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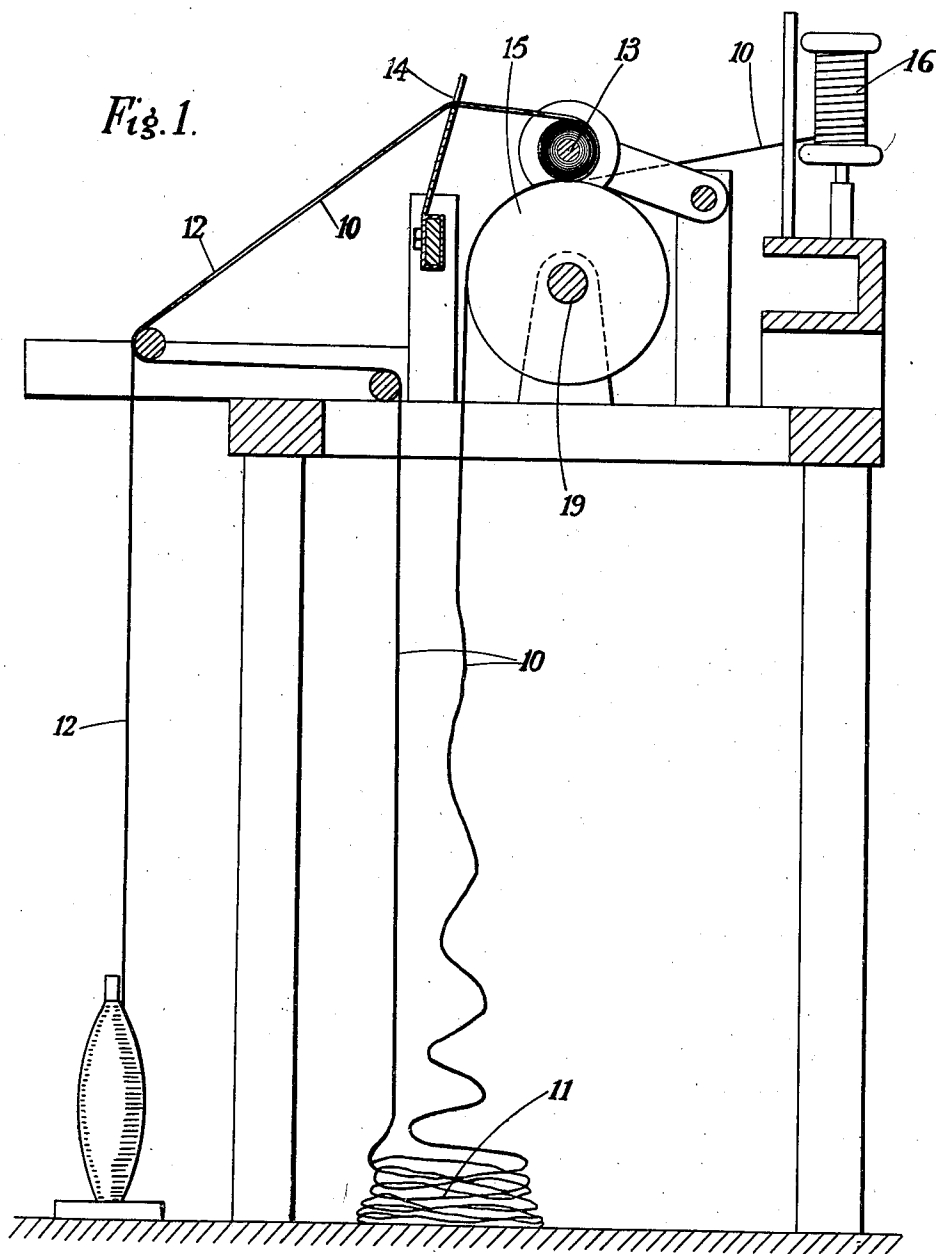
P. E. F. CLAY

2,220,213

METHOD OF PRODUCING ELASTIC THREAD

Filed Aug. 1, 1939

5 Sheets-Sheet 1



Inventor
Philip E. F. Clay,

by *G. B. Hollings*
Attorney

Nov. 5, 1940.

