Nov. 17, 1970 TOMIO TANAKA ET AL 3,540,204

METHOD FOR MANUFACTURING AN IMPROVED ELASTIC YARN COVERED WITH MULTIFILAMENT

Filed April 16, 1968 3 Sheets-Sheet 1

Fig. 1

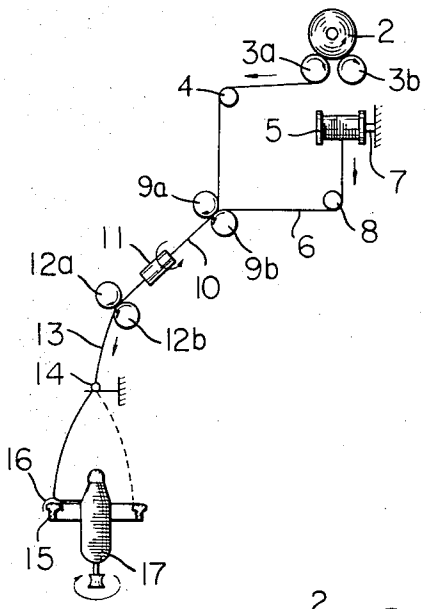


Fig. 3

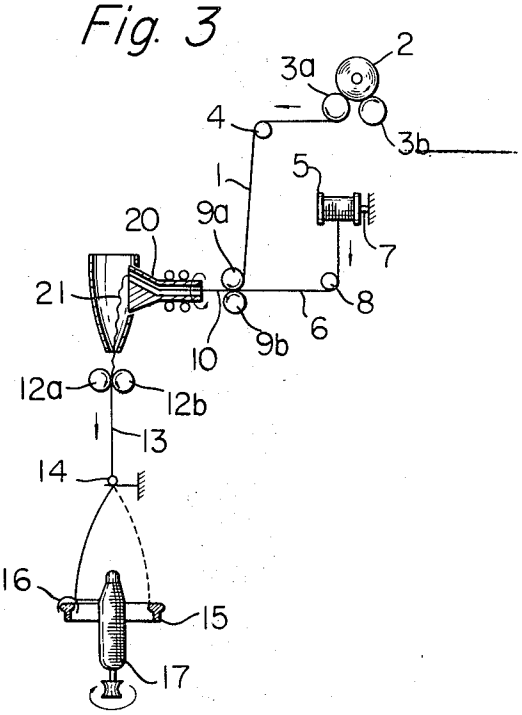


Fig. 2

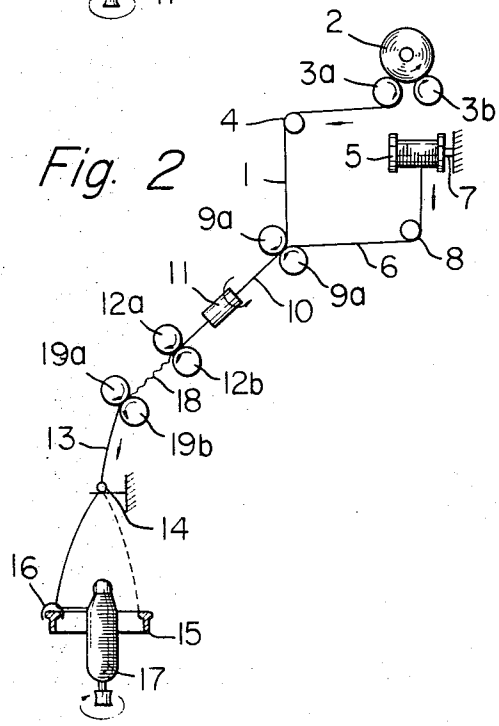
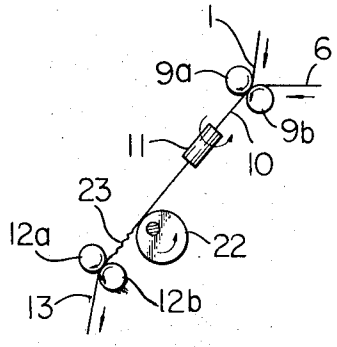


Fig. 4



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METHOD FOR MANUFACTURING AN IMPROVED ELASTIC YARN COVERED WITH MULTIFILAMENT
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Fig. 5

