the data were compiled from measurements on a yard length or on a fraction of a pound of the elastic yarn, and consequently any slight error in measurement thereof may have been multiplied in the figures given in the tables. Nevertheless, the data are accurate within the tolerances recognized in the trade.

The figures given in the tables are therefore to be taken as illustrative and not limiting.

Table I

Designation	A	B	C
1. Gauge of bare circular rubber core, relaxed and untwisted	.010"	.010"	.010"
2. Yards of elastic yarn per pound—normal condition	20,200	6,060	19,150
3. Elongation of elastic yarn—increase over normal length on stretching to limit	110%	110%	100%
4. Material of covering	1–2 ply 13/15 Cheney silk	4–100/1 cotton	1–2 ply 13/15 silk
5. Wraps of covering per inch of elastic yarn	98.0 L	63.4 L	90.6 L
6. Twist in rubber core per inch of elastic yarn	77.46 R	53.73 R	58.7 R
7. In one yard of normal elastic yarn—the inches of bare rubber relaxed	14	20.25	15.25
8. In one yard of normal elastic yarn the weight in grams of—			
a. Bare rubber	.0172	.0252	.0185
b. Both rubber and covering	.0224	.0745	.0230
9. Percent by weight of rubber core	76.8	33.8	80.5
10. Percent by weight of covering	23.2	66.2	19.5
11. Yardage of one pound of bare rubber core—relaxed	10,200	10,100	10,400
12. Yardage of relaxed bare rubber in one pound of elastic yarn	7,850	3,410	8,120
13. Gauge of elastic yarn	.00725"	.01475"	.00675"

Table II

Designation	D	E	F
1. Gauge of bare circular rubber core, relaxed and untwisted	.010"	.010"	.008"
2. Yards of elastic yarn per pound—normal condition	19,700	16,500	20,400
3. Elongation of elastic yarn—increase over normal length on stretching to limit	110%	110%	145%
4. Material of covering	1–2 ply 13/15 silk	2–2 ply 13/15 silk	1–3 ply 13/15 silk
5. Wraps of covering per inch of elastic yarn	97.6 L	93 L	121.9 L
6. Twist in rubber core per inch of elastic yarn	55 R	63 R	75.15 R
7. In one yard of normal elastic yarn—the inches of bare rubber—relaxed	15.625	15	19.125"
8. In one yard of normal elastic yarn—the weight in grams of:			
a. Bare rubber	.0185	.011	.0135
b. Both rubber and covering	.0234	.017	.0225
9. Percent by weight of rubber core	79.1	64.7	60%
10. Percent by weight of covering	20.9	35.3	40%
11. Yardage of one pound of bare rubber core—relaxed	10,650	10,650	17,850
12. Yardage of relaxed bare rubber in one pound of elastic yarn	8,550	6,880	10,825
13. Gauge of elastic yarn	.00675"	.0075"	.007"

Table III

Designation	G	H	I
1. Gauge of bare circular rubber core, relaxed and untwisted	.033"	.0333"	.0333"
2. Yards of elastic yarn per pound—normal condition	826	1,140	1,180
3. Elongation of elastic yarn—increase over normal length on stretching to limit	105%	115%	90%
4. Material of covering	6 ends 24s/1 cotton	4 ends 24/1 cotton	4 ends 24/1 cotton
5. Wraps of covering per inch of elastic yarn	24.9 left	29.2 left	29.1 left
6. Twist in rubber core per inch of elastic yarn	19.0 right	20.4 right	23.0 right
7. In one yard of normal elastic yarn—the inches of bare rubber relaxed	20¼"	15⅛"	13¾"
8. In one yard of normal elastic yarn—the weight in grams of—			
a. Bare rubber	.230	.170	.150
b. Both rubber and covering	.319	.224	.213
9. Percent by weight of rubber core	42%	43.2%	41.5%
10. Percent by weight of covering	58%	56.8%	58.5%
11. Yardage of one pound of bare rubber core—relaxed	1,230	1,120	1,149
12. Yardage of relaxed bare rubber in one pound of elastic yarn	516	480	451
13. Gauge of elastic yarn	.0375"	.031"	.0315"

The products above described in the tables were well balanced and free from kinks.

The covered yarns, as above described in the tables, are capable of being knitted in high speed commercial knitting machines of various sizes up to the finest in present use, depending upon the gauge of the yarn used. For instance, the yarn E of Table II has been successfully employed in knitting on full fashioned knitting machines of 45 and 48 gauge (needles per 1½ inches), and it is capable of use on a 51 gauge machine. Double covered elastic yarns at present in use, even with a core of $1/125$th of an inch, cannot be practically employed on full fashioned knitting machines finer than 42 gauge. As the present demand of the full fashioned knitting trade is usually for nothing finer than 45 gauge, it will be seen that the present invention not only meets but exceeds the demand. Moreover, it will be noted that in Example E, an elastic core of $1/100$th of an inch diameter was used, while by using a finer core, such as $1/125$th of an inch, a finished elastic yarn of still smaller diameter may be obtained which is therefore capable of use on even finer gauge knitting machines.

While capable of extended use, the invention is particularly applicable with elastic cores not exceeding .020 inch in diameter, or .00031416 square inch in cross sectional area. The finished yarn preferably should not exceed .025 inch in diameter.

While specific embodiments of the invention have been described, it is obvious that it is capable of modification, and it is not intended that the invention should be limited otherwise than as set forth in the appended claim.

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

An elastic yarn capable of being knitted, comprising a stretched elastic core of rubber twisted as an entirety in one direction to maintain it under torque and unbalanced from said twist, and a covering yarn helically wrapped in the opposite direction in direct frictional contact with the core to provide a covering that holds the core in a stretched condition, and the twist of the core being just sufficient to balance the opposite helical twist of the cover, whereby an accurately balanced elastic yarn which can be knitted in a knitting machine without kinking is produced.

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