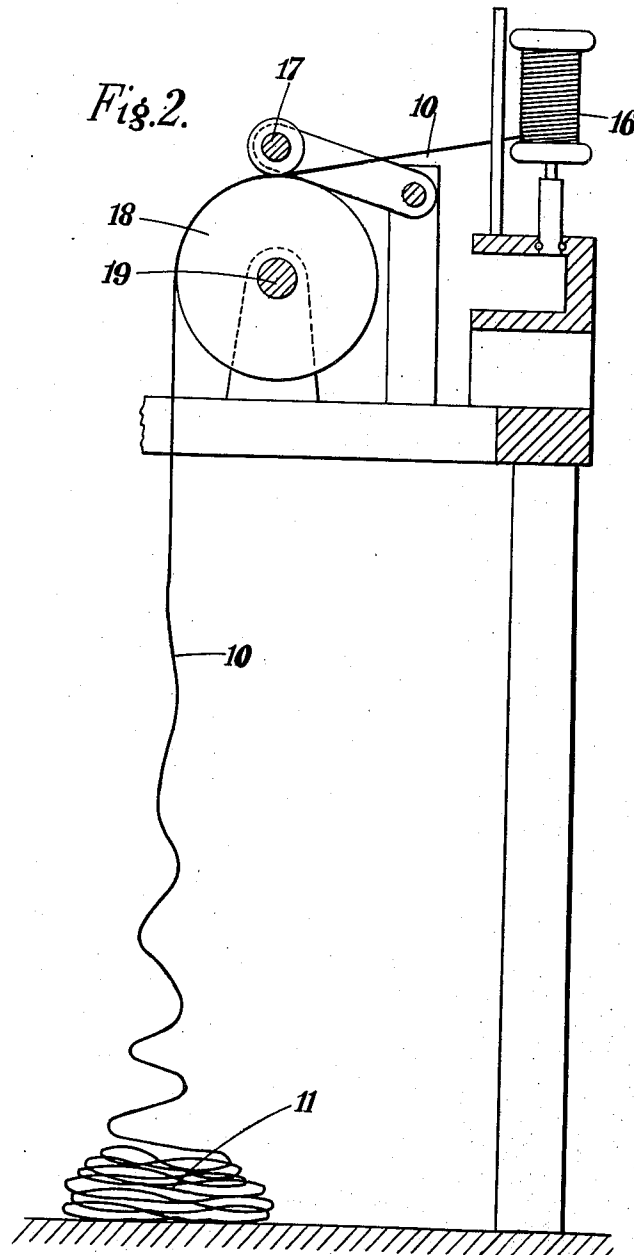
P. E. F. CLAY

2,220,213

METHOD OF PRODUCING ELASTIC THREAD

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5 Sheets-Sheet 2



Inventor
Philip E. F. Clay,

by *G. B. Collins*
Attorney

Nov. 5, 1940.

