Aug. 11, 1942. A. S. HUNTER 2,293,003

YARN STRUCTURE

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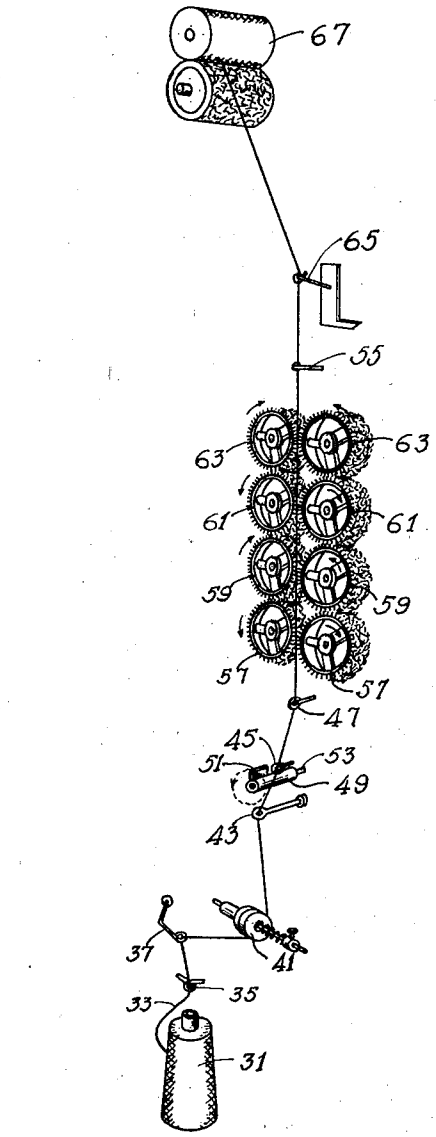


Fig. 1.

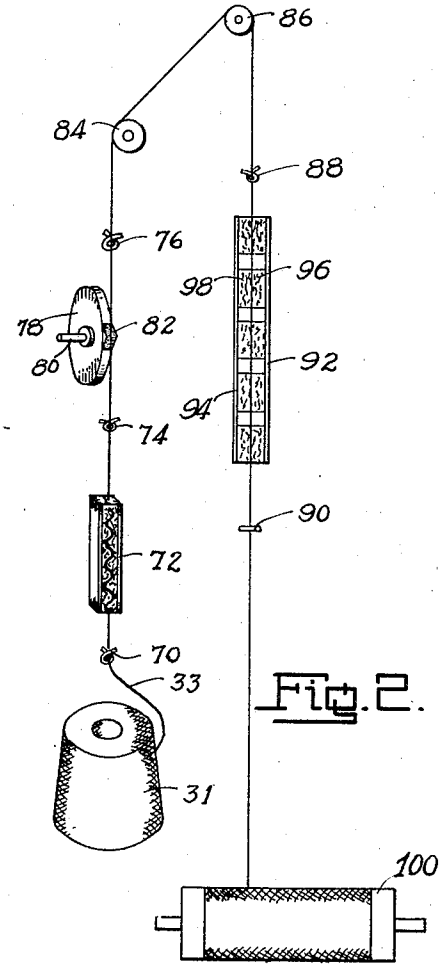


Fig. 2.

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Aug. 11, 1942. A. S. HUNTER 2,293,003

YARN STRUCTURE

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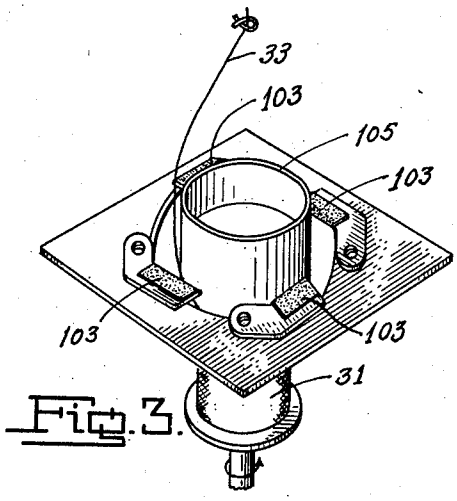


Fig. 3.

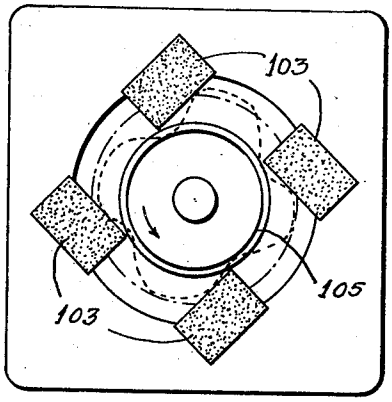


Fig. 4.

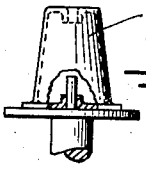


Fig. 6.

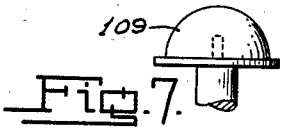


Fig. 7.

