Dec. 12, 1967 P. F. MARSHALL 3,357,171

VARIABLE DENIER WRAPPED YARN

Filed Feb. 25, 1966

Fig. 1

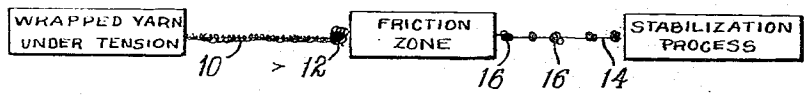


Fig. 2



Fig. 3

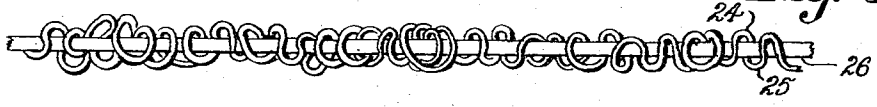


Fig. 4



Fig. 5



Fig. 6

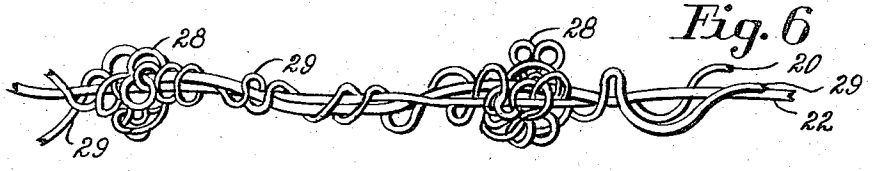
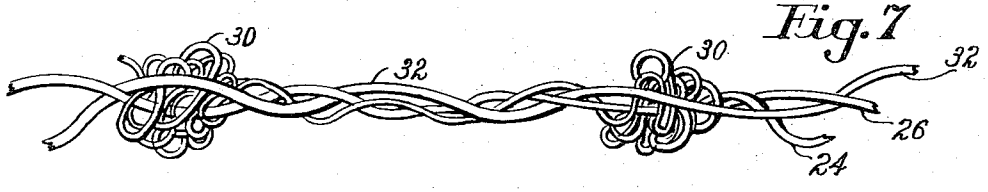


Fig. 7



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3,357,171

VARIABLE DENIER WRAPPED YARN

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This invention relates to a novelty yarn of the slub or nub type, and to a process for producing such a yarn. More particularly it relates to a process wherein a core strand is loosely wrapped with a wrapping strand, and the wraps of said wrapping strand are displaced along the core strand into randomly-spaced aggregates forming slubs or nubs.

By the terms slubs and nubs in this invention is meant that at intervals a portion of the wrapping strand is entangled upon itself to form a strand segment of heavier denier than the remaining portion of the wrapping strand. A slub is generally defined as a thickened portion of a yarn, said thickened portion possessing tapered leading and trailing ends. Nubs are generally defined as more abrupt thickened segments. By strand segment of heavier denier is meant herein not that the individual filaments of the wrapping strand are increased in denier, but that a localized knot, node, or thick place is formed in the wrapping strand as a whole.

Slub and nub yarns are conventionally produced by feeding a core strand and simultaneously overfeeding a wrapping strand into a twisting mechanism, and periodically arresting or slowing the feed of the core strand while continuing the overfeed of the wrapping strand to cause the overfed wrapping strand to accumulate around the core strand in uneven fashion, whereby the finished combination yarn is characterized by thick and thin segments. It is generally desirable that the thick and thin places be randomly distributed along the combination yarn, to prevent repetitive patterns in a woven or knitted fabric. Various expedients have been suggested for producing slub yarns of randomized periodicity, including computer controlling.

Conventional equipment for producing slub yarns is complex compared with the process of the present invention, and the output is comparitively slow. Furthermore, elaborate devices are utilized to try to effect randomness of slub distribution.

It is therefore an object of this invention to provide a novel and inexpensive process for producing a composite yarn characterized by randomized thick and thin segments, and to utilize such a composite yarn in the manufacture of fabrics, either alone or plied or wrapped with an auxiliary strand.