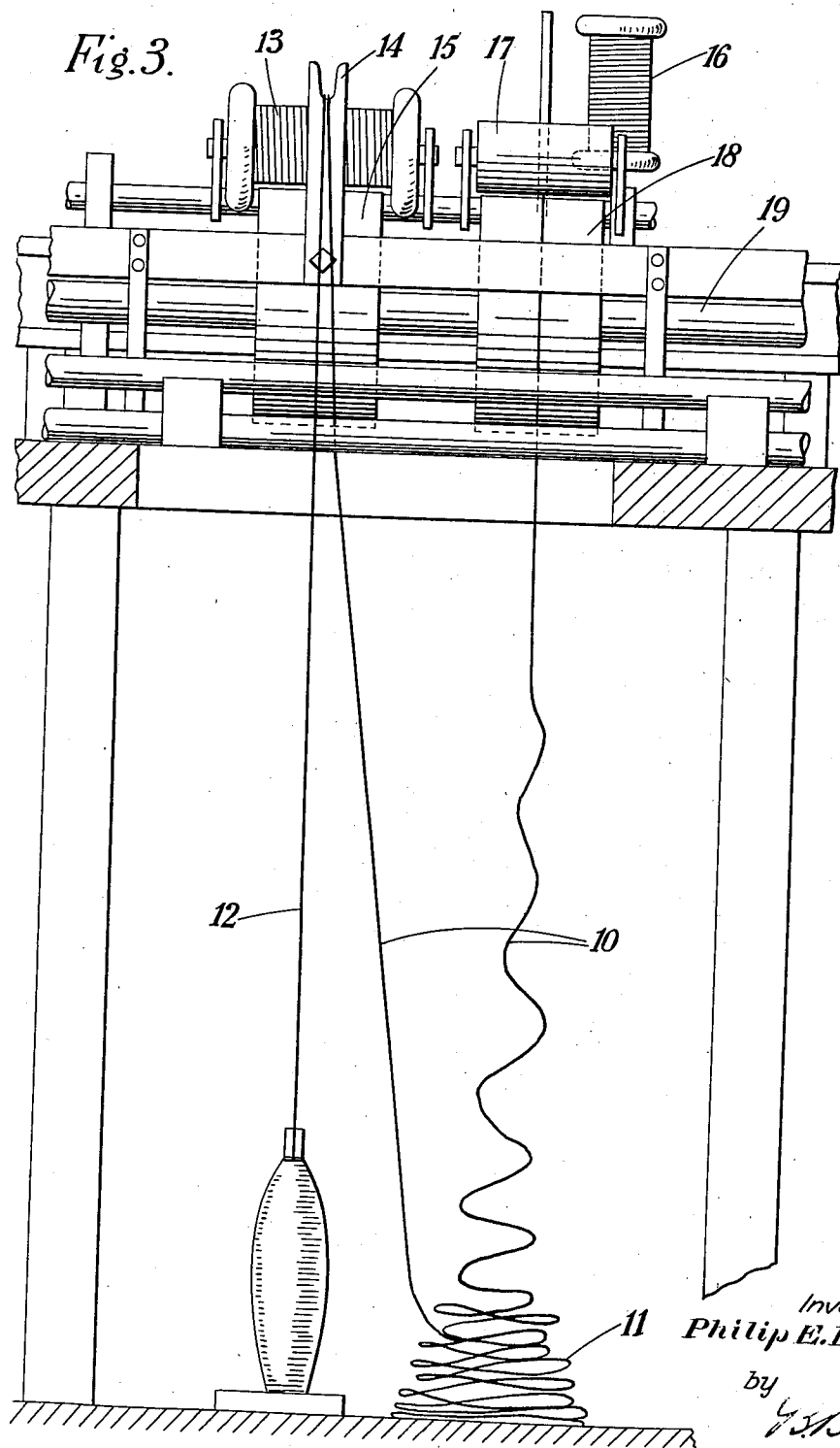
P. E. F. CLAY

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METHOD OF PRODUCING ELASTIC THREAD

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P. E. F. CLAY

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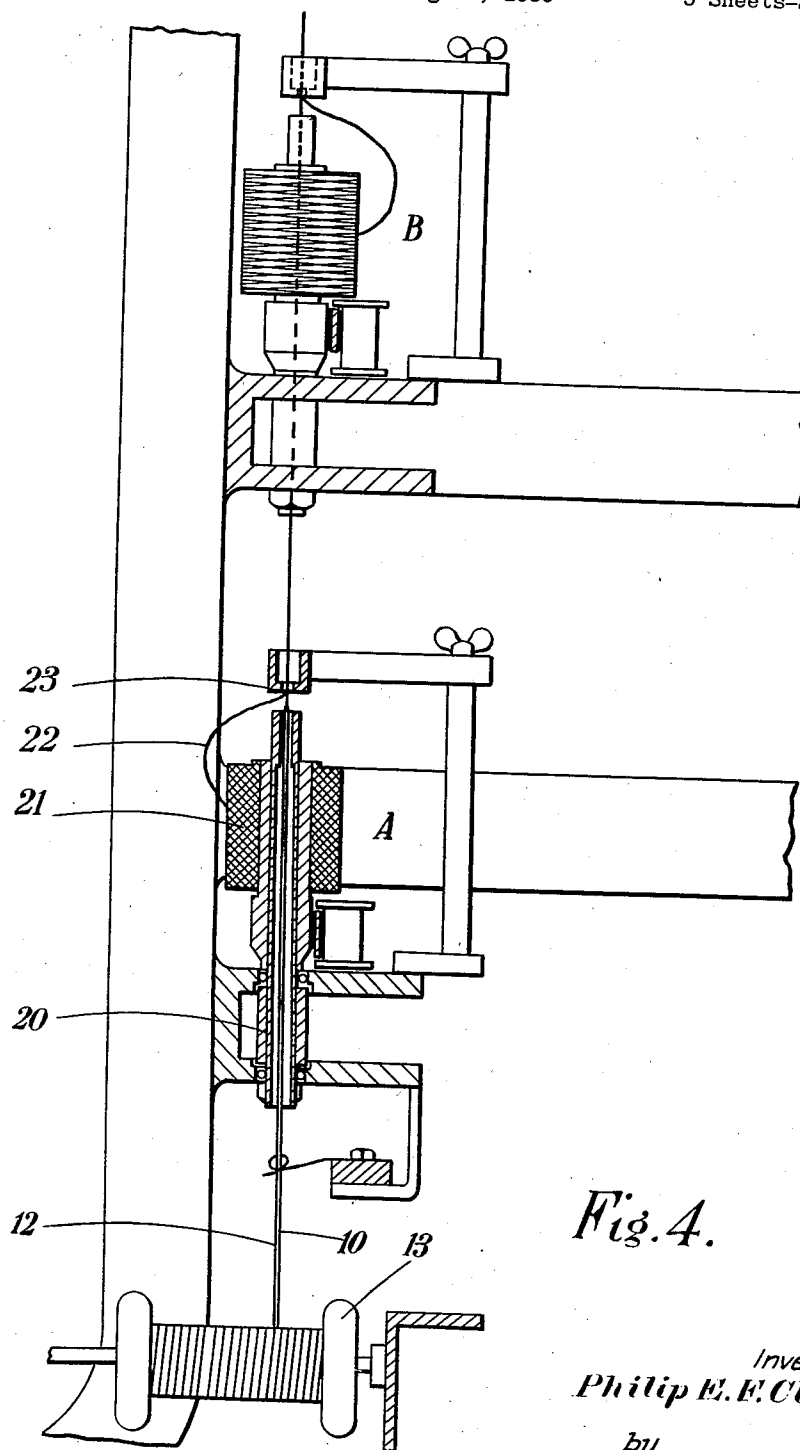