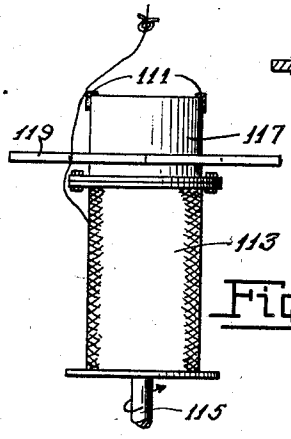


Fig. 8.

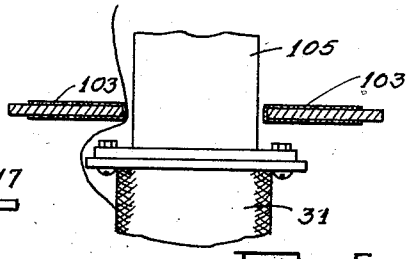


Fig. 5.

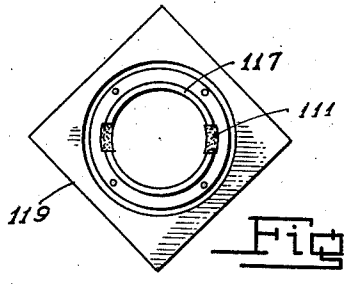


Fig. 9.

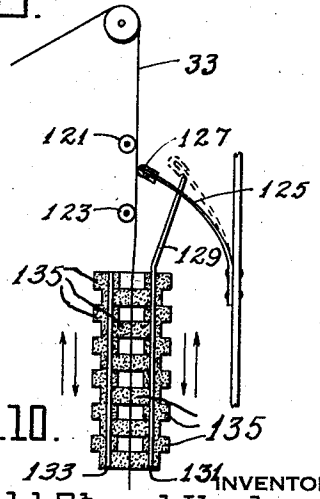


Fig. 10.

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YARN STRUCTURE

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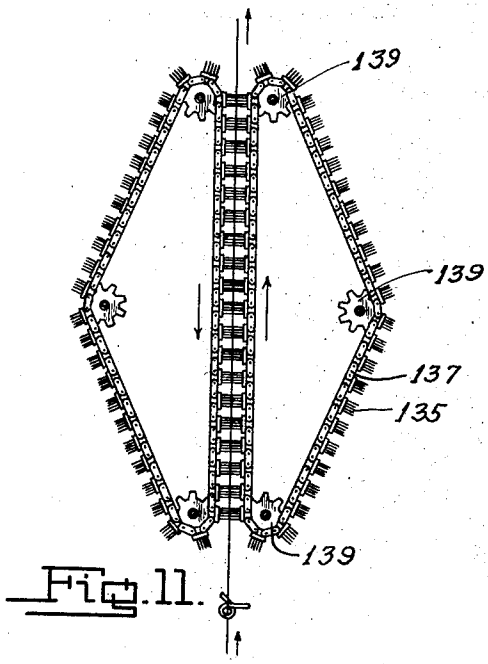


Fig. 11.

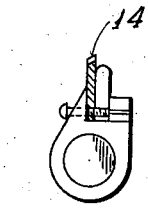


Fig. 16.

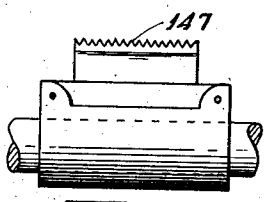


Fig. 17.

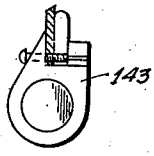


Fig. 14.

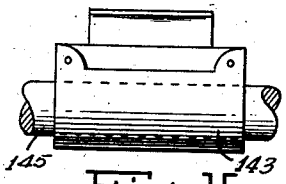


Fig. 15.

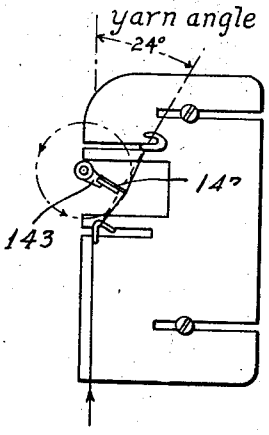


Fig. 12.

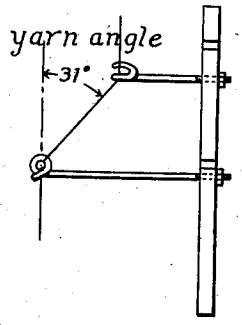


Fig. 13.

