June 3, 1969 J. L. RHYNE 3,447,307

YARN OF THE FLAKE TYPE

Filed July 6, 1967 Sheet 1 of 2

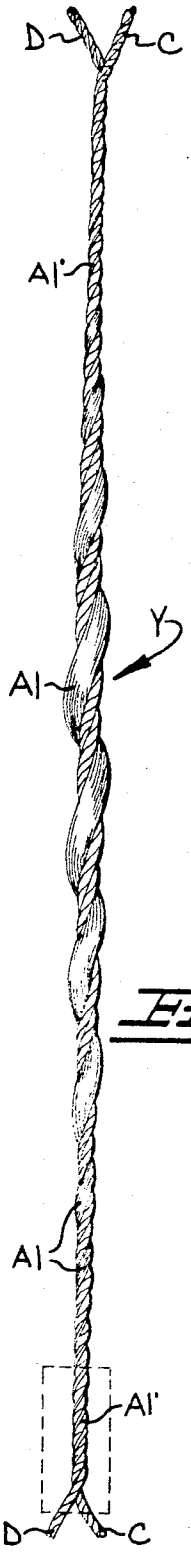


Fig-3

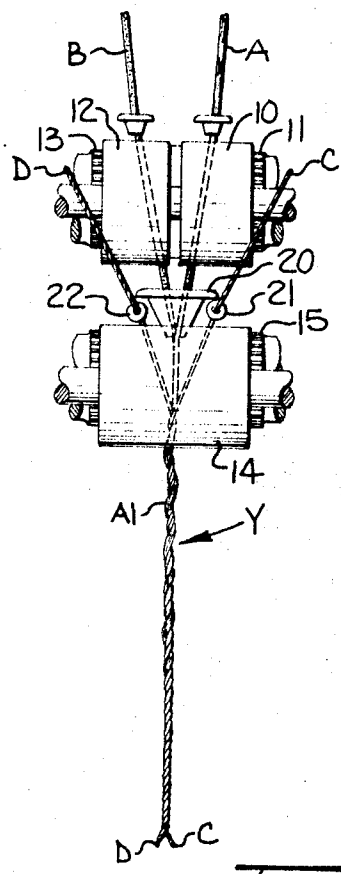


Fig-2

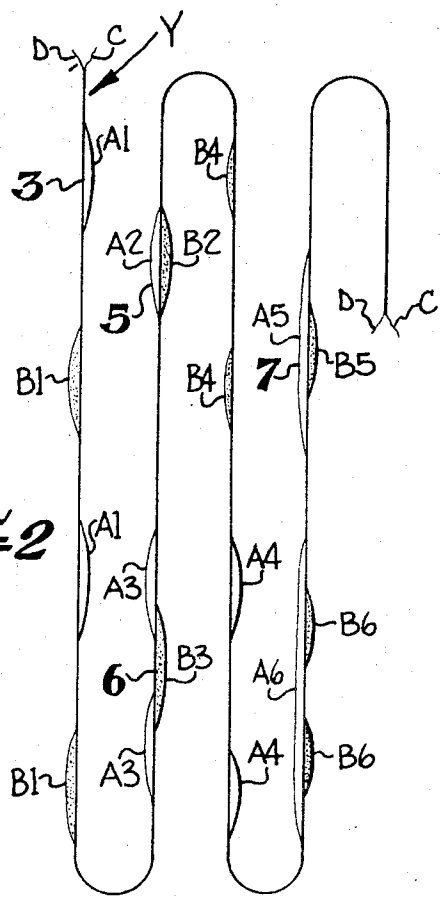


Fig-1

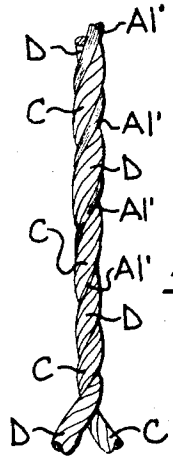


Fig-4

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YARN OF THE FLAKE TYPE

Filed July 6, 1967 Sheet 2 of 2

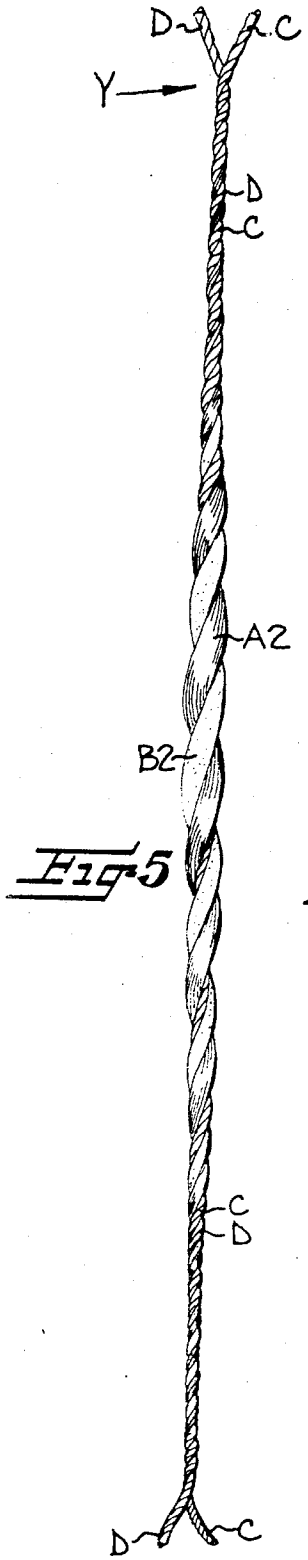


Fig-5

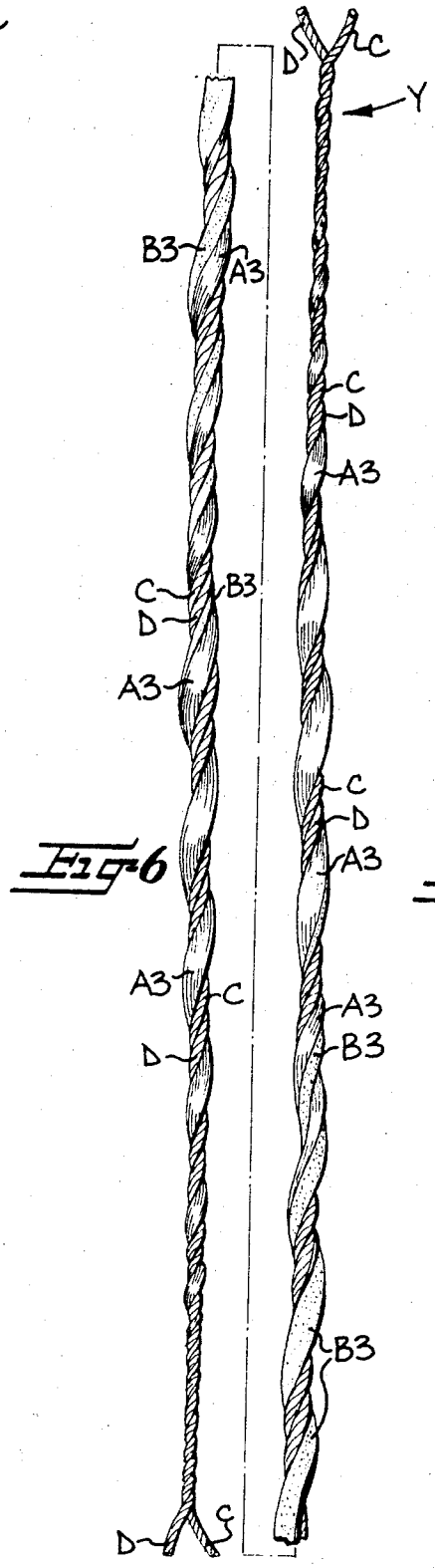


Fig-6

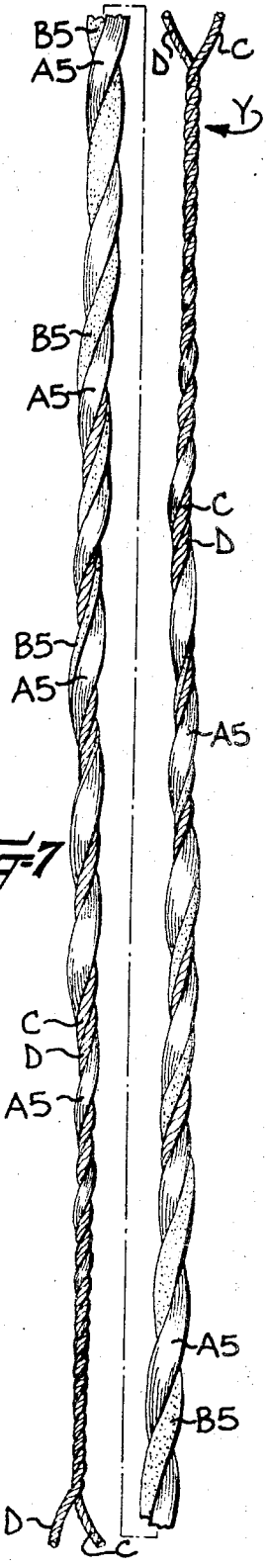


Fig-7

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3,447,307

YARN OF THE FLAKE TYPE

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Continuation-in-part of application Ser. No. 635,134, May 1, 1967. This application July 6, 1967, Ser. No. 651,566

Int. Cl. D02g *3/38, 3/00;* D01h *13/02*

U.S. Cl. 57—139 16 Claims

ABSTRACT OF THE DISCLOSURE

A novelty yarn characterized by a series of relatively short lengths of auxiliary strands intertwisted with at least two uninterrupted lengths of ground strands, and wherein certain of the lengths of auxiliary strands are of different characteristics, such as color or dye affinity, from other lengths of auxiliary strands.

