

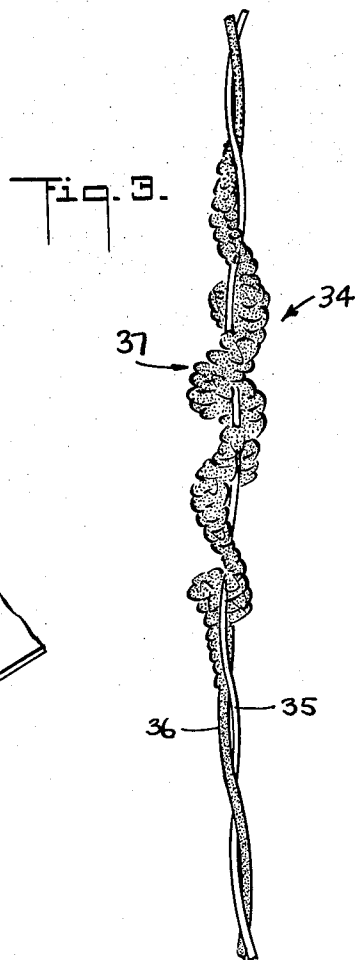
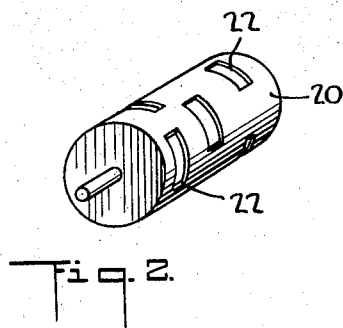
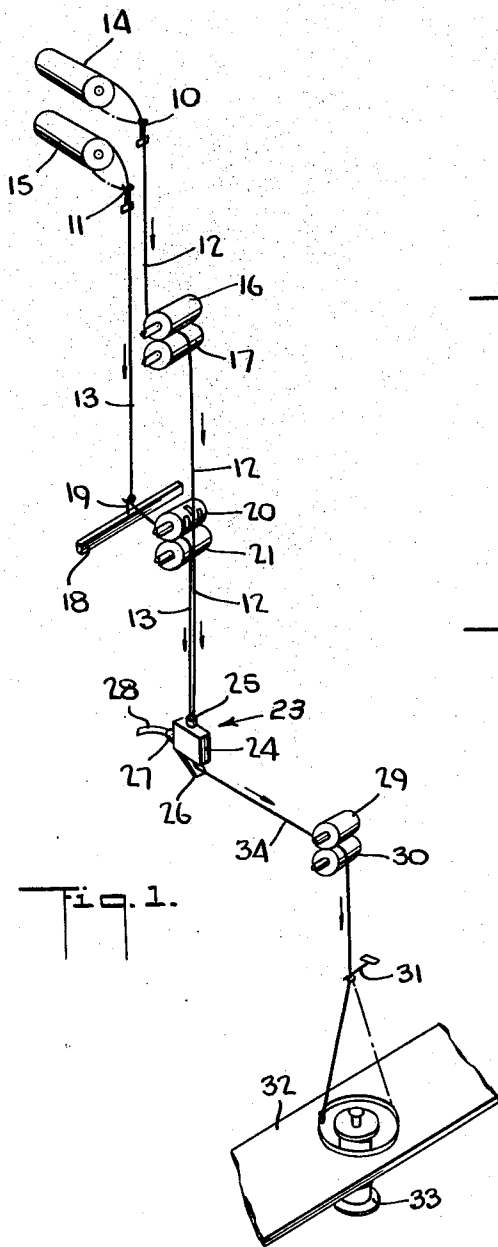
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APPARATUS FOR PRODUCING A COMPOSITE NOVELTY SLUB YARN

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APPARATUS FOR PRODUCING A COMPOSITE NOVELTY SLUB YARN

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This invention relates to novelty slub bulk yarn, more particularly to means for producing such yarn.

It is an object of the present invention to provide a heavy denier novelty slub bulk yarn which presents an unusual appearance and which can be employed in the manufacture of a variety of fabrics suitable for use as upholstery, draperies, clothing and the like.

It is another object of the present invention to provide a yarn of the aforesaid type which is composed of an unbulked core yarn surrounded and penetrated by a multitude of loops and curls formed in an auxiliary or slub yarn when subjected to a bulking operation.