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Aug. 11, 1942. A. S. HUNTER 2,293,003

YARN STRUCTURE

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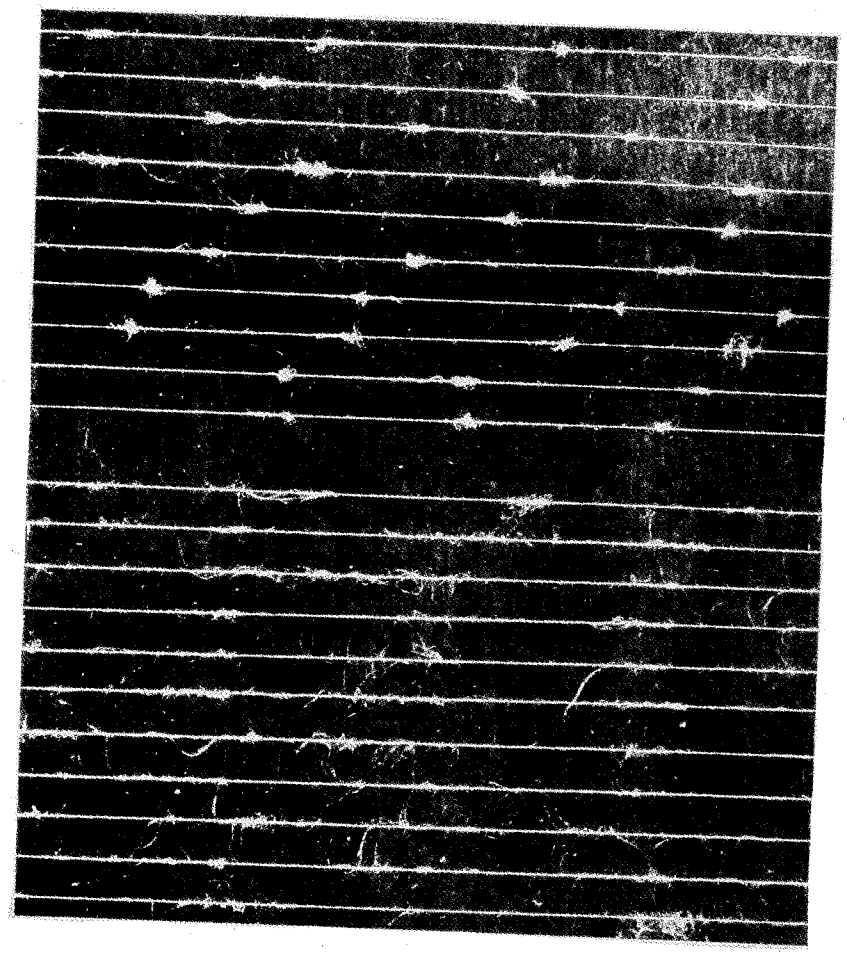


Fig. 18.

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BY
Louis A. Wiebe
ATTORNEY

Patented Aug. 11, 1942

2,293,003

UNITED STATES PATENT OFFICE

2,293,003

YARN STRUCTURE

Archibald Stuart Hunter, Kenmore, N. Y., assignor to E. I du Pont de Nemours & Company, Wilmington, Del., a corporation of Delaware

Application October 8, 1941, Serial No. 414,108

5 Claims. (Cl. 57—140)

The present invention relates to a new yarn structure, and to a new process and apparatus for the production of said new yarn structure. More particularly, the invention relates to the production of a yarn composed of artificial filaments and comprising compact bunches or nubs of entangled filaments intermittently severed in the yarn and anchored to unsevered filaments of the yarn.

This application is a continuation-in-part of my copending application Serial No. 299,170, filed October 12, 1939.

It is the purpose and object of the present invention to produce a yarn comprising at intervals along the length thereof severed and unsevered filaments, the severed filament ends being gathered into compact bunches.

It is another purpose and object of the present invention to produce a yarn composed of substantially uniform denier artificial filaments which yarn will, however, have a non-uniform denier.

It is the further purpose and object of this invention to produce a yarn composed of relatively long artificial filaments, which yarn will contain compactly gathered bunches or nubs of entangled filaments which have been severed from a continuous filament yarn, the bunches or nubs being anchored and entwined to unsevered filaments of the yarn.

It is another object of this invention to produce a yarn composed of relatively long artificial filaments of substantially uniform denier, which yarn will contain compactly gathered bunches or nubs of entangled filaments, which have been severed from a continuous filament yarn, the bunches or nubs being anchored and entwined to unsevered filaments of the yarn; and in which the several filaments at one section of the yarn will be the unsevered filaments at another section of the yarn.

It is furthermore an object of the present invention to provide a suitable process and apparatus for the production of yarn structures of the type referred to above.

In accordance with the present invention the novel yarn structure, above described, can be produced from yarns composed of continuous artificial filaments by a process comprising, in general, the following two essential steps:

1. Periodically abrading the yarn, that is, cutting, tearing or otherwise severing, (herein comprehended by the term "abrading") at intervals along the yarn, a small number of the continuous filaments of which the yarn is composed.

2. Gathering or collecting, and entangling, the severed ends of the filaments into compact bunches or nubs which are securely anchored to the remaining unsevered filaments of the yarn.