This application is a continuationin-part of my copending application Ser. No. 635,,134, now Patent No. 3,394,541 filed May 1, 1967.

This invention relates to textile yarns and more particularly to spun or twisted novelty or composite yarns of the flake type.

Flake yarns of the known prior arts generally comprise a twister multi-ply ground strand having recurrent spaced lengths of an auxiliary strand; usually roving, intertwisted therewith. This type of yarn is distinguished in the trade from conventional slub type of yarn in that removal of a length of the auxiliary strand or flake does not destroy the yarn as is the case if a slub is removed from slub yarn. To my knowledge, all the spaced lengths of the auxiliary strand of any given prior art flake yarn have been of the same characteristics; i.e., only one type of auxiliary strand has been used in producing any given flake yarn, thus seriously limiting the novelty effects obtainable. Typical spinning machinery capable of producing such prior art flake yarn is disclosed in Beswick's U.S. Patent No. 1,608,295, issued Nov. 23, 1926,

I have now discovered a flake yarn of improved construction such as to exhibit a wide variance of novelty effects as compared to conventional flake yarns and which may be commercially produced on equipment of the type such as is disclosed in my copending application, with only minor modifications being required in the pattern control thereof.

It is therefore an object of this invention to provide a new and improved novelty yarn of the flake type in which relatively short lengths of at least two fibrous auxiliary strands or flake strands; each auxiliary strand having different characteristics from the other, are intertwisted with and arranged in predetermined order along the length of at least two uninterrupted, intertwisted lengths of fibrous ground strands which also may have different characteristics from the auxiliary strands. According to the invention, the lengths of the two different auxiliary strands may be arranged in alternation, in spaced relationship, in partially or fully overlapping intertwisted relationship, or in any combination thereof, and they may be of substantially the same or of varying lengths along the ground strands with which they are intertwisted.