The basic steps in the process of the invention comprise:

(1) Combining with a core strand a loosely-adherent wrapping strand, said wrapping strand being disposed around said core strand either as a loose conventional wrap, or disposed in the form of doubled-back loops wound with false twist for a multiplicity of turns around said core strand.

(2) Passing the combined core and wrapping strands through a friction zone which applies a drag or resist to the wrapping strand, causing it to slide along the core strand until there is sufficient resistance to further slippage so that the retarding effect of the friction zone is overcome, and a slubbed segment of yarn passes through said friction zone.

(3) Stabilizing the thus-formed slubs and nubs by alternative procedures which comprise: wrapping the composite yarn with an auxiliary strand, as by a false-wrapping process or by true twisting, or stabilizing by knitting or weaving the composite yarn into a structure sufficiently

tight so that the courses and wales, or the warp and filling, are in such intimate association that slippage or displacement of the slubs is impeded.

The invention will be better understood with reference to the following description and drawings, in which:

FIGURE 1 is a combined schematic diagram and simple flow chart of the process.

FIGURE 2 is a conventional loose-wrapped yarn suitable for use in the process of this invention.

FIGURE 3 is a core yarn falsely wrapped with a wrapping strand in the form of a multiplicity of doubled-back loops.

FIGURE 4 is a schematic representation of the yarn of FIGURE 2 after it has passed through the friction zone.

FIGURE 5 is a similar schematic representation of the yarn of FIGURE 3 after said yarn has passed through the friction zone.

FIGURE 6 represents the yarn of FIGURE 4, stabilized by means of an auxiliary wrapping strand disposed around said yarn in the form of a multiplicity of doubled-back loops.

FIGURE 7 represents the yarn of FIGURE 5 stabilized by means of an auxiliary strand conventionally plied therewith.

Referring to FIGURE 1, a wrapped yarn **10** is supplied from any convenient source which applies a moderate tension to the yarn, as by drag rolls, star wheels, or other conventional devices not shown. The wrapped yarn may be of conventional type, as shown in FIGURE 2, wherein a wrapping strand **20** has been loosely disposed around a core strand **22**, as by a twisting operation. The wrap may also suitably be of the type shown in FIGURE 3, wherein a yarn has been formed by combining with a core strand **26** a wrapping strand **24** disposed around the core strand in the form of doubled-back loops **25**, wound with false twist for a multiplicity of turns around the core strand. The process of making a wrapped yarn of this type is set forth in my U.S. Patent 3,082,591, wherein it is explained that there is no true rotation of the wrapping strand around the core strand except in double-ended or loop form. Hence, no matter how heavy the wrap, there is no true net twist of wrapping strand around the core strand in toto, even though an individual strand may seem locally to be truly wrapped around the core.

By whatever process the core strand of the starting yarn is made, the wrapping strand must be in slidable engagement with the core. That is, the wrap should be loose enough so that if the wrapped yarn is passed over a sharp edge, the turns of wrapping strand will tend to slide along the core and bunch up together to form a node in the form of a slub or nub. The displacement of the turns of wrapping strand axially along the core strand in the friction zone continues until sufficient internal tightening or entanglement of the accumulating wrap has taken place to overcome the drag of the friction zone.

Referring again to FIGURE 1, the loosely-wrapped yarn **10** passes under tension to a friction zone, which may be created by passing the yarn over a knife edge, or by passing it through a small poteye and removing the yarn at a sharp angle therefrom. Alternatively, the friction zone may be a stationary or revolving roll with a roughened surface. Various such devices are known in the art and are suitable for the process of this invention, it being understood that the term "friction zone" as used herein means any suitable device for retarding or impeding the traverse, relative to the core strand, of a wrapping strand loosely disposed about said core strand. In FIGURE 1, an accumulation of axially-displaced wrapping strand **12** is shown at the edge of the friction zone. It will be understood that the actual accumulation occurs at the knife-edge, or at the rim of the poteye, or pe-

riphery of the roll, depending on the device used to impart frictional drag to the wrapping strand