Several modifications of apparatus suitable for use in accordance with the principles of the present invention are shown in the accompanying illustrations. The following detailed description, when taken in connection with the accompanying illustrations, will serve to disclose, in detail, the various features of the present invention. The specifically described and illustrated forms and modifications of apparatus and process are not, however, to be considered as limiting the invention thereto.

In the drawings:

Figure 1 is a diagrammatic, perspective view of one form of apparatus suitable for use in accordance with this invention.

Figure 2 is a diagrammatic, perspective view of a modified form of apparatus shown in Figure 1.

Figure 3 is a perspective view of one form of periodic yarn abrading mechanism.

Figure 4 is a diagrammatic top plan view of the apparatus shown in Figure 3.

Figure 5 is a side elevational view of a portion of the apparatus shown in Figure 3.

Figures 6 and 7 are various modified forms of yarn guiding means for use in an abrading device of the type shown in Figure 3.

Figure 8 is a side elevational view of another modified form of periodic yarn abrading mechanism.

Figure 9 is a top plan view of the abrading mechanism shown in Figure 8.

Figure 10 is a diagrammatic side elevational view of still another form of periodic yarn abrading mechanism together with a severed filament gathering or collecting mechanism.

Figure 11 is a modified form of a severed filament gathering mechanism.

Figure 12 is a diagrammatic side elevational view of a periodic yarn abrading mechanism with means for guiding the yarn along a suitable path during the periodic abrasion or severing of some of the yarn filaments.

Figure 13 is a diagrammatic front elevational view of a portion of the apparatus shown in Figure 12.

Figure 14 is an enlarged side elevational detailed view of the abrading cutter shown in Figure 12.

Figure 15 is a front elevational view of Figure 14.

Figures 16 and 17 are, respectively, side and front elevational views of a modified form of the cutter shown in Figures 14 and 15.

Figure 18 is a photolithographic drawing of a series of yarns in which some filaments have been severed, and severed and bunched.

The accompanying photolithographic drawings show the contrasting appearance of a yarn in which a few filaments are severed from the yarn at intervals along the length thereof, and

a similar yarn in which the severed filaments have been entangled and gathered into bunches securely anchored to the remaining unsevered filaments.

Referring to Figure 1 of the drawings, reference numeral 31 designates a cone or bobbin of yarn composed of continuous artificial filaments. The yarn 33 is drawn from the cone 31, through yarn guides 35 and 37, and between spring-pressed tension plates 39 and 41. The yarn is then passed through yarn guides 43, 45 and 47. A rotating abrading or filament-severing mechanism 49 is positioned adjacent the traveling yarn between guides 43 and 45. The abrading or severing element 51 of the abrading mechanism 49 rotates about the shaft 53. Upon rotation of the element 51, the latter is forced into periodic contact with the yarn and breaks, tears or cuts a number of the continuous filaments of the yarn at intervals along the yarn.

The abraded yarn is guided through a filament gathering or collecting mechanism by means of guides 47 and 55. The filament gathering mechanism comprises a plurality of sets of rollers 57, 57; 59, 59; 61, 61; and 63, 63. Each of these rollers is provided with a covering of a resilient, yieldable material such as plush, pile carpet material, soft felt or the like on the external periphery thereof. Each set of rollers is mounted for rotation on parallel shafts with the external peripheral faces in alignment with each other. The two rollers of each set are so spaced from each other that the resilient covering material on the external surfaces of the two rollers will be in definite contact with each other and, therefore, in contact with the yarn which is made to pass between them. If desired, a suitable yarn guide such as shown at 47 and 55 may be positioned between each set of rollers.

Some of the rollers will be rotated to cause the resilient covering thereon to rub along the yarn in the direction of movement of the yarn, and others of the rollers will be rotated to cause the resilient covering thereon to rub along the yarn in a direction counter to the movement of the yarn. The severed filament ends are thereby shirred, rolled, pushed or otherwise gathered or collected, and entangled into a compact, well anchored bunch or nub between the remaining unsevered filaments. Preferably the rollers are rotated in the direction of the arrows shown thereon in the drawings. In this way alternate sets of rollers cause rubbing on the yarn in opposite directions along the moving yarn.

The yarn, after passing through guide 55, is passed through guide 65 and is then wound on a bobbin or spool 67. The yarn winding mechanism will, of course, be provided with a yarn traversing mechanism (not shown) to wind the yarn in even and uniform layers on to the bobbin.

In the modified form of abrading and collecting apparatus shown in Figure 2 of the drawings, the continuous filament yarn 33 is drawn from the cake or cone 31, passed through yarn guide 70, and thence through a conventional washboard tensioning device 72 and yarn guides 74 and 76. A yarn abrading wheel 78 is positioned between yarn guides 74 and 76. The abrading wheel rotates on shaft 80, the direction of rotation being either in the direction of travel of the yarn or in the opposite direction. The wheel 78 is provided with an abrading element 82 on the external periphery of the wheel. The element 82 may consist of any device or material, for example, sandpaper or emery cloth, which will sever only a limited number of the filaments of the yarn when passed into contact with the latter. The element 82 is positioned on the wheel 78 to project from the wheel axis a greater distance than the other external peripheral portions of the wheel. The abraded yarn is then passed over guide rollers 84 and 86 and thence through yarn guides 88 and 90.