Fig. 4.

Inventor
Philip E. F. Clay,

by *W. B. Collins*
Attorney

Nov. 5, 1940.

P. E. F. CLAY

2,220,213

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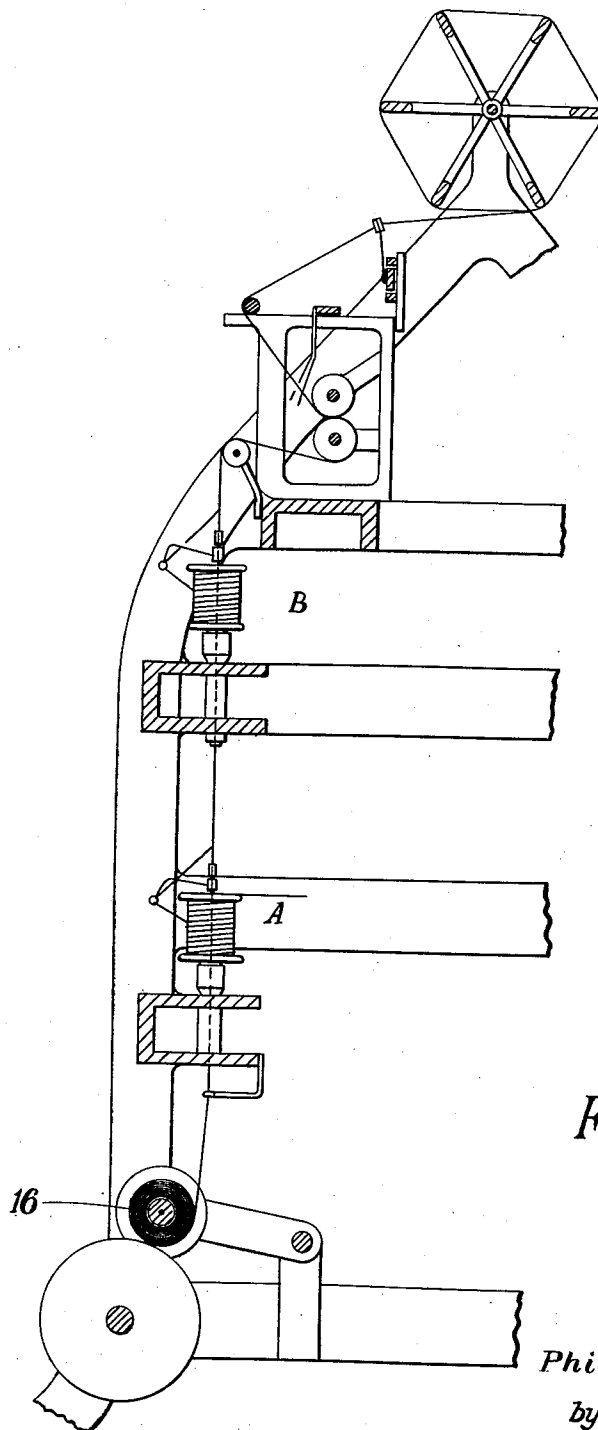


Fig. 5.