Another object of the present invention is the provision of a novel apparatus for producing a high denier novelty slub bulk yarn composed of an unbulked core yarn in combination with a bulked, slub-forming auxiliary yarn.

Concurrently, it is an object of the present invention to provide means for combining a core yarn and an auxiliary yarn in such a manner as to impart thereto the desired irregular slub distribution.

The foregoing and other objects and characteristics of the present invention will be more fully understood from a consideration of the following detailed description thereof when read in conjunction with the accompanying drawing.

In accordance with one aspect of the present invention a novelty slub yarn is produced by an intermittent relieving of the tension on one of two multifilament yarns fed simultaneously into a fluid bulking jet, whereby the untensioned or auxiliary yarn is violently whipped about and the individual filaments thereof are formed into a multitude of loops and curls embracing and penetrating the second yarn or core which is always maintained under tension. Advantageously the resulting yarn has twist in it, which serves to stabilize its structure by preventing the looped filaments of the auxiliary yarn from separating from the core. The twist may be provided by taking up the product on a downtwister or by employing a core and/or an auxiliary yarn which initially contain twist. Stability and strength are also imparted by the unbulked core.

The yarns may comprise nylon, polyesters such as polyethylene terephthalate, rayon, polymers and/or copolymers of olefins and/or vinyls such as ethylene, propylene, acrylonitrile, vinyl chloride, etc., metals, metalics and especially organic acid esters of cellulose such as cellulose acetate, cellulose propionate, and the like. Of course, more than one core and/or auxiliary yarn may be employed if desired. If the several yarns are of different color or luster this will contribute to the variegated appearance of the product.

A jet of the type capable of being employed in this apparatus, and usually called an "air jet," is fully disclosed in the copending application of Clifford W. Palm et al., Serial No. 356,349 filed May 21, 1953, now Patent No. 2,942,402, and since such jet per se forms no part of the present invention, no further detailed description thereof is deemed necessary herein.

In order to permit bulking of the auxiliary yarn it is necessary that at least intermittently it be supplied to the bulking jet more rapidly than it is taken away therefrom. The percent overfeed, i.e. 100 times the quotient of (feed

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rate minus withdrawal rate) divided by the withdrawal rate may range from about 10 to 600% or more, and preferably about 20 to 200–500%. The percent overfeed of course takes into consideration the slubs as well as the length of yarn between slubs. The product may be bulked between slubs, if desired, however, by suitable selection of the normal supply speed of the auxiliary yarn. Thus the normal percent overfeed may be about 20 to 25%, higher overfeeds reducing the yarn strength and producing a yarn in which the intermittent character of the bulking will be obscured; that portion of the total denier of each slub comprising auxiliary yarn on the average ranges from about 50% or less to about 90% or more and preferably about 65 to 85%.

The core passes through the system at slightly in excess of 0% overfeed, e.g. it is supplied to the jet about 5 to 10% faster than it is withdrawn therefrom in order to accommodate the auxiliary yarn filaments which enter between, and thus distend, the core filaments.

The apparatus for forming the novel product comprises separate feeds for the auxiliary yarn and core, a bulking jet, a take-up mechanism, and means for intermittently varying, e.g. speeding up, the feed of the auxiliary yarn to the jet. The variation of the feed of the auxiliary yarn may be achieved by normally passing the yarn through a tension gate which is intermittently opened, by varying the speed of a positive feed device, by varying the path of the yarn from its supply to the jet, or the like. A suitable device for effecting this variation comprises a special rotatable drive roll for feeding the auxiliary yarn to be bulked. The surface of the roll is divided into yarn-engaging and non-engaging areas which are not uniform along the effective length of the roll. Means are provided to traverse the yarn along the length of said special roll to cause the yarn alternately to be engaged and disengaged, non-uniformly, by the yarn-engaging surface. Thus the non-engaging area may comprise one or more serpentine depressions in the roll surface, a plurality of spaced depressions preferably randomly cut out of the roll surface, or the like; the engaging areas may comprise high friction materials. Advantageously, the roll surface is provided with random cut outs and cooperates with a smooth-surfaced companion roll. When the yarn is gripped between the companion roll and the yarn-engaging surface of the special roll the yarn is positively fed at predetermined speed. When the yarn passes between the companion roll and a depressed area of the special roll it is not positively fed but rather is pulled along rapidly by the action of the jet.