The different characteristics of the fibrous auxiliary strands may be inherent characteristics of the particular fibers or blends thereof which form the fibrous strands, or may be induced characteristics. For example, inherent characteristics would include dye affinity, coarseness or fineness of fibers which would result in rough or smooth cover or hand, and light reflectibility. Induced characteristics would include color which is imparted to the fibrous auxiliary strands before inclusion in the yarn, and size or length, or both.

Further objects, features and advantages of the invention will become apparent from the following description wherein reference is made to the accompanying drawings, in which—

FIGURE 1 is a schematic fragmentary plan view illustrating a spinning or twisting mechanism which may be used in producing the novelty yarn of the present invention;

FIGURE 2 is a diagrammatic view of the novelty yarn illustrating various ways in which the auxiliary or flake strands may be arranged along and intertwisted with the ground strands in accordance with the invention;

FIGURE 3 is a greatly enlarged fragmentary view of a portion of the novelty yarn such as is indicated at **3** in FIGURE 2 and showing a single length of a flake strand intertwisted with the ground strands;

FIGURE 4 is a further enlarged detail of the portion of the strand enclosed in a dotted rectangle **4** in FIGURE 3, and particularly illustrating how each terminal end portion of a length of flake strand is secured to the ground strands by virtue of the twist therein; and

FIGURES 5, 6 and 7 are greatly enlarged fragmentary views of the flake areas of the yarn indicated at **5, 6** and **7**, respectively, in FIGURE 2.

Referring more specifically to the drawings, and especially to FIGURE 1, the novelty yarn of the present invention may be produced on any conventional spinning or twisting mechanism suitably modified to control the introduction of the various strands in the manner to be later described, and provided that such mechanism is provided with a suitable twisting mechanism. The apparatus disclosed in my said copending application Ser. No. 635,134, is particularly suited for the production of the novelty yarn of the present invention. As shown in FIGURE 1, the apparatus for producing the novelty yarn of the flake type may include two pairs of upper and lower back drafting rolls **10, 11** and **12, 13**, and a single pair of upper and lower front or delivery drafting rolls **14, 15.**

The two pairs of back drafting rolls **10, 11** and **12, 13** are adapted to receive and feed respective separate first and second fibrous flake or auxiliary strands of roving A, B, of relatively different characteristics, from respective separate sources, not shown, to the single pair of delivery rolls **14, 15.** A suitable means, such as a trumpet **20**, may be provided for, at times, convergingly combining the separate fibrous flake strands A, B in their course from the back rolls **10–13** to the delivery rolls **14, 15.** Each pair of drafting rolls **10, 11** and **12, 13** is driven independently of the other pair at spaced intervals of predetermined duration so that, at times, each pair of drafting rolls will rotate while the other pair of drafting rolls is at a standstill and at other times both pairs of drafting rolls **10, 11** and **12, 13** may rotate in unison. Such selective rotation of the two pairs of drafting rolls may be effected by control means such as is disclosed in my said copending application. In order to impart suitable draft to the roving-like fibrous flake strands A, B, the delivery rolls **14, 15** are suitably driven to rotate at a surface speed somewhat greater than that of the drafting rolls **10-13.**

During production of the novelty flake yarn of the present invention, at least two spun or pretwisted independent fibrous ground strands C, D are directed continuously from suitable respective sources, not shown, into the nip of the delivery rolls **14, 15.** To facilitate and ensure securement of the attenuated terminal end portions of lengths of the flake strands A, B to the ground

strands C, D as the strands are intertwisted, it is preferred that the ground strands C, D are directed into the space between the drafting rolls **10–13** and the delivery rolls **14, 15** in spaced relationship, as by means of eyelets **21, 22**, so the ground strands enter the nip on opposite sides of the corresponding flake strand or strands and then converge inwardly to be intertwisted therewith between the delivery rolls **14, 15** and the usual twisting means, not shown, spaced forwardly of the delivery rolls **14, 15.** As is well known, the twisting means may take the form of the usual ring, traveler and rotating bobbin of a twister or spinning frame.