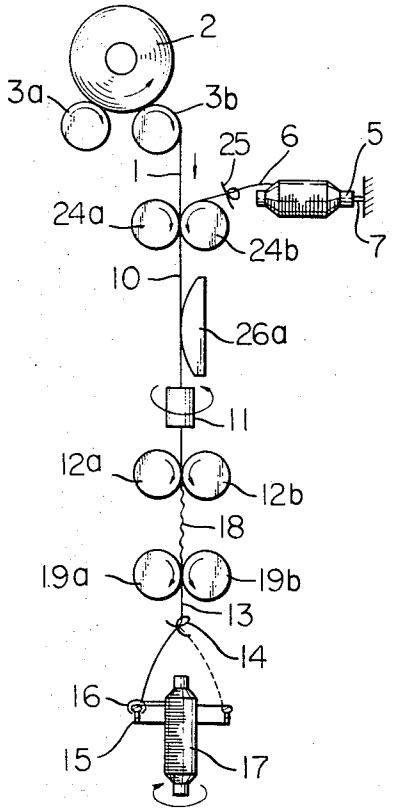
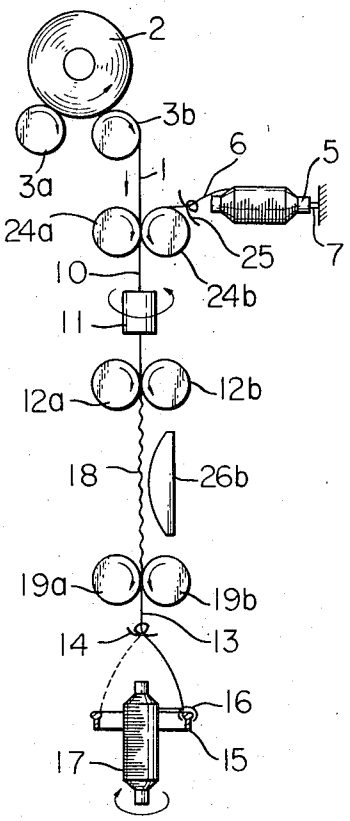