An apparatus which has given good results is shown in the accompanying drawing, in which:

FIG. 1 is a schematic illustration of an apparatus designed for carrying out the process and producing the yarn according to the present invention;

FIG. 2 is an enlarged perspective view of one of the elements of the apparatus shown in FIG. 1; and

FIG. 3 is an enlarged view of a short length of the product.

Referring now more particularly to the drawing, it will be seen that the apparatus according to the present invention comprises a pair of pigtail guides 10 and 11 which are positioned for guiding a yarn 12 to serve as a core and an auxiliary yarn 13 taken, respectively, from a pair of bobbins or spools 14 and 15. The apparatus further includes a pair of feed rolls 16 and 17, one or both of which may be positively driven by any suitable means (not shown), for drawing the yarn 12 from bobbin 14. Following the pigtail guide 11 there is provided a traverse bar 18 which may be reciprocated longitudinally of itself by any suitable means (not shown) and is provided with a yarn guide loop or eye 19. A second pair of feed rolls 20 and 21, one or both of which may be positively driven

and the axes of rotation of which are substantially parallel to the direction of reciprocable movement of the traverse bar 18, is positioned adjacent the latter and adapted to draw the auxiliary yarn 13 from the spool 15.

The feed rolls 16 and 17 are of conventional construction, one being preferably made of rubber or of a rubber-covered rigid material, the other being made of steel. Of the feed rolls 20 and 21, for a purpose which will become clear presently, only the roll 21 is of conventional construction e.g. steel. Reference to FIG. 2 shows that the roll 20, which may be made of cork, neoprene, or other material having a high coefficient of friction, is provided over its entire periphery with a plurality of recesses or cut-outs 22, preferably randomly spaced. Although these are shown as being substantially rectangular in outline, it will be understood that both the shapes or outlines and the distribution of the recesses 22 in the surface of the roll 20, hereinafter referred to as a "cut roll," may be varied at will.

Positioned at the discharge side of the pairs of feed rolls 16-17 and 20-21 is a yarn bulking jet 23 which comprises a housing 24 having a yarn inlet tube 25 at its top and a yarn outlet passageway (not shown) at its bottom. Attached to the bottom of the housing 24 is a deflector plate 26 oriented at a predetermined angle to the yarn outlet path. The function of this plate will be more fully explained hereinafter. In the interior of the housing 24 is defined a chamber through which the yarn to be bulked is passed, and the housing is further provided with a fluid inlet nipple 27 communicating with the chamber and adapted to be connected to a line 28 leading from any suitable source of fluid under pressure, for example, compressed air or steam.

A pair of take-up or delivery rolls 29 and 30 of conventional construction is arranged at the discharge side of the air jet 23 for drawing the yarn from the latter and feeding it via a pigtail guide 31 to a ring rail 32 by means of which the yarn is reciprocated along a take-up spool 33 while being wound thereon.

The auxiliary yarn 13, passes through the jet at the same time, but it is to be intermittently bulked. In order to accomplish this, the feed rolls 20 and 21 are driven at a peripheral speed which is equal to or somewhat more than the driven peripheral speed of the delivery rolls 29 and 30. Because the roll 20 is provided with the cut-outs or recesses 22, the yarn 13 will be relieved of all tension whenever it passes between the rolls 20 and 21 at a location corresponding to one of the recesses 22. It will be seen, therefore, that as the yarn 13 is traversed back and forth along the longitudinal dimension of the cut roll 20 by the traverse bar 18, it will first be gripped between the outer surface of the roll 21 and an uncut surface portion of the roll 20, thus being kept under tension, will then be relieved of tension when located within the confines of one of the recesses 22 as the latter passes over the roll 21, will thereafter again be gripped and tensioned between the roll 21 and another uncut surface portion of the roll 20, and so on.

Consequently, whenever the yarn 13 is not under tension, the various filaments thereof in the bulking chamber of the jet 23 will be whipped about by the stream of compressed air in such a manner as to form a multitude of loops and curls around, over and through the unbulkcd and continually tensioned yarn 12. During this time the action of the jet 23 draws the yarn 13 off its spool 15 at a rate which may be many times, e.g. about 125 to 600% of, the normal rate, i.e. many times the peripheral speed of the roll 21. Thus, there is formed in the jet a single end of a new and composite yarn 34 which, as it leaves the jet 23 through the outlet passageway thereof, first impinges against the deflector plate 26, which may extend from the housing at an angle of about 15 to 75 degrees. Such impingement enhances and aids in the stabilizing of the loops and curls formed in the yarn, and the stability of the product yarn 34 may be still further enhanced by

subjecting the yarn to a slight additional twist, whereby the core yarn and the slub-forming auxiliary yarn become permanently affixed to one another.

