

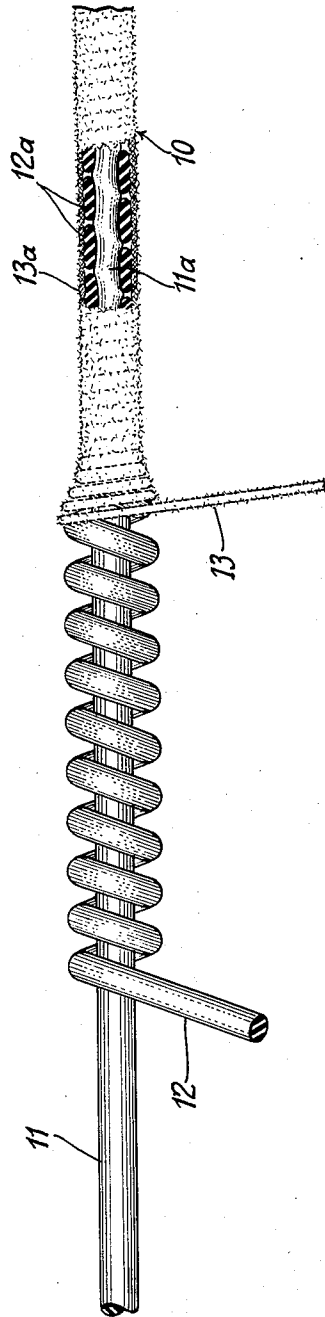
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ELASTIC YARNS

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ELASTIC YARNS

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This invention relates to elastic yarn suitable for braiding, knitting, weaving and sewing, particularly to such yarns which comprise a latex rubber or the like filament core and a fibrous cover. In the manufacture of elastic braided, woven or knitted fabrics, it is often desirable to make these as thin as possible to reduce the bulk and weight to a minimum without losing strength or modulus of elasticity and without reducing resistance to needle cuts.

Heretofore, great difficulty has been experienced in making yarns of relatively thin gauge which were of sufficient uniformity, and provided sufficiently high tensile strength and modulus of elasticity to meet the desirable requirements for the manufacture of such elastic fabric. For example, it is well known that lack of uniformity in elastic yarn results in a fabric which lacks uniformity of stretch, which is highly desirable, if not essential. Furthermore, fabrics for use in stretch garments, such as girdles, are required not only to provide great tensile strength but also to provide substantial resistance to stretch. Heretofore, in order to get the required strength and resistance to stretch, elastic yarns were required of such a size as to produce fabric thicker than desired.

An object of this invention is to produce elastic yarns of the character described which have increased tensile strength and increased modulus of elasticity for a given weight and size.

Another object is to produce elastic yarns of thin gauge where the degree of stretch is stabilized and maintained at a relatively low figure.

Further and other objects, features and advantages of the invention will more clearly appear from the detailed description given below taken in connection with the drawing which is a somewhat schematic illustration, on a greatly enlarged scale, of a relaxed piece of elastic yarn embodying my invention, with parts broken away to better illustrate the structure.

In general, the elastic yarn of this invention consists in a latex rubber filament core substantially elongated beyond its relaxed condition, helically wrapped with an uncovered latex rubber filament substantially elongated beyond its relaxed condition as to be in tight binding rubber-to-rubber restrictive engagement with the core filament, and a fibrous filament outer helical wrapping tightly encasing said latex rubber filament wrapping and disposed thereabout in an opposite helical direction. The fibrous outer wrapping preferably being sufficiently tight to compress the enclosed rubber wrapping and core.

I have found that elastic yarns of the order of about .013" diameter or smaller having the desirable characteristics above indicated may be provided by constrictively wrapping a substantially elongated latex rubber core filament with an uncovered latex rubber filament as small as and preferably smaller than the core filament helically wound thereabout under sufficient tension to substantially elongate said winding filament and then applying over the helically wound latex rubber filament an outer cover of fibrous yarn helically wound in a direction opposite to

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that of the helically wound latex rubber filament under sufficient tension to maintain said core and binding latex rubber filaments in substantially elongated condition. In general, the core filament is elongated two to three times its relaxed filament length; and the wrapping latex rubber filament is of a size substantially no larger than the core filament and is elongated to a substantially greater extent than said core filament, and preferably from about 3 to 7 times the initial relaxed length of said wrapping filament.