Fig. 6



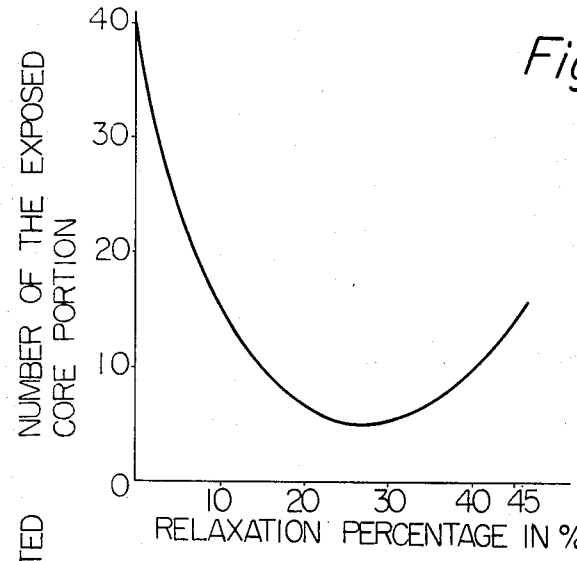


Fig. 7

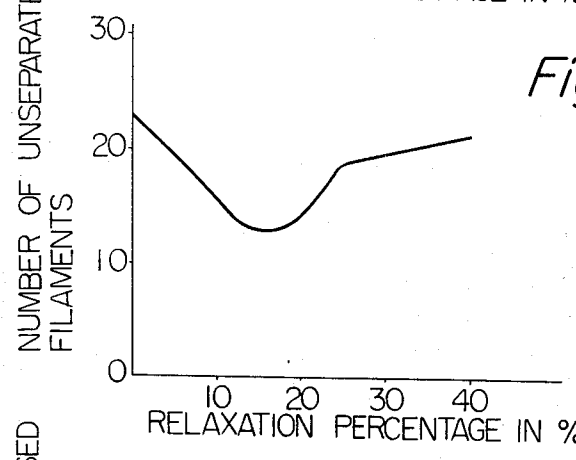


Fig. 8

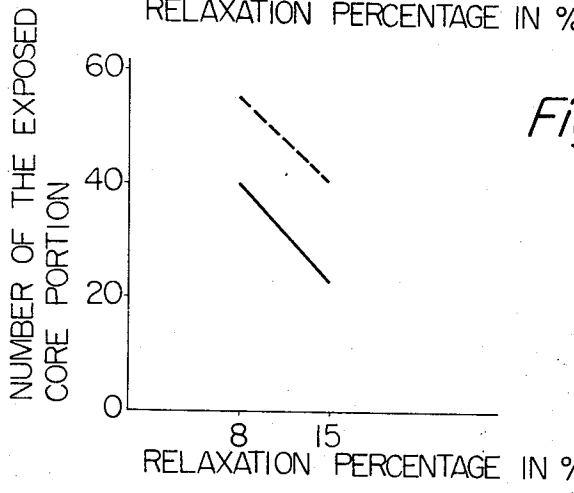


Fig. 9

United States Patent Office 3,540,204 Patented Nov. 17, 1970

3,540,204

METHOD FOR MANUFACTURING AN IMPROVED ELASTIC YARN COVERED WITH MULTIFILAMENT

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Claims priority, application Japan, Apr. 18, 1967, 42/24,264; Apr. 24, 1967, 42/25,817; June 2, 1967, 42/34,982
Int. Cl. B65h 81/06; D02g 3/36
U.S. Cl. 57—163 13 Claims

ABSTRACT OF THE DISCLOSURE

A method is disclosed for manufacturing an improved elastic yarn having an elastic core component and a multifilamentary component surrounding the elastic component characterized by the step of placing the yarn in a relaxed condition while passing the yarn through a false-twisting operation. A heat setting operation may advantageously be applied to the processing yarn during the false-twisting operation along with the relaxation.

The present invention relates to a method for manufacturing an improved elastic yarn covered with a multifilament sheath, and more particularly relates to a method for manufacturing an improved elastic yarn covered with multifilament provided with a novel configuration composed of an elastic core yarn and a non-elastic man-made multifilament covering the core yarn as a sheath.

The term "elastic yarn" as used herein refers to a yarn having high elastic property such as a rubber yarn or a polyurethane yarn.

On the other hand, the term "non-elastic yarn or multifilament yarn" as used herein refers to an ordinary yarn such as a spun or multifilament yarn but not including the so-called textured yarns, such as stretch yarn, called Helanca, etc. in the market.

The term "elastic covered yarn" as used herein refers to an elastic yarn covered with non-elastic multifilament yarn.

The conventional methods for manufacturing elastic covered yarn are classified into three groups, i.e., the single covering method, the double covering method, and the twisting method after doubling. In the single covering method, an elastic yarn is used as a core component while the non-elastic multifilament is used as a sheath component covering the core component. The method of covering the yarn produced by the single covering method by another non-elastic multifilament is called the double covering method.

Generally, in the conventional elastic covered yarn covered with a multifilament, it is well known that the individual filaments of the multifilament bundle together and consequently, the configuration of the yarn will be that of a yarn composed of a core yarn with strings of the multifilament spirally surrounding the core yarn. In the conventional elastic covered yarn covered with a plurality of multifilaments, such a configuration of the yarn can be readily observed.

These conventional methods for manufacturing elastic covered yarn have several drawbacks. In the case of either the single or double covered yarns, the multifilament used as the sheath component have a poor elastic property and have a tendency for forming many looped projections beyond the surface of the yarn when

the manufactured elastic covered yarn is relaxed. As is well-known, the surface condition or the apparent effect of the textile products made from such yarns having many looped projections are remarkably deteriorated. The drawbacks thus caused by the formation of loops of multifilaments in the sheath component can be effectively eliminated by increasing twist number or the number of twists imparted to the manufactured yarn, that is, the number of windings of the sheath components around the core component. But such an increase in the number of twists or winding is generally accompanied by a reduction in the production efficiency. Moreover, too much twisting often results in lowered elastic property of the manufactured yarn or troubles occur in the manufacturing process caused by so-called snarling of the yarn.

It is also well-known to use crimped yarn as the sheath component of a covering yarn. However, in this case, the surface of the yarn is provided with numerous fine crimps resulting in a roughened appearance of the yarn. Furthermore, this method is accompanied with high production cost and low productivity due to the fact that the manufacturing process is divided into two stages, crimping and covering of the yarn.

The object of the present invention is to eliminate the above-mentioned drawbacks of the elastic covered yarn produced by the conventional methods and the principal object of the present invention is to provide a novel method for manufacturing an improved elastic covered yarn provided with a core component sufficiently and uniformly covered by a sheath component of multifilament.

Another object of the present invention is to provide a method for manufacturing an improved elastic covered yarn having a smooth surface and an excellent elastic property at a high production efficiency and low production cost.

A further object of the present invention is to provide a method for manufacturing improved elastic covered yarn which can provide the textile products made of the yarn with favorable hand feeling and unique surface effect.