As shown in FIG. 3, the product yarn 34 between slubs comprises a bundle 35 of core filaments and a bundle 36 of auxiliary yarn filaments. At the slub 37 the auxiliary yarn filaments are bulked and interlaced through the core filaments which stabilizes the bulk. Because of the presence of the core it is possible to obtain bulking of several hundred percent in the slubs whereas in the absence of a core, whether bulked continuously or intermittently, about 50% or less bulking is a general maximum if reasonably strong yarn is to be produced.

The distribution of the slubs along the product yarn 34 is, of course, completely irregular due to the random distribution of the recesses 22 in the surface of the cut roll 20, and in conjunction with the reciprocating traverse bar 18. The use of the cut roll 20 enables the formation of slubs ranging in length from as low as 0.375 inch to as high as 2 inches with intervening non-slubbed portions ranging in length from as low as 0.50 inch to as high as 120.25 inches.

In a representative run with the illustrated apparatus, employing a cellulose acetate auxiliary yarn of 104 filaments united with 5.5 Z turns per inch into a 200 denier yarn and a high tenacity cellulose acetate core of 40 filaments united with 2.5 Z turns per inch into a 48 denier yarn and taking up the product at 94 feet per minute with 2 turns per inch, both rolls 17 and 21 operating at 10% overfeeds, there is obtained the product described in the table.

Table

	Unslubbed Portion (273 denier)	Length Unslubbed Portion, Inches	Length Subsequent Slub, Inches	Slub Denier
0	-----	8.65	1.625	860
1	-----	0.50	0.375	510
2	-----	6.25	0.625	565
3	-----	8.87	1.375	905
4	-----	8.62	1.500	710
5	-----	8.75	1.375	905
6	-----	16.50	1.125	300
7	-----	8.62	1.500	710
8	-----	1.25	1.500	710
9	-----	5.87	1.500	710
10	-----	1.50	1.500	710
11	-----	5.37	2.000	885
12	-----	8.25	2.000	885
13	-----	8.25	2.000	710
14	-----	8.37	1.500	945
15	-----	69.12	1.625	875
16	-----	8.87	1.875	970
17	-----	8.31	2.000	710
18	-----	8.62	1.375	1,093
19	-----	21.75	1.500	825
20	-----	9.25	0.815	763
21	-----	11.12	0.500	532
22	-----	9.50	1.562	568
23	-----	9.50	0.500	532
24	-----	10.81	0.875	1,200
25	-----	9.75	0.500	710
26	-----	120.25	1.500	475
High	-----	120.25	2.000	1,200
Low	-----	0.50	0.375	300
Avg	-----	14.91	1.338	747

It is to be understood that the foregoing detailed description is given merely by way of illustration and that many variations may be made in the invention without departing from the spirit thereof.

Having described our invention what we desire to secure by Letters Patent is:

1. Apparatus for producing a composite novelty slub yarn, comprising a bulking jet, a first pair of feed rolls for feeding a first multifilament yarn into said jet, a second pair of feed rolls for feeding a second multifilament yarn into said jet jointly with said first yarn, the contact surface of one of said second feed rolls being provided with a plurality of randomly spaced cut-outs, a pair of delivery rolls for feeding yarn leaving said jet away from the latter, and means for traversing said second yarn back and forth along said second feed rolls,

the tension on said second yarn being relieved so as to permit bulking thereof under the influence of said jet whenever said second yarn passes between a cut-out in the surface of said one roll and its associated roll of said second pair of feed rolls.

2. Apparatus for producing a composite novelty slub yarn, comprising a bulking jet, a first pair of feed rolls for feeding a first multifilament yarn into said jet, a second pair of feed rolls for feeding a second multifilament yarn into said jet jointly with said first yarn, the contact surface of one said second feed rolls being provided with a plurality of spaced cut-outs extending only partially across said surface in the axial direction, a pair of delivery rolls for feeding yarn leaving said jet away from the latter, and means for traversing said second yarn back and forth along said second feed rolls, the tension on said second yarn being relieved so as to permit bulking thereof under the influence of said jet whenever said second yarn passes between a cut-out in the surface of said one roll and its associated roll of said second pair of feed rolls.

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