The size and amount of twist in the pretwisted ground strands, as well as the amount of twist in the intertwisted ground strands of the yarn, and the type of fibers of which the ground strands are made, may be tailored according to a manufacturer's or customer's requirements. In a nonlimiting example, each ground strand may be a single 13-count cotton strand having a pretwist therein of about 10 to 12 turns per inch in the form of either S twist or Z twist, and these two strands may be intertwisted at about 8 to 10 turns per inch in the form of either S or Z twist.

Each flake strand A, B preferably has a minimum amount of twist therein, if any, and is preferably substantially larger or bulkier than the ground strands C, D. Each flake strand may be in the form of a .50-hank to about a 5-hank roving as fed to the back rolls **10–13**, although it is believed that a 3-hank roving would be the smallest size ever used commercially for the flake strands A, B in the production of a variegated novelty yarn according to this invention. Very pleasing aesthetic effects have been achieved by utilizing a roving of one size for flake strand A and a roving of another size for flake strand B; e.g., strand A could be formed of a .80-hank roving and strand B could be formed of a 1-hank roving.

The novelty yarn of the present invention is shown in its preferred embodiment as being formed from two ground strands C, D and lengths of two auxiliary or flake strands A, B. It is to be understood, however, that the novelty yarn may include more than two ground strands and may include lengths of more than two flake strands of relatively different characteristics without departing from the spirit of the instant invention.

Essentially, the flake type novelty yarn of this invention, generally designated at Y, comprises recurrent predetermined lengths of the first flake strand A interspersed with recurrent predetermined lengths of the second flake strand B, with the lengths of both flake strands A, B being intertwisted substantially throughout the lengths thereof with the uninterrupted ground strands C, D and arranged in a predetermined or patterned series along the length of the ground strands. Each flake strand A, B has different characteristics from the other and, preferably, the ground strands also have different characteristics from the flake strands and may have different characteristics with respect to each other.

Depending upon the result desired, the flake strands A, B and ground strands C, D may be formed of suitably chosen fibers which may be either natural or synthetic or both or blends of two or more types of fibers having different affinities such that when the strands are formed into the novelty yarn Y, the yarn may be subjected to any of the well known cross-dyeing methods to produce the effect of a space-dyed yarn of different colors or shades or combinations thereof. For example, the pretwisted ground strands C, D may be selected to have little or no affinity for the dyes to be used in dyeing the auxiliary strands A, B after the yarn Y is formed. Then, if one of the strands A and B were formed of Orlon fibers and the other of nylon fibers, the Orlon might be dyed with a "basic grey" and the nylon with an "acid red." As is well known, a wide range of dyes, and fibers having various degrees of affinity for dyes compatible therewith, are readily available to impart many different combinations of colors to the yarn Y.

Further, the fibrous strands A–C may be formed of suitably chosen fibers, some or all of which are predyed before being formed into the novelty yarn. Predyeing would also produce a yarn having sections of different colors or shades or combinations thereof. In this case, it would be possible to form the pretwisted fibrous ground strands C, D and the roving-like flake strands A, B of the same type of fibers, which are predyed different colors or shades before being formed into the yarn Y. Further, the strands A–C may be formed of suitably chosen fibers which have affinities for the same dye, but wherein one or more of the types of fibers may have a greater affinity than the other type or types of fibers such that one or more of the strands will be dyed a deeper shade than the other or others of the strands which would be dyed a lighter shade.

The novelty yarn of the instant invention may be used as the warp or filling, or both, for a woven fabric or as the yarn for a knitted fabric. By suitably choosing the different characteristics of the fibrous strands A–D, a fabric may be produced having a mottled or variegated appearance and/or a variable feel or hand along its length.

In the illustrated exemplary embodiment, the novelty yarn Y includes a first section having a plurality of relatively short lengths A1 of first flake strand A which are arranged along ground strands C, D in alternation with a plurality of relatively short lengths B1 of second auxiliary strand B. The flake strand lengths A1, B1 are spaced apart from each other to form respective flake areas therefrom with nonflake areas of the intertwisted ground strands C, D being exposed between the proximal ends of adjacent flake strand lengths A1, B1.