The drawing shows on a greatly magnified scale, and with the features somewhat exaggerated for clarity, an elastic yarn 10 in its relaxed condition with a segment of the cover broken away to better show the relative arrangement of the interior structure of the finished product embodying my invention; one end of the yarn having the cover and binding filament removed from a portion thereof to show the parts in their individually relaxed state. Referring more particularly to the right hand of the drawing where a segment of the fibrous yarn outer cover has been broken away from the relaxed elastic yarn 10, it will be seen that the elongated rubber core filament designated 11a and the elongated rubber binding filament designated 12a within the restrictive wrapping or yarn covering designated 13a are substantially smaller than the individually relaxed rubber core filament 11 and rubber binding filament 12 at the left hand of the drawing where the parts are more or less disassembled. It is further noted that in the finished product the tensioned binding filament 12a is somewhat flattened and the covering yarn 13a is appreciably flattened and its fibers appear to span the spaces between the respective turns of the helically wound yarn 13.

Elastic yarns embodying my invention have a very substantially higher modulus of elasticity and are much stronger than conventional elastic yarns of the same size and present increased resistance to needle cuts. This increase in modulus of elasticity, strength and resistance to needle cuts makes it possible to produce a thinner and lighter weight fabric for a given purpose than was possible with elastic yarn previously known.

As an example of the benefits of increased tensile strength and modulus of elasticity of the yarn made according to this invention, it is noted that fabrics, such as that used in girdles or brassieres made from elastic yarns embodying this invention weighing only 6100 yards/pound had a strength and modulus of elasticity equal to or greater than a fabric made from previously known elastic yarn weighing 3900-4300 yards/pound. In other words, a fabric made from yarns embodying this invention is about one-third lighter than a fabric having equivalent strength and modulus of elasticity made from previously known elastic yarn. Further, my improved elastic yarn is of such uniformity that the stretch variation in fabric made therefrom is very substantially reduced and often runs to as little as 5% or less.

The following examples of elastic yarns embodying my invention will serve as illustrative:

Example I.—An elastic yarn of approximately .012" diameter in relaxed condition and having a yardage of approximately 6,000 yards per pound comprises a core of a single filament of latex rubber of a size known in the trade as "130" cut filament¹ (or the equivalent "115" extruded filament), and an uncovered cut latex rubber filament of "130" size (or equivalent "115" extruded) helically wrapped in substantially elongated condition about the core filament in substantially elongated condition. The core filament is elongated to an extent where 3¾" of the core filament in relaxed condition corre-

¹ As is well known, such cut threads are somewhat elongated in cross section so that they are thinner in one direction than in the other, and the "130" designation means that there are 130 filaments per inch as measured on the lesser diameter.

sponds to each 10" length of the relaxed elastic yarn and hence the core filament is elongated between 2 and 3 times its initial relaxed length. There are about 71 wraps of the helical wrap latex rubber filament per inch of relaxed elastic yarn and the wrap filament is elongated to an extent where $7\frac{1}{16}$ " of the wrap filament in relaxed condition corresponds to each 10" length of relaxed elastic yarn which requires the helical wrap filament to be elongated about $3\frac{1}{2}$ times its initial relaxed length. The elastic yarn further comprises an outer fibrous cover provided by a helical wrapping of 50/1 cotton applied under tension with 68 wraps per inch and requiring $26\frac{1}{2}$ " for each 10" length of relaxed finished yarn. The core filament and the latex rubber inner wrap filament each runs 13,000 yards per lb. in relaxed state and the outer wrap yarn runs 42,000 lbs. per yard.

Examples of other sizes of elastic yarn are set forth in the table below, wherein the sizes of the latex rubber core and latex rubber winding filaments are given in the number of diameters per inch for extruded (round) filaments. However, in every case the equivalent cut sizes could be used instead of the extruded sizes; extruded filament No. 115 being equivalent to cut filament No. 130, and extruded filament No. 95 being equivalent to cut filament No. 105.