Between guides 88 and 90, the yarn is subjected to a brushing or rubbing action by a filament gathering or collecting mechanism. The filament gathering or collecting mechanism comprises two reciprocating members 92 and 94. Member 92 is provided with a yieldable, resilient brushing material 96 on the side which faces member 94. Similarly, member 94 is provided with a brushing material 98 on the side facing member 92. The abraded yarn is passed between the members 92 and 94; these members are then rapidly reciprocated in unison, first in one direction and then in the opposite direction with the yieldable, resilient brushing material of both members in contact with the yarn. The severed ends of the filaments are accumulated and entangled in a compact bunch or nub and are securely anchored to the unsevered filaments by the action of the members 92 and 94 on the abraded yarn. The yarn is then wound on a bobbin 100 in a conventional manner.

Figures 3, 4 and 5 illustrate another form of abrading mechanism which can conveniently be used to periodically abrade a continuous filament yarn while imparting twist to or removing twist from the latter. In this form of mechanism the yarn 33 is drawn from the yarn package 31 as the latter is being rotated to cause the yarn to balloon. A plurality of abrading or filament severing elements 103 is positioned in the normal path of the ballooning yarn. These abrading elements cause a severing of a few filaments of the yarn at spaced intervals along the length thereof. To prevent the yarn 33 from whipping and becoming entangled, a cylindrical member 105 is preferably positioned within the normal ballooning path of the yarn, as illustrated. Instead of the cylindrical member 105 a frusto-conical member 107 or a semi-spherical member 109 such as shown respectively in Figures 6 and 7 may be used. The normal ballooning path of the yarn and the way in which the abrading members 103 deflect the yarn from this normal path are illustrated in Figure 4. This type of device has particular utility where the abrading of the yarn filaments and the gathering and collecting of the yarn filaments are combined with a yarn twisting operation.

Figures 8 and 9 illustrate a modified form of the apparatus shown in Figures 3, 4 and 5. In this modification the yarn is periodically abraded by abrading members 111 attached to the top edge of a cylindrical member 117, which in turn is attached to the flange of the spool 113. The spool 113 is rotated by means of spindle 115 which causes the thread to balloon against the abrading members 111. This modification causes an abrasion of the yarn from the inside of the yarn balloon in a device which combines a twisting of the yarn with the abrading and compacting of the filaments.

Figure 10 illustrates a slightly modified form of yarn abrading and filament gathering, entangling and compacting mechanism. In this device the yarn 33, under tension, is passed against yarn guides 121 and 123. A leaf spring member 125, tipped with an abrading element

127, intermittenly contacts the yarn as it passes between guides 121 and 123. The leaf spring member 125 is forced out of contact with the yarn by means of a striker bar 129 fastened to reciprocating member 131. The abraded yarn then passes between members 131 and 133 which are reciprocated in unison with each other. The members 131 and 133 are provided with spaced, yieldable, resilient brushing pads 135 which push or shirr and entangle the severed ends of the filaments into a compact bunch which is anchored to the unsevered filaments. Pads 135 are provided on both sides of members 131 and 133, so that these members may be turned when one side becomes worn.

Figure 11 illustrates another modified form of filament gathering or collecting mechanism. In this form of device a plurality of spaced, yieldable, resilient pads 135 is attached to the links of a pair of chains 137. The chains 137 travel about rotating sprocket wheels 139. One chain is positioned on each side of the traveling yarn 33, and the sections of the two chains adjacent to the yarn are preferably made to travel in opposite directions. The chain traveling in the direction of movement of the yarn may have a greater or lesser speed than the chain moving counter to the direction of travel of the yarn. The latter chain may, in fact, be substantially stationary or even move very slowly in the same direction as the former.

Figures 12 to 15 show an intermittent yarn abrading mechanism in which the abrading element 141 is fastened to rotating supporting member 143. The supporting member 143 is mounted on a rotating shaft 145. The element 141 is fastened to member 143 between clamping elements in any desired manner. The element 141, when the supporting member is rotated, intermittently passes into contact with the yarn and, as a consequence, tears or cuts a number of filaments of the yarn. In this modification it is preferred that the yarn be made to travel along a line which makes a substantial angle, for example, 20° to 50°, with the face of the cutter so as to prevent the slipping of the filaments from the abrading element without severing the same.

Figures 16 and 17 show a modified form of device in which the abrading element comprises a fine-toothed metal element 147 which is adapted for use in a device of the construction shown in Figures 13 and 14. The fine teeth, when passed against the yarn, pick out a number of filaments and sever the same upon continued rotation of element 147.