Inventor
Philip E. F. Clay,

by

B. B. Collins
Attorney

UNITED STATES PATENT OFFICE

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METHOD OF PRODUCING ELASTIC THREAD

Philip Ernest Frank Clay, Radcliffe-on-Trent,
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9 Claims. (Cl. 57—163)

This invention comprises improvements in or relating to elastic thread (including the production thereof) and fabrics embodying such thread. By "elastic thread" is meant a filament or strand of rubber, either covered or uncovered.

In order to take up the strain or tension on elastic thread, and in order to prevent undesired elongation thereof, while being wound onto a bobbin or the like and/or while being fed to a working position, such for example as a textile machine, it has been proposed to associate with said elastic thread a relatively inelastic carrier thread (i. e. a thread which prevents the elastic thread from stretching) such as a wool thread, which carrier thread is rendered inoperative after the composite thread has been incorporated in fabric (e. g. if the carrier thread is of wool, it is dissolved out). The provision of such carrier thread, however, is not in itself sufficient to eliminate certain undesirable or detrimental effects frequently produced in fabrics embodying elastic thread, particularly in woven fabrics in which all the wefts, or all the warps, or both, are constituted by elastic thread. Thus, smooth-faced fabrics such as satin-fabrics often have a definite tendency to become wrinkled, when the wool carrier thread is dissolved, instead of being perfectly flat.

Hitherto the elastic thread has been slightly extended when combined with the carrier thread (for example has been extended to a small degree by the act of combination). This extension or elongation persists until, after the composite thread has been incorporated in fabric, the carrier thread is dissolved out. Upon the removal of the carrier thread, the associated elastic thread is free to contract. Such contraction tends to be accompanied by puckering of the fabric, itself undesirable. Moreover, since the degree of firmness with which the elastic thread is gripped in the fabric may vary at different points the elastic thread may contract unevenly throughout the fabric, and therefore even if the mere fact that the elastic contracts slightly does not give the fabric an uneven surface the irregular contraction will do so. Alternatively, or in addition, an uneven surface may result from a variation in the extent to which the elastic thread is stretched or extended along the length thereof, which variation may be caused by a variation in the resistance offered to the traverse or feed of the thread to the covering position in a machine whereby a cotton or other wrapping or covering thread is

wrapped spirally around it, and/or by virtue of twist imparted to the elastic thread during the covering operation.

It will therefore be appreciated that the poor results hitherto obtained with the known composite threads can be attributed to extension or stretching of the elastic thread, and the present invention seeks to improve these results by the avoidance of this extension or stretch.

As viewed from one aspect, the present invention provides a composite thread, comprising elastic thread and a relatively inelastic carrier thread and characterised in that said elastic thread is in a fully relaxed condition. By the expression "fully relaxed condition" it is to be understood that the elastic thread is in such condition that it will not of its own volition relax or contract. As viewed from another aspect the invention provides a composite thread, comprising elastic thread and a relatively inelastic carrier thread and characterised in that the elastic thread is free from variations in the degree to which it is extended or stretched along its length.

It will be appreciated that either the elastic thread or the carrier thread, or each of them, may consist of a single strand or of a plurality of strands.

The two constituent threads (i. e. the elastic thread and the carrier thread) may be combined in various ways. They may be wrapped by at least one covering thread and so held together. They may be adhered together, either throughout their entire length or at spaced points, or they may be twisted or doubled together, and any of these three modes may be combined. According to a subsidiary feature of this invention the elastic thread is wrapped elastic thread, i. e. a rubber filament or filaments suitably wrapped, and the carrier thread is external to said wrapping. When this construction is adopted, the two constituent threads (viz: the wrapped elastic thread and the carrier thread) may be combined by any of the modes hereinbefore referred to, but prior to such combination it is preferred that the wrapped elastic thread shall be boiled.