Because of the draft being imparted to the auxiliary strands of roving A, B, whenever either pair of drafting rolls **10, 11** or **12, 13** stops rotating, delivery rolls **14, 15** pull the respective flake strand apart. In the course of pulling the strand apart, it is attenuated so that substantial proximal terminal end portions of the two lengths of flake strand thus being formed are "feathered" or tapered. The length of such tapered terminal end portions may be several times the average staple length of the fibers, although the greater the staple length and the amount of draft, the greater is the length of the tapered terminal end portions. The amount of draft imparted to the flake strands A, B may be within the range of about four to eight.

Referring now to FIGURES 3 and 4, the fine or tapered terminal end portions of the length A1 of flake straind A are each designated at A1′ and it will be observed that, as a result, at least in part, of each flake strand A, B being introduced to the nip of the delivery rolls **14, 15** between the ground strands C, D at the point of convergence thereof, each terminal end portion A1′, for example, is intertwisted with and between the ground strands C, D and, thus, is firmly secured to the ground strands. In other words, at the lowermost portion of FIGURE 4 it can be seen that the first two or three turns or twists of the ground strands C, D are in contiguous or touching relationship and, in the succeeding turns thereabove the adjacent turns or twists of the ground strands C, D are separated by the respective tapered terminal end portion A1′. By referring to the lower portion of FIGURE 3, it will be noted that as the size of the taper increases in the course of the twisting operation, the length A1 of flake strand A becomes displaced in a gradual manner with respect to the ground strands C, D so that, ultimately, the flake strand length A1 and both of the ground strands C, D are twisted around each other; i.e., the two ground strands C, D are again in contiguous touching relationship and intertwisted with the flake strand length A1 throughout the extent of the medial portion of each flake area between the re-

spective tapered terminal end portions A1' of each flake strand length A1.

It will be noted that the amount of twist in the medial portion of the flake area formed of each flake strand length A1, along with the amount of twist in corresponding portions of the ground strands, is substantially less than the amount of twist present in the nonflake areas of the intertwisted ground strands. This is largely due to the fact of there being a greater number of ends in the medial portion of each flake area as compared to the number of ends in the nonflake areas of the ground strands. Thus, it can be appreciated that the medial portion of the flake area formed of each flake strand length A1 is in the form of flake strand spirals with a turn of the ground strands C, D positioned between adjacent pairs of turns of the corresponding flake strand.

Although the flake strand lengths B1 are not shown in detail, it is apparent that the flake strand lengths B1 would appear substantially the same as that described with respect to the flake strand length A1 shown in FIGURES 3 and 4, with the exception of the differences in the characteristics of the respective strands A, B from which the strand lengths A1, B1 are formed.

Referring again to FIGURE 2, it will be observed that the novelty yarn Y may include at least one section formed from coextensive lengths A2, B2 of both respective flake strands A, B plied and intertwisted with the ground strands C, D. In this instance, and as best shown in detail in FIGURE 5, both flake strand lengths A2, B2 are of substantially the same length and they are intertwisted with each other and with the ground strands C, D. Thus, depending upon the bulk of flake strands A, B, at least the centermost portion of the flake area formed of the two intertwisted flake strand lengths A2, B2 includes alternating turns of relatively different characteristics or colors. Since the amount of twist or turns per inch in the yarn increases proceeding outwardly from the medial portion of the flake area formed of flake yarn lengths A2, B2, the ground strands C, D may be visible between adjacent turns of the flake strand lengths A2, B2 adjacent the terminal end portions of these flake strand lengths. In other respects, the flake are shown in FIGURE 5 may be constructed in substantially the same manner as the flake area shown in FIGURE 3.