The photolithographic drawing, Figure 18, illustrates a yarn in which a few filaments of the yarn have been intermittently severed but in which the severed filaments have not been gathered into bunches or nubs. This figure also shows the novel appearance of a yarn in which a few filaments have been periodically severed and the severed filament ends gathered or collected, and entangled in compact bunches or nubs which are securely anchored to the remaining unsevered filaments.

The following specific example is given to illustrate the procedural steps of the process of this invention as applied to a particular yarn:

Example

Regenerated cellulose yarn produced by the viscose process, having 3 turns per inch twist, and composed of 100 filaments of one denier each, is passed through suitable tensioning and guiding devices to impose a constant tension of about 45 grams on the yarn between guides 43 and 45 as shown in Figure 1 of the drawings. The yarn under tension, traveling at a rate of 6000 inches per minute, is passed adjacent a suitable abrading mechanism which is rotated at a speed of 2000 to 3000 R. P. M. and, therefore, is adapted to make an abrading contact with the yarn at spaced intervals of 2 to 3 inches. Each abrading contact of the abrading element with the yarn is adapted to sever a portion of the filaments, for example, from 10 to 40 or more. The abraded yarn is then passed between a plurality of pairs of pile carpet-covered gathering or collecting rolls, each pair of rolls being positioned on opposite sides of the traveling yarn as shown in Figure 1 of the drawings. All of the rolls are rotated at a linear peripheral speed of approximately 21,000 inches per minute. The direction of rotation of both of the first pair of rolls is such as to brush the yarn in the direction of travel of the latter. Both of the second pair of rolls are rotated in a direction to brush the thread counter to the direction of travel thereof. The third and fourth pairs of rolls are, respectively, duplicates, as to direction of rotation, of the first and second pairs of rolls.

The abraded and brushed yarn, produced as a result of this treatment, contains, at spaced intervals of 2 to 3 inches, nubs or bunches of compact, severed, entangled filament ends which are securely anchored to and entwined with unsevered filaments. The appearance is similar to that of the abraded and collected filament yarn shown in the photolithographic figure, Figure 18, of the drawings.

As will clearly appear from the various specific embodiments of the invention illustrated, many types and kinds of abrading devices can be utilized in accordance with the present invention. The contact of the yarn with the abrading surface should, however, be intermittent. The abrading surface may be brought into contact with the yarn by any suitable reciprocating, oscillating, rotating or similarly functioning mechanism which will operate to bring the two into contact with each other intermittently.

The most satisfactory severing means comprises certain types of abrading devices embodying the idea of periodically forcing relatively sharp abrading surfaces into the tensioned yarn which is traveling relative to the abrading surface. Surfaces having projecting points, such as carborundum stone, diamond dust or a garnet impregnated surface, sandpaper, a plurality of needle points, teasle, garnet wire, carding cloth elements, etc., serve this purpose very satisfactorily. Fine toothed saw blades having more than 10, and preferably from 10 to 50, teeth per inch are admirably suited for this purpose. It is furthermore preferred that the saw blades have straight-face, no-set teeth. By "straight-face, no-set teeth" is meant that the teeth all lie in substantially the same plane and the faces of the teeth approaching the yarn have no hooks and are substantially straight. It is to be understood, however, that while certain types of abrasive or projecting surfaces are preferred, other severing means may be used. For instance, more or less sharp continuous cutting edges may be used, providing the number of filaments severed are a fractional number of the filaments at any one point along the yarn.

The speed of the yarn, the tension on the yarn, the frequency with which the yarn contacts the

severing member, and the character and time of contact of the contacting surface of the severing member will determine the extent and distribution of the severed filaments and the spacing and size of the nubs subsequently collected. It is desired that the yarn be but periodically abraded, quite unlike the artificial woolly yarn produced heretofore, for only then will it be possible to collect and entangle the loose filament ends as discrete, well-anchored nubs. As many as 10 or more points of severance per inch of yarn may be made, but generally not more than 2 or 3 cuts per inch are desired. One cut every 2 or 3 inches along the yarn is preferred; however, one cut every 5 or 10 inches of yarn has been found to be satisfactory for many purposes, depending on the character of the fabric to be made. When the points of abrasion are comparatively far apart, for example, 5 or more inches, it is important that the time of contact between the abrasion means and the yarn be comparatively short to prevent the formation of a pluraltiy of nubs between points of abrasion. The time of contact of the abrading element can be shortened in any desired manner such as by decreasing the diameter of the abrading roll, increasing the speed, etc.

An intermittent roughening of the yarn by abrading during the ballooning of the yarn on both uptwisters and downtwisters where the abrasive cutting is substantially at right angles to the movement of the yarn has been found to be quite satisfactory. The abrading elements positioned about the circular path of the balloon normally should be few, for example, not more than 3 or 4, depending on the circumference of the ballooning circle and the amount of twist being inserted in the yarn, so that the yarn will not be very noticeably fuzzed. Because of the fluctuating balloon size on a ring twister as the ring rail rises and falls, abrading on an uptwister is preferred if a high degree of uniformity is desired, or a stabilizing device may be employed to make the diameter of the balloon more constant than is characteristic of some standard ring twisting equipment.