The invention also provides a method of producing a composite thread comprising elastic thread and a relatively inelastic carrier thread, which includes the step of combining with the carrier thread an equal length of completely relaxed elastic thread. Another feature of the invention resides in a method of producing a composite thread comprising elastic thread and a

relatively inelastic carrier thread, wherein the rubber thread is wrapped with a covering thread while under little or no tension or stretch, is then subjected to heat treatment, and the wrapped thread is finally combined with the carrier thread.

In order that the invention may be better understood, reference will now be made to the accompanying drawings, in which:

Figure 1 is a sectional elevation of a portion of the apparatus employed in the exercise of this invention.

Figure 2 is a further sectional elevation thereof.

Figure 3 is a rear elevation thereof.

Figure 4 is an elevation of a further portion of apparatus, while

Figure 5 is an elevation of certain wrapping apparatus employed in one method according to the invention.

Referring now particularly to Figure 1, in one method of combining an elastic thread with a relatively inelastic carrier thread so that the two can be simultaneously worked or utilized as a single composite thread, a rubber thread 10 is taken from a loose supply (e. g. a loose coil, pile or bundle) 11 thereof offering no resistance to withdrawal, and by means of a suitable machine illustrated in Fig. 1 is wound in a completely relaxed condition with an inelastic carrier thread 12 upon a bobbin or like receiving member 13 so that the component threads 10, 12 lie side by side on the bobbin and can be simultaneously withdrawn therefrom as a composite thread; it being understood that when so withdrawn the carrier thread 12 takes the strain from the fully relaxed rubber thread 10. The composite thread so withdrawn may be combined in any desired manner, for example by being doubled in a doubling machine of any known construction.

Figures 1 and 3 show the relevant parts of the apparatus. This apparatus does not need detailed description, but it may be mentioned that in their passage to the bobbin 13 the two constituent threads pass through a guide 14 which is suitably traversed to and fro. The bobbin 13 is preferably driven by a drum 15 on a shaft 19, which drum is in surface contact with the bobbin so that the linear speed of take-up is constant.

One machine may be employed to wind a plurality of bobbins such as 13, and the same machine may simultaneously be employed to unwind the elastic thread 10 from a bobbin into the loose pile 11. This is illustrated in Figure 2. In this figure the bobbin containing the initial supply of elastic thread is indicated in 16. From this bobbin the said thread 10 is withdrawn through the nip between a roller 17 and a driving drum 18 (which drum is advantageously fixed to the aforesaid shaft 19). Thence it descends to the floor or other support and forms the loose pile or coil 11. While said coil or pile is fed as indicated in Figure 2, elastic may simultaneously be abstracted as indicated in Figure 1.

The combined rubber and carrier threads may be covered by spirally winding therearound cotton or the like, the covering thread or threads being carried from a supply to a covering position in any convenient manner.

According to one method (Figure 4) of applying a surrounding covering or wrapping to the combined rubber and relatively inelastic carrier threads, said two threads (rubber and carrier) are withdrawn from the bobbin 13 upon which same are wound side by side and are passed, at

a first wrapping station A, through a vertically disposed tube 20 or the like about the axis of which the supply or supplies 21 of covering or wrapping thread 22 is/are adapted to rotate. Advantageously rotation is imparted to the tube 20 as well as to the supply or supplies 21 of covering thread, and the covering thread 22 is wrapped spirally about the combined rubber and carrier thread at a position immediately beneath a fixed eye or guide 23, the covered composite thread being drawn upwardly by suitable means through said eye 23. Preferably the covering is fed or guided to the covering point within a restricted space between the upper end of the aforesaid vertical tube 20 and the underside of a plate or member furnished with the aforesaid eye 23, and the simultaneous rotation of the covering thread supply or supplies 21 and the tube 20 results in the covering thread 22 being applied without imparting twist to the combined rubber and carrier thread constituting the core. Any suitable means may be provided for preventing or restraining ballooning of the covering thread extending to the covering position. For example, the guiding aperture through which the core with covering thread is drawn and adjacent to which the covering is effected, may be provided in the top of a hollow member of substantially bell shape suitably supported and extending down over the aforesaid vertically disposed tube and supply bobbins. Alternatively, one or more suitably located arms or fingers may be provided for preventing ballooning.