The yarn Y also may include a flake area in which three or more lengths A3, B3 of the respective flake strands A, B are arranged in alternating relationship with the proximal ends only of adjacent flake strand lengths A3, B3 being overlapped and intertwisted as shown in detail in FIGURE 6. In this instance, it is apparent that the proximal overlapping portions of the adjacent strand lengths of different characteristics would constitute a composite of said different characteristics while the nonoverlapping portions of the corresponding flake strand lengths A3, B3 would exhibit a spiral-like configuration having the characteristics of only one of the flake strands intertwisted with the ground strands C, D.

In the central portion of FIGURE 1, it will be observed that the yarn Y may include longitudinally spaced flake areas formed of lengths A4, B4 of the respective flake strands A, B. Essentially, this section of the yarn Y containing the flake strand lengths A4, B4 is illusrtated to show that two or more consecutive lengths of either of the flake strands A, B may be positioned between an adjacent pair of flake strand lengths formed of the other strand. In other respects, the flake areas formed of the strand lengths A4, B4 may each be formed in the same manner as that described with respect to the flake strand lengths A1 with particular reference to FIGURES 3 and 4.

As shown in the upper right-hand portion of FIGURE 2 and in FIGURE 7 by way of example, the yarn Y may include a section or sections in the form of composite flake areas in which a length A5 of the first flake strand A is of substantially greater extent than a length B5 of the second flake strand B. It will be noted that the flake strand length B5 is intertwisted throughout its length with the ground strands C, D and with the flake strand length A5. Additionally, the strand length A5 extends beyond both of the terminal end portions of the flake strand length B5. In other respects, the flake area formed of the two different lengths A5, B5 may be constructed in the same manner as that shown in FIGURE 5.

As a further example, the lower right-hand portion of the yarn Y in FIGURE 1 is shown provided with a flake area comprising a single length A6 of flake strand A which is substantially longer than the combined length of two longitudinally spaced relatively shorter lengths B6 of the other flake strand B. From the foregoing description, it is apparent that the flake area composed of the strand lengths A6, B6 may be constructed in substantially the same manner as those flake areas of the yarn shown in FIGURES 5 and 7 and, accordingly, a further description thereof is deemed unnecessary.

It is thus seen that, by suitable pattern control of the intervals of rotation of the drafting rolls 10–13, many variations in the various flake areas formed in the yarn from the flake strands A, B may be produced, and the lengths of any of the various types of flake areas may be varied, as desired. It is apparent that a single uninterrupted length of the novelty yarn Y may include other forms of flake areas and may include all or any of the various forms of flake areas heretofore described in combination or individually, provided, of course, that recurrent lengths of at least the two flake strands A, B are arranged along the corresponding single uninterrupted length of the ground strands C, D. The term "relatively short," as applied herein to the lengths of the flake strands A, B of which the various flake areas are formed, has particular reference with respect to the length of the ground strands, although the flake strand lengths B5 and B6 are also shorter or of lesser length than the respective flake strand lengths A5 and A6. In other words, each flake strand length A1–A6, B1–B6 may be of any reasonable length of from a few inches to several feet, as desired.

I claim:

1. A novelty yarn of the flake type comprising at least two intertwisted uninterrupted fibrous ground strands, a plurality of predetermined relatively short lengths of a first fibrous auxiliary strand having predetermined characteristics, a plurality of predetermined relatively short lengths of at least one second fibrous auxiliary strand having different characteristics from said first auxiliary strand, and said predetermined lengths of said first and second auxiliary strands both having at least their end portions secured between the same ones of said ground strands and being arranged in a predetermined series along said ground strands and intertwisted with said ground strands substantially throughout the extent of each respective length.

2. A novelty yarn according to claim 1, in which said ground strands each contain a predetermined amount of twist in addition to the twist resulting from the intertwisting thereof.

3. A novelty yarn according to claim 1, in which each auxiliary strand is a roving.

4. A novelty yarn according to claim 1, in which at least some immediately adjacent lengths of said auxiliary strands are spaced from each other longitudinally of said ground strands.