In order to attain the above-listed objects, the art of the present invention is carried out in combination with a so-called false-twisting operation. An elastic yarn component is surrounded by a multifilamentary bundle of fibers in such a manner that the latter completely embrace the formed and the thusly consolidated yarn mass is then passed through a false-twisting operation accompanied by a suitable relaxation treatment which is inserted into the process at a suitable stage of the false-twisting operation. Concurrently or in succession with this insertion of relaxation, a suitable thermal treatment can advantageously be inserted into the false-twisting operation.

Further features and advantages of the present invention will be apparent from the ensuing description with reference to the accompanying drawings to which, however the scope of the invention is no way limited.

FIG. 1 is a diagrammatic sketch of an embodiment of the method for manufacturing an improved elastic covered yarn according to the present invention,

FIG. 2 is a diagrammatic sketch of another embodiment of the method for manufacturing an improved elastic covered yarn of the present invention,

FIGS. 3 and 4 are diagrammatic sketches of modified embodiments of the method shown in FIG. 2,

FIG. 5 is a diagrammatic sketch of another embodiment of the method in which heat set treatment is applied for manufacturing an improved elastic covered yarn of the invention,

FIG. 6 is a diagrammatic sketch of a modified embodiment of the method shown in FIG. 5,

FIG. 7 is a graphical representation showing the relation between the relaxation percentage and the number of exposed core portions,

FIG. 8 is a graphical representation showing the relation between the relaxation percentage and the number of unseparated filaments contained in the sheath portion of the elastic core yarn of the present invention,

FIG. 9 is a graphical representation showing the difference of the covering effect of yarns manufactured by different methods.

In order to attain the above-described objects of the invention, it is essential to use a multifilament yarn composed of a plurality of individual filaments separated from each other as the sheath component of the elastic covered yarn. The separation of the individual filaments of the multifilament must be particularly maintained when the elastic core yarn is being covered by the multifilament.

As the result of our research work, it was disclosed that the above-mentioned desirable condition can be obtained by a process which comprises doubling an elastic yarn in a stretched condition together with a multifilament yarn, next primary twisting the doubled yarn, untwisting the primary twisted doubled yarn, subjecting the untwisted, doubled yarn to a suitable relaxation treatment, and next twisting the untwisted doubled yarn under a stretched condition just after untwisting. Further it was disclosed that a more effective separation of the individual filament can be obtained by applying heat set treatment to the doubled yarn during the primary twisting or to the untwisted doubled yarn before the covering operation of the multifilament yarn around the elastic core yarn. Consequently, an elastic covered yarn having an excellent quality can be produced by adding the above-mentioned heat set treatment.

As described above, the principle of the methods for manufacturing the elastic covered yarn of the present invention is an application of the separation of individual filaments positioned in the sheath portion of the multifilament caused by relative displacement of individual filaments due to the strain of the individual filaments which occurs during the manufacturing process. This separated condition of individual filaments can be maintained even during the covering operation by any one of the following methods;

(1) Completing the covering operation before sufficient recovery of the strain of the individual filaments.

(2) Promoting positively the separation of the individual filaments in a relaxed condition after untwisting.

(3) Heat setting the strained configuration of the individual filaments before the start of the recovery.

(4) Application of the foregoing method combined with relaxation just after untwisting.

Relaxation of the yarn just after untwisting plays an important role in the manufacture of the elastic covered yarn because of the fact that, by putting individual filaments in a relaxed condition just after untwisting, the individual filaments are positioned in the sheath portion of the yarn in a sufficiently separated condition.

In the case when thermoplastic synthetic filaments are used as the sheath component of the yarn, heat treatment of the yarn effectively promotes the separation of the individual filaments in the sheath portion of the yarn and realizes uniform thermal shrinkage of the filaments in the sheath portion winding around the core elastic yarn. Consequently, an elastic covered yarn obtained is provided with a uniform and smooth surface condition.

It was also disclosed by our experimental testing that the final twisting operation of the multifilament yarn with the elastic core yarn under tension is effective for obtaining a uniform covering of the individual filaments of the multifilament yarn around the elastic core yarn

which is caused by sufficient interaction among them during the twisting operation.

The above-mentioned processes for separation of the individual filaments of the multifilament yarn can be performed in one process by utilizing the so-called false twist spindle, or in two processes by utilizing the Italian throwing machine. The former process is more desirable than the latter because continuous manufacturing the elastic covered yarn can be attained at a lower cost.