A plurality of covering operations may be simultaneously effected, in which case a plurality of rotary bobbins carrying the covering thread may be spaced side by side with their axes parallel and simultaneously rotated by means such as a frictional driving band. Also if desired a plurality of covering threads may be applied to the same core at different positions in its length, in which case one or more threads is/are wrapped in one direction and one or more other threads in an opposite direction.

This is illustrated in Figure 4, in which figure two wrapping stations or positions A and B are shown. The mechanism at the position A has already been described, and that at the upper wrapping position B is similar to it in all material respects. Desirably, however, the two wrapping devices are rotated in opposite directions and the top one may rotate more slowly than the bottom one, for example at three-quarters the speed thereof. This insures that the pitch of the outer wrapping applied at the station B is greater than the pitch of the inner wrapping applied at the station A.

Upon leaving the wrapping device at station B the wrapped composite thread is wound under no tension on to a suitable bobbin or the like.

Instead of applying the covering thread or threads to the combined rubber and carrier thread as above, the rubber may be covered or wrapped previous to combining same with the inelastic carrier thread, in which case the covered rubber thread is so produced or treated as to remove crinkles or kinks therefrom and fix same in a fully relaxed condition, i. e. in a condition beyond which same will not of its own volition relax further, irrespective of any tension that may have been applied to the rubber during the wrapping thereof. For example, two covering threads may be spirally wrapped about the rubber thread in succession, in opposite directions,

the second wrapping being if desired more closely applied than the first and functioning to remove or assist in removing kinks or wrinkles formed in the rubber between the turns of the first wrapping and nullify or substantially nullify the twist produced in said rubber at said first wrapping operation; the thread so covered being heat-treated such as by boiling or by applying steam heat for a sufficient period, say for example half an hour, so as to fix same against further relaxation of its own volition irrespective of any stretch or elongation that may have been applied to the rubber during the covering operation.

This method of covering the thread is illustrated in Figure 5. The elastic thread is taken from a supply bobbin 16 and is passed through a wrapping device at a wrapping station A. It will be noted that this device may incorporate a flyer, but as said device is otherwise substantially identical with the devices illustrated in Figure 4, no further description thereof is necessary. If a second wrapping is desired, the wrapped thread is passed through a second wrapping device at an upper station B; thence it passes to winding-up mechanism which in the construction illustrated comprises a hank winder. The hanks of wrapped elastic thread are then boiled, steam heated or otherwise heat treated, fully to relax them.

The fully relaxed covered elastic is then combined with a wool or like inelastic carrier thread whilst maintaining the elastic thread in the fully relaxed condition. This may be effected by first forming a loose pile of the elastic thread in the fully relaxed condition as already described with reference to Figure 2. The elastic thread is then withdrawn from this loose pile in a fully relaxed condition, and wound side by side on to a carrier with the inelastic carrier thread which is withdrawn simultaneously from a source of supply, the elastic thread being maintained in a fully relaxed condition as previously described with reference to Figure 1. The two threads may then be combined by withdrawing them as one composite thread and doubling them together in a doubling machine of any known construction.

If desired, instead of doubling the two threads together, the carrier thread may, as before stated, be combined with rubber thread to form a composite thread by integrally connecting or positively adhering one thread to the other. This composite thread may be produced by connecting the relatively inelastic thread to the rubber at intervals in its length, or said inelastic thread may be adhered to the rubber along its entire length. For example, the adherence of the two threads may be effected by partially fusing the rubber or rendering same tacky so that the wool or like inelastic thread becomes adhered thereto, and this can be accomplished by the action of a suitable rubber solvent or otherwise.

The positively adhered or integrally connected rubber and carrier threads may have one or more spiral wrappings of cotton or other covering material applied thereto.

This invention also includes fabric incorporating elastic thread according to this invention, the carrier thread having been rendered inoperative. The invention further includes a method of producing fabric wherein there is fed, to a fabricating position at which they are incorporated as one in the fabric under manufacture, a completely relaxed elastic thread and an equal

length of inelastic carrier thread, and wherein subsequent to the said incorporation the carrier thread is rendered inoperative to restrain extension of the elastic thread. The carried thread is preferably of a nature different from any other textile thread incorporated in the fabric (i. e. the covering thread and/or textile thread forming part of the structure of the fabric) such that it may be dissolved out of the fabric without injuring said other textile thread, but the carrier thread may be rendered inoperative by breaking it at appropriate intervals.