Examples.....	II	III	IV	V	VI
1. Core:					
Extruded (round) latex rubber filament—					
(a) No. of dia./inch.....	95.....	115.....	115.....	95.....	95.....
(b) Approx. dia. in inches.....	.0105".....	.0087".....	.0087".....	.0105".....	.0105".....
(c) Yards per pound relaxed.....	9,600.....	13,000.....	13,000.....	9,600.....	9,600.....
(d) Initial length relaxed per 10" of elastic yarn relaxed.....	$4\frac{7}{8}$ ".....	$3\frac{3}{4}$ ".....	$4\frac{7}{8}$ ".....	$4\frac{7}{8}$ ".....	$4\frac{7}{8}$ ".....
(e) Elongation factor.....	2.05.....	2.66.....	2.42.....	2.42.....	2.05.....
2. Binding Wrap:					
Extruded (round) latex rubber filament—					
(a) No. of dia./inch.....	115.....	115.....	115.....	95.....	115.....
(b) Approx. dia. in inches.....	.0087".....	.0087".....	.0087".....	.0105".....	.0087".....
(c) Yards per pound relaxed.....	13,000.....	13,000.....	13,000.....	9,600.....	13,000.....
3. Outer Cover: Yarn, Denier.....	150 den. Dull Acetate.....	100 den. Dull Acetate.....	150 den. Dull Acetate.....	150 den. Dull Acetate.....	50/1 C.P. Cotton.....
4. Elastic Yarn:					
(a) Dia. in inches.....	.013".....	.010".....	.011".....	.012".....	.012".....
(b) Yards/pound.....	6100.....	8100.....	7600.....	6000.....	5900.....

It will be understood by those skilled in the art that the tension and number of wraps of the latex rubber binding filament and the fibrous wrap may be varied to correspondingly vary the properties of the finished yarn; bearing in mind that the elongation of the latex rubber wrap should be of the order of 3 to 7 times the relaxed filament length.

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

1. An elastic yarn comprising an axially disposed latex rubber filament core of a size not substantially larger than .0105" diameter extruded or equivalent size cut filament, said core filament in the relaxed state of said yarn being in a substantially stretched condition, a latex rubber filament at least substantially as small as said core filament and constrictively helically disposed about said rubber core binding said core in said stretched condition and a helical outer wrapping of textile fibre yarn encasing said helically disposed latex rubber filament and disposed thereabout in an opposite helical direction, said elastic yarn having an extensibility of not less than 60% and not more than 150% of its relaxed length.

2. An elastic yarn for use in elastic fabrics comprising an axially disposed latex rubber filament core, a latex rubber binding filament constrictively helically disposed about said rubber core and a helical outer wrapping of textile fibre yarn encasing said helically disposed latex rubber filament and disposed thereabout in an opposite helical direction, said latex rubber core filament in the relaxed elastic yarn being elongated about 2 to 3 times its relaxed length and said latex rubber binding filament in the relaxed elastic yarn being elongated from 3 to 7 times its relaxed length.

3. An elastic yarn comprising an axially disposed latex rubber filament core not substantially larger than .0105" diameter extruded or equivalent size cut filament, an uncovered latex rubber filament of a size at least as small as said core filament constrictively helically disposed about said rubber core in direct binding engagement therewith, said latex rubber core filament and said helically disposed latex rubber binding filament when said yarn is in relaxed condition being elongated substantially beyond their initial relaxed filament lengths and an outer fibre wrapping encasing said helically disposed latex rubber binding filament and holding said latex rubber core and helical rubber latex binding filaments in elongated condition.

4. An elastic yarn for use in elastic fabrics comprising an axially disposed latex rubber filament core, an uncovered latex rubber filament constrictively helically disposed about said rubber core in direct binding engagement therewith, said latex rubber core filament while said yarn is in relaxed condition being elongated substantially beyond its initial relaxed filament length and said helically disposed latex rubber binding filament being elongated a greater extent beyond its initial relaxed filament length than said core filament and an outer fibre wrapping encasing said helically disposed latex rubber filament and

holding said latex rubber core and helical rubber latex filaments in elongated condition.

5. An elastic yarn for use in elastic fabrics comprising an axially disposed latex rubber filament core, a latex rubber filament constrictively helically disposed about said rubber core in direct engagement therewith, said latex rubber core filament while said yarn is in relaxed condition being elongated 2 to 3 times its initial relaxed filament length and said helically disposed latex rubber filament while said yarn is in relaxed condition being more than 3 to 7 times its initial relaxed filament length and an outer fibre wrapping encasing said helically disposed latex rubber filament and holding said latex rubber core and helical rubber latex filaments in elongated condition.

6. An elastic yarn comprising an axially disposed latex rubber filament core not substantially exceeding No. 95 extruded size or equivalent cut size, a helically disposed uncovered latex rubber binding filament of at least as small size as the size of said core filament constrictively helically disposed about said core and a helical outer wrapping encasing said latex rubber binding filament and disposed thereabout in an opposite helical direction and holding the same in said constricting relation to said latex rubber core, said latex rubber core and binding filaments in the relaxed state of said yarn being elongated beyond their initial relaxed state.

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