The elastic yarn for the core component of the elastic covered yarn of the invention may be polyurethane yarn or rubber yarn and regenerated multifilament, such as rayon or acetate multifilament, thermoplastic synthetic multifilament such as polyamide, polyester, polypropylene, polyacrylonitrile or synthetic composite multifilament having a dimensional shrinkable property can be effectively used as the multifilament for forming the sheath component of the elastic covered yarn.

Next, some typical embodiments of the manufacturing method according to the present invention are described.

In the embodiment of the manufacturing method shown in FIG. 1, the doubling, primary twisting, untwisting, and secondary twisting operations are operated continuously as a single continuous process. That is, in FIG. 1, a package **2** of an elastic yarn **1** is rotated in a feeding direction by a pair of rotatably mounted support rollers **3***a*, **3***b*, on which the package **2** is supported. The elastic yarn **1** is stretched in a stretch zone between a guide roller **4** and a pair of feed rollers **9***a*, **9***b*. Then the stretched yarn is doubled with a multifilament **6** supplied to the feed rollers **9***a*, **9***b* by way of a guide roller **8** from a package **5** rotatably supported by a creel **7**. The doubled yarn **10** is twisted in a twisting zone between the feed rollers **9***a*, **9***b* and a false-twist spindle **11** and untwisted in a zone between the false-twist spindle **11** and a pair of delivery rollers **12***a*, **12***b*. During the above-described travel, the doubled yarn **10** is subjected to a continuous and uniform relaxation within a zone between the rollers **9***a*, **9***b* and **12***a*, **12***b*. The untwisted and relaxed doubled yarn **13** is again provided with twist while passing through a snail wire **14** and a traveller **16** running on a ring **15** and the elastic covered yarn thusly produced is taken up by a bobbin **17**. To obtain an excellent covering effect by the multifilament, the relative rotational speed of the feed rollers **9***a*, **9***b* with respect to the delivery rollers **12***a*, **12***b* is very important and it is necessary to rotate the feed rollers **9***a*, **9***b* at the same speed or at a higher surface speed than that of the delivery rollers **12***a*, **12***b*. As mentioned above, the strain on the individual fibers caused by the primary twisting operation is not completely relieved at the termination of the untwisting operation, and the partially strained multifilament yarn of the untwisted doubled yarn **13** is supplied to the secondary twisting zone in such a manner that the separated condition of the individual filaments is maintained. The secondary twisting operation of the untwisted doubled yarn is carried out by the ring twisting method. Consequently, the elastic covered yarn composed of the elastic yarn as the core component and the multifilament yarn as the sheath component uniformly surrounding the core component is continuously produced.

In the above-mentioned process, it is preferable to provide the doubled yarn with a fairly large twist number during the primary twisting operation for obtaining sufficient separation of the individual fibers of the multifilament, thereby remarkably improving the covering faculty of the multifilament. However, almost a similar number of twist as that applied during manufacturing of the false twisted elastic yarn may be applied for the present invention and a Z-twist or S-twist can be applied for practicing the present invention.

EXAMPLE 1

A polyurethane elastic yarn of 70 denier was doubled together with a nylon multifilament yarn having total

it is necessary to carefully consider the condition of the heat set as this is important. The condition of the heat set treatment must be chosen in accordance with the thermal property of the elastic yarn. The effective heating temperature should be lower than 200° C., or more preferably in a range between 80 and 180° C., to prevent degradation of the elastic property of the elastic covered yarn. An effective heating temperature exceeding 200° C. often causes extensive deterioration of the elastic property of the yarn particularly polyurethane yarn is used as the elastic core yarn.

The time of the set should be slightly longer than that of the non-elastic yarn, or preferably in a range between 0.3 and 5 seconds.

The over-feed ratio of the rollers **24***a*, **24***b* with respect to the rollers **12***a*, **12***b* in the false twisting zone depends on the material of the yarns and temperature of the heat setting operation, and it is preferable to choose an over-feed ratio in a range from 0.9 to 1.3. The relaxation ratio in the zone between the rollers **12***a*, **12***b* and the rollers **19***a*, **19***b* is preferably chosen in a range from 5 to 45%. Further, when the heat set operation is performed during the relaxation treatment, the above-described conditions can satisfactorily be applied.

In the above-mentioned embodiments shown in FIGS. 5 and 6, the elastic covered yarn is produced by one continuous process, however, the primary twisting, untwisting, or the secondary twisting, heat set treatment, untwisting and relaxation treatment and the secondary twisting can be carried out separately or some of the above-mentioned operations may be combined and a similar type of elastic covered yarn can also be produced.