I claim:

1. A method of producing composite thread, comprising elastic thread and a relatively inelastic thread, which comprises wrapping the elastic thread in a relaxed condition, subjecting the wrapped thread to heat treatment to relax it fully, and combining said relaxed wrapped elastic thread in an untensioned condition with an equal length of carrier thread.

2. A method of producing a composite thread comprising an elastic thread and a relatively inelastic carrier thread, which consists in forming a loose pile of said elastic thread in a relaxed condition, withdrawing said thread from said pile, simultaneously withdrawing the carrier thread from a source of supply, winding both of said threads side by side on to a carrier, and in doubling the elastic thread with the inelastic carrier thread, the elastic thread being maintained in a relaxed condition throughout all the operations.

3. A method of producing a composite thread comprising elastic thread and a relatively inelastic carrier thread, which consists in forming a loose pile of said elastic thread in a relaxed condition, withdrawing said thread from said pile under substantially no tension, simultaneously withdrawing the carrier thread from a source of supply, winding said carrier thread and said elastic thread side by side on to a carrier, doubling the elastic thread with the inelastic carrier thread, and in covering the thus formed doubled thread with a covering material, the elastic thread being maintained in a relaxed condition throughout all the operations.

4. A method of producing a composite thread comprising an elastic thread and a relatively inelastic carrier thread, which consists in withdrawing the elastic thread from a source of supply, covering said thread with a covering material, heat treating said covered thread to relax the covered thread fully, forming a loose pile of said fully relaxed covered thread, withdrawing said thread from said loose pile in a fully relaxed condition, simultaneously withdrawing the inelastic carrier thread from a source of supply, winding said threads side by side onto a carrier whilst maintaining said elastic thread in a fully relaxed condition, and in doubling said elastic thread together with the inelastic carrier thread whilst maintaining the elastic thread in a fully relaxed condition.

5. In the manufacture of fabric having an elastic thread, a method of supplying the elastic thread in a completely relaxed condition to a fabricating position, which method consists in withdrawing the rubber thread from a loose supply thereof in a completely relaxed condition, simultaneously withdrawing an inelastic carrier thread from a supply, winding the elastic thread in a completely relaxed condition simultaneously with the inelastic carrier thread upon a receiver

ing member, withdrawing the composite thread so formed from the receiving member, wrapping at least the elastic material with a covering material, and in subsequently rendering the carrier thread inoperative to restrain extension of the elastic thread.

6. In the manufacture of fabric having an elastic thread, a method of supplying the elastic thread in a completely relaxed condition to a fabricating position, which method consists in withdrawing the rubber thread from a loose supply thereof in a completely relaxed condition, simultaneously withdrawing an inelastic thread from a source of supply, doubling said elastic thread with said inelastic thread, working said inelastic thread and elastic thread as a single composite thread, the said inelastic thread restraining extension of said elastic thread, and in subsequently rendering said inelastic thread inoperative to restrain extension of said elastic thread.

7. A method of producing a composite thread comprising an elastic thread and a relatively inelastic carrier thread, in which the elastic thread is substantially fully relaxed and within a given length of the composite thread has the same length as the accompanying carrier thread, which comprises providing a loose supply of the elastic thread wherein said thread lies in a fully relaxed condition, withdrawing the elastic thread therefrom and, without imparting any appreciable tension to it, winding it with an equal length

of carrier thread upon a carrier by rotation of the latter.

8. A method of making a composite thread comprising an elastic thread and an inelastic carrier thread and wherein the elastic thread is in a substantially relaxed condition, which method comprises establishing a supply of elastic thread consisting of a loose pile of such thread in a state of complete relaxation, and a supply of carrier thread, withdrawing the two threads simultaneously from their respective supplies while maintaining the elastic thread substantially in its fully relaxed condition, winding them side by side into a rotating holder, and subsequently withdrawing the two threads as one from said holder and combining them.

9. A method of making a composite thread comprising an elastic thread and an inelastic carrier thread and wherein the elastic thread is in a substantially relaxed condition, which method comprises establishing a supply of elastic thread consisting of a loose pile of such thread in a state of complete relaxation, and a supply of carrier thread, withdrawing the two threads simultaneously from their respective supplies while maintaining the elastic thread substantially in its fully relaxed condition, winding them side by side into a rotating holder, and subsequently withdrawing the two threads as one from said holder and securing them to each other along their length.

PHILIP ERNEST FRANK CLAY.