Likewise, the broken, torn or otherwise severed filament ends may be brushed, rolled, shirred or otherwise gathered or collected, and entangled, to form a compact bunch or nub which is securely anchored to the unsevered filaments by innumerable types and designs of apparatus. It is only necessary that the yarn contacting surfaces of the gathering or collecting device have sufficient resiliency and yieldability to permit their forcing of the filament ends into a compact bunch without materially damaging the unsevered filaments. It is preferred, in order to obtain a yarn having firm, compact, and securely anchored nubs or bunches, to employ apparatus in which the gathering or collecting surfaces move along the yarn in both directions along its length. The gathering or collecting surfaces may, however, be moved in such a way as to brush across the path of yarn travel. The nubs or bunches thus formed along the yarn will generally be located intermediate the points at which the filaments are severed.

By moistening the yarn with water or aqueous or non-aqueous finishes, textile dopes, etc., in the course of collection of the nubs, still further improvement in the product can be obtained and the nubs are thus prevented from loosening during subsequent textile handling.

Preferably, the speed of movement of the gathering or collecting surfaces should be relatively fast, dependent of course on the speed of yarn travel and the degree of compactness and anchorage desired. By increasing the pressure between the gathering or collecting surfaces, by increasing the number of the gathering or collecting devices, by increasing the length of the contacting surface of the collecting device, or by using a twisted pile fabric such as a chenille construction, rather than a straight pile as in mohair, for collecting device surfaces, the ease of collection, together with the formation of tight, well-anchored nubs is improved. The resilient, yieldable surfaces of the gathering or collecting devices may be continuous or discontinuous.

The yarn contacting surfaces when used in the collection of the severed filament ends may be any suitable material which will cause the filament ends to be pushed and entangled backward or forward into nubs. A resilient, non-packing surface is preferred, such as certain types of pile fabrics, for instance, broadloom carpet, wool pelt, flannel, felt, etc., although short bristle brushes, providing the bristles are not too hard and stiff, roughened soft rubber or sponge rubber, or other spongy or opened surface materials can be used satisfactorily.

The yarn produced in accordance with this invention is illustrated pictorially on the photolithographic figure, Figure 18, of the drawings. It is to be noted that the severed filament ends have been entangled and collected and the yarn has retained the general appearance of a continuous filament yarn except for the nubs themselves. This is entirely different from the woolly yarns produced heretofore. The average length of the filaments in the yarn is at least one yard, and in general several yards in length. As a result of the long filaments in the yarn, the strength retained in the nubby yarn of the present invention is generally about 60% to 80% its original strength.

As previously pointed out, only relatively few filaments, that is, less than 50% and preferably from 10% to 30% of the filaments in the yarn, are severed each time the yarn contacts the severing member, and of the severed filaments, at least a few filaments continue on several feet before they are severed again. It is, therefore, possible to gather and entangle by rolling, sliding or shirring, backward and/ forward along the yarn, the filament ends to form relatively compact filamentous bunches of nubs that are exceedingly well anchored, since the other ends of the filaments which are severed extend well along the yarn and serve as anchorage for the filamentous collection. Inasmuch as the nubs are formed by piling up the filament ends from both sides of the nub, it is anchored in two directions, and numerous textile tests have proved the anchorage sufficient to withstand the usual operations involved in making a fabric. These and other nubs purposely formed and spaced in accordance with this invention are in sharp contrast to "fluff balls" sometimes encountered in yarns due to the accidental accumulation of one or more broken filaments which easily slip along the yarn and are easily removed therefrom by cutting.

Because this yarn is preferably made from uniform denier yarn, the nub portions are just as fine and soft as the rest of the yarn. The invention permits the use of fine denier, fine filament yarn, such as 100-denier-100-filament yarn, with the attendant advantages of softness, sheer-

ness, and excellent draping qualities. Even though the filaments comprising the body and nub portions of the yarn are all substantially constant in denier, the variation between the denier or diameter of the base yarn and the nub portions is practically unlimited, the nubs being, for example, only 50% or 100% larger in diameter, or as much as 3, 5, 10 or even 20 times larger in diameter.

Preferably, the nubs in the yarn are spaced from ½ inch to 5 or 6 inches apart. The nubs may, however, be spaced very far apart, for example, 10, 15, 20 inches or more, if desired. The length of the nub may vary widely but generally from ⅛ inch to ⅜ inch or more. Furthermore, the nubs may be spaced a uniform distance from each other or they may be spaced at greatly varying distances from each other.