EXAMPLE 3

A polyurethane elastic multifilament yarn of 70 denier was doubled together with a nylon multifilament yarn of 70 denier by the process shown in FIG. 5. The polyurethane multifilament yarn was stretched at a stretching ratio of 3.5 between the supply roller **3***b* and the feed rollers **24***a*, **24***b*. 400 turns/meter of S-twist was imparted into the doubled yarn using a false-twist spindle **11** while heating it at the effective temperature of 140° C. after which the yarn was relaxed for about 10%. After the relaxation, 900 turns/meter of Z-twist was finally imparted to the yarn under a stretched condition. The elastic covered yarn thus obtained was provided with a uniformly and sufficiently covered surface, high bulkiness and unique hand feeling.

Referring to FIGS. 7, 8 and 9, the relation between the degree of relaxation and the degree of covering effect in the configuration of the elastic covered yarn of the present invention is graphically shown. In these drawings, the degree of relaxation is represented by the relaxation percentage which has already been defined in the foregoing description while the degree of covering effect is represented by the number of portions of the core elastic yarn exposed from the surface of the elastic covered yarn (hereinafter called as "exposed core portions") or the number of unseparated filaments in the sheath portion of the yarn.

The relation between the relaxation percentage and the number of the exposed core portion is shown in FIG. 7, wherein the former is taken on the abscissa while the latter is taken on the ordinate. Measurement of the exposed core portions was carried out upon a woven cloth wherein the elastic covered yarn of the present invention was used as the filling yarn. As is apparently understood from the results shown in the drawing, the best covering effect can be obtained at a relaxation percentage of about 25%, and the optimum relaxation percentage ranges between 5 and 45%.

Referring to FIG. 8, the relation between the relaxation percentage and the number of unseparated filaments in the sheath portion of the yarn measured by stretching the elastic covered yarn of the present invention at a stretching ratio of 70% is shown. In the drawing, the former is taken on the abscissa while the latter is taken on the ordinate. It will be understood that too much unseparated filaments in the sheath portion results in a poor covering effect of the yarn.

In FIG. 9, the difference of the covering effects of yarns manufactured in different manners are shown. In the drawing, the relaxation percentage is taken on the abscissa while the number of the exposed core portions is taken on the ordinate, the curve designated by the full line corresponds to the elastic covered yarn manufactured by false twisting, relaxing and twisting while the curve designated by the dotted line corresponds to the elastic covered yarn manufactured by false twisting, relaxing, twisting, taking up once onto a package and twisting again. As is apparently shown in the drawing, the elastic covered yarn manufactured by the former method yields better covering effect.

While the invention has been described in conjunction with certain embodiment thereof, it is to be understood that various modifications and changes may be made without departing from the spirit and scope of the invention.

What is claimed is:

1. A method for manufacturing an improved elastic yarn having a core of elastic yarn surrounded by a sheath composed of individual filaments comprising: providing an elastic yarn and a bundle of individual filaments; doubling said elastic yarn together with said bundle of individual filaments while maintaining said elastic yarn in a stretched condition; primary twisting said doubled yarn; untwisting said primary twisted yarn; secondary twisting said untwisted doubled yarn in a stretched condition just after untwisting; and providing relaxation to said doubled yarn between said primary twisting and secondary twisting operations.

2. A method for manufacturing an improved elastic yarn according to claim **1**, wherein said relaxation treatment of said doubled yarn is carried out during said untwisting operation.

3. A method for manufacturing an improved elastic yarn according to claim **1**, wherein said relaxation treatment of said doubled yarn is carried out after said untwisting operation.

4. A method for manufacturing an improved elastic yarn according to claim **3**, wherein said relaxation treatment of said doubled yarn is continuously carried out at a uniform condition of relaxation.

5. A method for manufacturing an improved elastic yarn according to claim **3**, wherein said relaxation treatment of said doubled yarn is periodically carried out.

6. A method for manufacturing an improved elastic yarn having a core of elastic yarn surrounded by a sheath composed of individual filaments comprising: providing an elastic yarn and a bundle of individual filaments; doubling said elastic yarn together with said bundle of individual filaments while maintaining said elastic yarn in a stretched condition; primary twisting said doubled yarn; untwsting said primary twisted yarn while subjecting said doubled yarn to a heat set treatment; applying relaxation to said untwisted doubled yarn just after untwisting; secondary twisting said relaxed doubled yarn in a stretched condition.