Still referring to FIGURE 1, the yarn **14** is shown emerging from the friction zone as a core strand wrapped with a wrapping strand which is now accumulated into slubs or nubs **16**. The yarn structure at this point is shown in enlarged detail in FIGURES 4 and 5. FIGURE 4 represents the yarn of FIGURE 2 after the wrapping strand **22** has been axially displaced by friction into the nubbed configurations **28**, randomly disposed along the core strand **22**. FIGURE 5 is a similar representation of the yarn of FIGURE 3, with the wrapping strand **24** aggregated into slub-like accumulations **30**, disposed along the axis of the core strand **26**.

The yarn **14** of FIGURE 1 is shown as passing into a stabilization process. The primary purpose of such a process is to anchor the irregularly-spaced thick and thin places in the yarn against further slippage or displacement. This may be accomplished by knitting or weaving the yarn into a fabric of such close texture that the irregularities in the yarn are locked into place by frictional contact with other yarns.

In the case of open fabric structures, however, or where for other reasons a more durable persistance against nub slippage is desired, the yarn **14** of FIGURE 1 may be plied or wrapped with a third strand. FIGURE 6 shows the yarn of FIGURE 4 when overwrapped with a third strand, said third strand **29** being disposed about both the core strand **22** and the first wrapping strand **20** in the form of doubled-back loops wound with false twist for a multiplicity of turns around core strand **22** and primary wrapping strand **20**. Again, the apparatus described in U.S. Patent 3,082,591 is suitable for wrapping a variable denier yarn according to this process.

Alternatively, a conventional wrapping or plying operation may be carried out on the yarn **14** of FIGURE 1, as shown in FIGURE 7 which represents the yarn of FIGURE 5 plied with a third strand **32** as in a conventional yarn twister. In FIGURE 7, the first wrapping strand **24**, disposed around the core strand **26** in loop form and aggregated into thick places **30** along the axis of the core strand, is overwrapped, together with the core strand, by the third strand **32** which is truly twisted around both the core strand and the first wrapping strand.

In the yarns of both FIGURES 6 and 7 the slubs and nubs **28** and **30** respectively are substantially locked into place along the yarn axis by the auxiliary wrapping strands **29** and **32** respectively.

By the use of core strands, wrapping strands, and plying or overwrapping strands of different colors, deniers, lustres, and dyeabilities, a wide variety of variable denier yarns can be produced in which the slubs and nubs are truly randomly distributed. At the same time, the process is simple, rapid, and economical.

Having thus described my invention, I claim.

1. The method of producing a composite yarn characterized by randomly-distributed thick and thin segments which comprises
   - loosely associating at least one wrapping strand with at least one core strand,
   - frictionally displacing said wrapping strand axially along said core strand to form randomly-spaced slubs and nubs,
   - and stabilizing said slubs and nubs against further displacement.

2. The process according to claim **1** in which the wrapping strand is loosely associated with the core strand in the form of doubled-back loops falsely wrapped around the core strand for a multiplicity of turns.

3. The process according to claim **1** in which the wrapping strand is loosely associated with the core strand in the form of true twist around said core strand.

4. The process according to claim **1** in which the stabilization against further displacement of said slubs and nubs is effected by plying said core strand and said wrapping strand with an auxiliary strand disposed with true twist around said core strand and said wrapping strand.

5. The process according to claim **1** in which the stabilization against further displacement of said slubs and nubs is effected by wrapping said core strand and said wrapping strand with an auxiliary wrapping strand disposed around said core strand and said wrapping strand in the form of doubled-back loops wound with false twist for a multiplicity of turns around said core strand and said wrapping strand.

6. The process according to claim **1** in which the stabilization against further displacement of said slubs and nubs is effected by converting the composite yarn into a fabric.

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