The invention may additionally be applied to continuous filament yarns wherein the filaments are non-uniform in denier to further increase the variety of novelty yarns. If the severing and collecting steps are so regulated, still greater variations in denier may be produced on yarns already varying as much as 1000% or more, or by means of this invention filamentous nubs may be interspaced between the nodes or blobs already contained in the yarn.

The invention is applicable to all types of continuous filament yarns, such as cellulosic yarns made from viscose, cuprammonium cellulose, cellulose esters, for instance, cellulose acetate, cellulose propionate, cellulose butyrate, mixed esters such as cellulose acetopropionate or cellulose aceto-butyrate, cellulose ethers such as methyl cellulose, ethyl cellulose, benzyl cellulose, or glycol cellulose or cellulose ether-esters; or continuous filament yarns produced from casein or other proteins, or from synthetic polymers or resins such as polyvinyl acetals, thermoplastic filaments such as vinyl acetate, vinyl chloride or polymers of vinyl acetate and vinyl chloride, ethyl methacrylate, styrene, polythene, polyvinyl formal, synthetic linear polymers such as nylon, and the like, and natural silk. The yarn may be of any size and composed of very fine filaments such as one denier or less, or of larger filament sizes such as 2 to 4 denier or more. For instance, viscose rayon yarns of the following sizes and filament count: 75 denier-40 filament, 100 denier-100 filament, 100 denier-60 filament, 150 denier-60 filament, and 250 denier-150 filament, lend themselves admirably to the process of this invention.

This invention can be applied simply and cheaply to modify any uniform denier continuous filament yarn, whether wound in the form of cones, spools or other finished package, or in the form of bucket or bobbin cakes or twister spools, or other preliminarily wound packages. The variability of this process to produce any desired pattern of nubby yarn adds greatly to its utility and since the invention is applicable to all sorts of continuous filamentary yarns, this affords additional manipulation of fabric construction to produce, for example, unusual coloring or cross dyeing effects.

The yarn produced in accordance with this invention is admirably suited for the fabrication of high quality, fine weight, novelty fabrics possessing an excellent hand, very attractive appearance, and good draping qualities. Such fabrics have a very pleasing, refined appearance, and a desired sheerness which has heretofore been impossible without sacrificing the novelty effect. The yarn of this invention may be used either in the filling or warp, or in both, in the production of woven goods, or as a knitting yarn. As a filling yarn for crepe fabrics, this yarn serves admirably and noticeably enriches the fabric.

The nubby yarn produced by means of this invention may be plied, as by twisting the same together with one or more continuous filaments or spun yarns of the same type, for example, viscose rayon nubby yarn plied with uniform denier continuous filament viscose rayon yarn. In addition, the nubby yarn of this invention may be combined in any suitable way with one or more yarns of another type, for instance, by combining the nubby viscose rayon yarn with a continuous filament cellulose acetate yarn, or by combining two or more of these nubby yarns, one of which may be viscose rayon and the other cellulose acetate. The mixed yarns may be used in the preparation of woven or knitted fabrics or in conjunction with other yarns in woven fabrics; e. g., in either warp or filling. Additional novel effects may be obtained by using this nubby yarn and other types of yarn intermittently in either the warp or filling, or both, or by feeding different yarns in alternation into the knitting machine.

Since many changes and modifications can be made in the above-described details without departing from the nature and spirit of the invention, it is to be understood that the invention is not to be limited except as set forth in the appended claims.

I claim:

1. A yarn composed of artificial filaments and containing, alternately along the length of the yarn, sections of substantially parallel filaments and nubs composed of compact bunches of filaments gathered and entangled within the substantially parallel filaments, the bunched filaments of one of the nubs being the substantially parallel filaments of another of said nubs.

2. A yarn composed of artificial filaments and containing, alternately along the length of the yarn, sections of substantially parallel filaments and nubs composed of compact bunches of filaments gathered and entangled within the substantially parallel filaments, the bunched filaments of one of the nubs being the substantially parallel filaments of another of said nubs, the bunched filaments comprising less than 50% of the filaments of said nubs.

3. A yarn composed of artificial filaments and containing, alternately along the length of the yarn, sections of substantially parallel filaments and nubs composed of compact bunches of filaments gathered and entangled within the substantially parallel filaments, the bunched filaments of one of the nubs being the substantially parallel filaments of another of said nubs, the bunched filaments comprising between 10% and 30% of the filaments of said nubs.

4. As a new article of manufacture, a multiply yarn in which at least one ply consists of the product of claim 1.

5. As a new article of manufacture, a multistrand, composite yarn structure comprising strands of filaments of different composition, at least one of the strands consisting of the product of claim 1.

ARCHIBALD STUART HUNTER.

CERTIFICATE OF CORRECTION.

Patent No. 2,293,003. August 11, 1942.

ARCHIBALD STUART HUNTER.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1. first column, line 39, for "several" read --severed--; page 4, second column, line 51, for "and/ forward" read --and/or forward--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 29th day of September, A. D. 1942.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)