7. A method for manufacturing an improved elastic yarn according to claim **6**, wherein said primary twisting operation is performed while maintaining said doubled yarn in a stretched condition.

8. A method for manufacturing an improved elastic yarn according to claim **6**, wherein said primary twisting operation is performed while maintaining said doubled yarn in a relaxed condition.

9. A method for manufacturing an improved elastic yarn according to claim **6**, wherein the relaxation percentage of said untwisted doubled yarn is maintained within

denier of 140 denier by the method described above and 2,000 turns/meter of Z-twist was imparted to the yarn by the false-twist spindle, and 400 turns/meter of S-post twist was imparted to the yarn simultaneously with the untwisting operation. The elastic covered yarn thus manufactured was provided with a uniformly and sufficiently covered surface and also with excellent elastic property.

In the second embodiment shown in FIG. 2, the doubled yarn of the elastic yarn and multifilament yarn, which has already gone through the twisting and untwisting operations as aforementioned with respect to FIG. 1, is supplied to a relaxation zone for a relaxation treatment so as to enhance the separation of the individual filaments of the multifilament yarn and, with the exception of the above-mentioned relaxation treatment, the processes of the manufacturing method are the same as those of the first embodiment. The relaxation treatment is carried out in the relaxation zone which comprises a pair of rollers **12***a*, **12***b* and a pair of delivery rollers **19***a*, **19***b* rotating at a slower surface speed than that of the rollers **12***a*, **12***b*. The doubled yarn delivered from the relaxation zone is continuously provided with twist by the same method as in the first embodiment shown in FIG. 1 to produce the elastic covered yarn. During the relaxation treatment of the untwisted doubled yarn, the elastic yarn is maintained in a stretched condition while the individual filaments of the relaxed multifilament maintain their own form. Consequently a more effective separation of the individual fibers can be obtained as compared with the results obtained in the first embodiment shown in FIG. 1. The secondary twisting of the doubled yarn is carried out with the individual filaments in a relaxed condition by which an excellent covering effect of the multifilament yarn around the elastic yarn can be obtained. It is also important to appropriately set the relative surface speed of the three pairs of rollers **9***a*, **9***b* and **12***a*, **12***b* and **19***a*, **19***b*. It is necessary to fix the surface speed of the rollers **12***a*, **12***b* at a slightly slower speed than that of the rollers **9***a*, **9***b*. The reduced speed of the rollers **12***a*, **12***b* must be set in accordance with the number of twist or twist number of the false twist may be within a range from zero to 20 percent. The surface speed of the rollers **19***a*, **19***b* must be slower than that of the rollers **12***a*, **12***b*.

An estimation of "relaxation percentage" as used herein concerning the relaxation of the untwisted doubled yarn is generally given by

$$\frac{l-l'}{l}\times 100\%$$

where

l=the length of the yarn under complete extension

l'=the length of the yarn during relaxation of the doubled yarn

and the practical range of the relaxation percentage for obtaining sufficient relaxation in practicing the present method is from 5 to 45%.

Modified relaxation treatments are shown in FIGS. 3 and 4. Referring to FIG. 3, a funnel type false-twist spindle **20** is used. Doubling of the elastic core yarn **1** with the covering multifilament **6** is carried out in the same manner as that adopted in the preceding embodiment. Twisting and untwisting of the doubled yarn **21** is performed by the funnel type false-twist spindle, and relaxation of the untwisted yarn is simultaneously carried out by discharging the untwisted yarn from the outlet of the spindle **20** at periodically varying speeds. Taking-up of the relaxed yarn **13** is also carried out in the same manner as that of the preceding embodiment. By applying this kind of funnel type false-twist spindle, separation of the individual filaments within the multifilament yarn can be remarkably promoted on account of the combined effect of relaxation with vibration provided by the funnel type false-twist spindle **20**. This is one of the outstanding features of the present embodiment.

Referring to FIG. 4, still another embodiment of the process for carrying out the method of the present invention is shown. In this embodiment, periodical relaxation of the untwisted doubled yarn can be performed by passing the yarn over an eccentric roller **22**. By continuously rotating the eccentric roller **22**, it is possible to supply the untwisted doubled yarn **23** to the relaxing zone at a periodically varying speed.

In all of the above-mentioned embodiments, the direction of the twist finally imparted to the yarn when taken up onto the take-up bobbin **17** should preferably be the reverse of the twists imparted to the yarn during false-twisting.