5. A novelty yarn according to claim 1, in which at least one of said lengths of said first auxiliary strand is spaced between an adjacent pair of said lengths of said second auxiliary strand.

6. A novelty yarn according to claim 1, in which at least one of the lengths of said first auxiliary strand is also intertwisted at least in part with at least one of the lengths of said second auxiliary strand.

7. A novelty yarn according to claim 1, wherein adjacent lengths of said first and second auxiliary strands are

overlapped and intertwisted, but only at their proximal end portions.

8. A novelty yarn according to claim 1, wherein at least one of said lengths of said first auxiliary strand is also intertwisted substantially throughout its length with at least one of said lengths of said second auxiliary strand.

9. A novelty yarn according to claim 8, wherein the last-named length of said first auxiliary strand is of substantially lesser length than the last-named length of said second auxiliary strand.

10. A novelty yarn according to claim 1, in which some of said auxiliary strands are of varying lengths with respect to each other.

11. A novelty yarn according to claim 1, in which said first and second auxiliary strands are colored, but differ in color from each other.

12. A novelty yarn according to claim 1, in which said first auxiliary strand has a different dye affinity from said second auxiliary strand.

13. A novelty yarn according to claim 12, wherein at least one of said ground strands has a different dye affinity from both of said auxiliary strands.

14. A novelty yarn of the flake type comprising at least two pretwisted and intertwisted, uninterrupted fibrous ground strands, a plurality of relatively short lengths of respective first and second roving-like fibrous auxiliary strands, said first auxiliary strand having a different dye affinity than said second auxiliary strand, said lengths of auxiliary strands being arranged in a predetermined series along said ground strands and interwisted with said ground strands in the form of flake areas, at least some adjacent flake areas being spaced apart and providing therebetween exposed nonflake areas of said intertwisted ground strands, the auxiliary strand of each flake area having tapering terminal opposite end portions secured between the same ones of said ground strands by virtue of the intertwisting of the ground strands, the amount of twist in the medial portion of each flake area between the respective tapering terminal end portions (along with the amount of twist in corresponding portions of said ground strands) being substantially less than the amount of twist present in said nonflake areas of said ground strands, and said medial portions of said flake areas being in the form of auxiliary strand spirals with turns of said ground strands positioned between adjacent turns of the respective auxiliary strands.

15. A novelty yarn of the flake type comprising at least two pretwisted and intertwisted, uninterrupted fibrous ground strands, a plurality of relatively short lengths of

respective first and second colored roving-like fibrous auxiliary strands, said first auxiliary strand being a different color than said second auxiliary strand, said lengths of auxiliary strands being arranged in a predetermined series along said ground strands and intertwisted with said ground strands in the form of flake areas, at least some adjacent flake areas being spaced apart and providing therebetween exposed nonflake areas of said intertwisted ground strands, the auxiliary strand of each flake area having attenuated tapering terminal opposite end portions secured between the same ones of said ground strands by virtue of the intertwisting of the ground strands, the amount of twist in the medial portion of each flake area between the respective tapering terminal end portions (along with the amount of twist in corresponding portions of said ground strands) being substantially less than the amount of twist present in said nonflake areas of said ground strands, and said medial portions of said flake areas being in the form of auxiliary strand spirals with turns of said ground strands positioned between adjacent turns of the respective auxiliary strands.

16. A novelty yarn of the flake type comprising at least two intertwisted uninterrupted fibrous ground strands, a plurality of predetermined relatively short lengths of a first fibrous auxiliary strand having predetermined characteristics, a plurality of predetermined relatively short lengths of at least one second fibrous auxiliary strand having different characteristics from said first auxiliary strand, said predetermined lengths of said first and second auxiliary strands having at least their end portions secured between said ground strands and being arranged in a predetermined series along said ground strands and intertwisted with said ground strands substantially throughout the extent of each respective length, and said first and second auxiliary strands each being of varying lengths with each having varying length spacing therebetween.

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JOHN PETRAKES, *Primary Examiner.*

U.S. Cl. X.R.

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