The following example is illustrative of the present invention, but is not to be construed as limiting the same.

EXAMPLE 2

A polyurethane elastic yarn of 70 denier was doubled together with a nylon multifilament having a total denier of 70 denier by the process shown in FIG. 2. The polyurethane elastic yarn was stretched at a stretching ratio of 3.5 between the roller **4** and the feed rollers **9***a*, **9***b*. 2,000 turns/meter of S-twists were imparted to the doubled yarn in the false-twisting zone while relaxing it about 10%, next relaxation was applied to the untwisted doubled yarn in the relaxing zone between the rollers **12***a*, **12***b* and the rollers **19***a*, **19***b*. After the relaxation, 1,100 turns/meter of Z-twist was finally imparted to the yarn while a same was in a stretched condition. The elastic covered yarn thus obtained was uniformly and sufficiently covered, and provided excellent elastic property.

As already described in the present specification, in the manufacturing process for producing the elastic covered yarn according to the present invention, the heat set treatment of the doubled yarn during the primary twisting operation or during the relaxation treatment is effective for separating the individual filaments of the multifilament and for producing an elastic covered yarn having excellent quality. Further, this heat treatment is useful not only for improving the separation of the individual fibers of the multifilament but also for improving the high bulkiness and elastic property of the elastic covered yarn.

An embodiment of the manufacturing method utilizing, heat set treatment according to the present invention is shown in FIG. 5. In the drawing, an elastic yarn **1** is fed from a package **2** rotatably supported by a pair of supply rollers **3***a*, **3***b* which are positively rotated, and stretched in a stretching zone comprising the rollers **3***a*, **3***b* and a pair of feed rollers **24***a*, **24***b*. The stretched yarn is then doubled with a non-elastic synthetic multifilament **6** supplied from a package **5** through a yarn guide **25** and next the doubled yarn **10** is fed to the false twisting zone. The doubled yarn **10** is twisted by a false twist spindle **11** while a heat set treatment is imparted to the doubled yarn by a heater **26***a*. After passing through the false twist spindle **11**, the twisted doubled yarn is untwisted, and then the untwisted doubled yarn is relaxed in the relaxation zone between the rollers **12***a*, **12***b* and **19***a*, **19***b* after which the relaxed doubled yarn is twisted and wound around the bobbin **17** by the ring twisting method. The manufacturing method shown in FIG. 6 differs slightly from that shown in FIG. 5, in that the heat set treatment is applied to the doubled yarn while the relaxation of the yarn is taking place, that is, the heat set treatment is operated by a heater **26***b* in the relaxation zone between the rollers **12***a*, **12***b* and **19***a*, **19***b*. By the above-mentioned heat set treatment, the individual fibers of the thermoplastic multifilament are sufficiently separated and set by heat in a remarkably curling condition, and finally the double yarn **13** is twisted by the ring twisting method while under tension.

In the above-mentioned two embodiments, the number of twist and direction of the twist of the false-twisting operation can be chosen in the same manner as that of the embodiments shown in FIGS. 1 and 2. Furthermore,

a range from 5 to 45%, where said relaxation percentage is defined by

$$\frac{l-l'}{l}\times 100\%$$

l = the length of the yarn under complete extension,
l' = the length of the yarn during relaxing the doubled yarn.

10. A method for manufacturing an improved elastic yarn having a core of elastic yarn surrounded by a sheath composed of individual filaments comprising: providing an elastic yarn and a bundle of individual filaments; doubling said elastic yarn together with said bundle of individual filaments while maintaining said elastic yarn in a stretched condition; primary twisting said doubled yarn; untwisting said primary twisted doubled yarn; applying relaxation to said untwisted doubled yarn while said doubled yarn is subjected to a heat set treatment just after untwisting; and secondary twisting said relaxed doubled yarn in a stretched condition.

11. A method for manufacturing an improved elastic yarn according to claim **10**, wherein said primary twisting operation is performed while maintaining said doubled yarn in a stretched condition.

12. A method for manufacturing an improved elastic yarn according to claim **10**, wherein said primary twisting operation is performed while maintaining said doubled yarn in a relaxed condition.

13. A method for manufacturing an improved elastic yarn according to claim **10**, wherein the relaxation percentage of said untwisted doubled yarn is in a range from 5 to 45%, where said relaxation percentage is defined by

$$\frac{l-l'}{l}\times 100\%$$

l = the length of the yarn under complete extension,
l' = the length of the yarn during relaxing the doubled yarn.

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