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METHOD OF HANDLING A PLURALITY OF YARNS DURING PROCESSING

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2 Sheets-Sheet 2

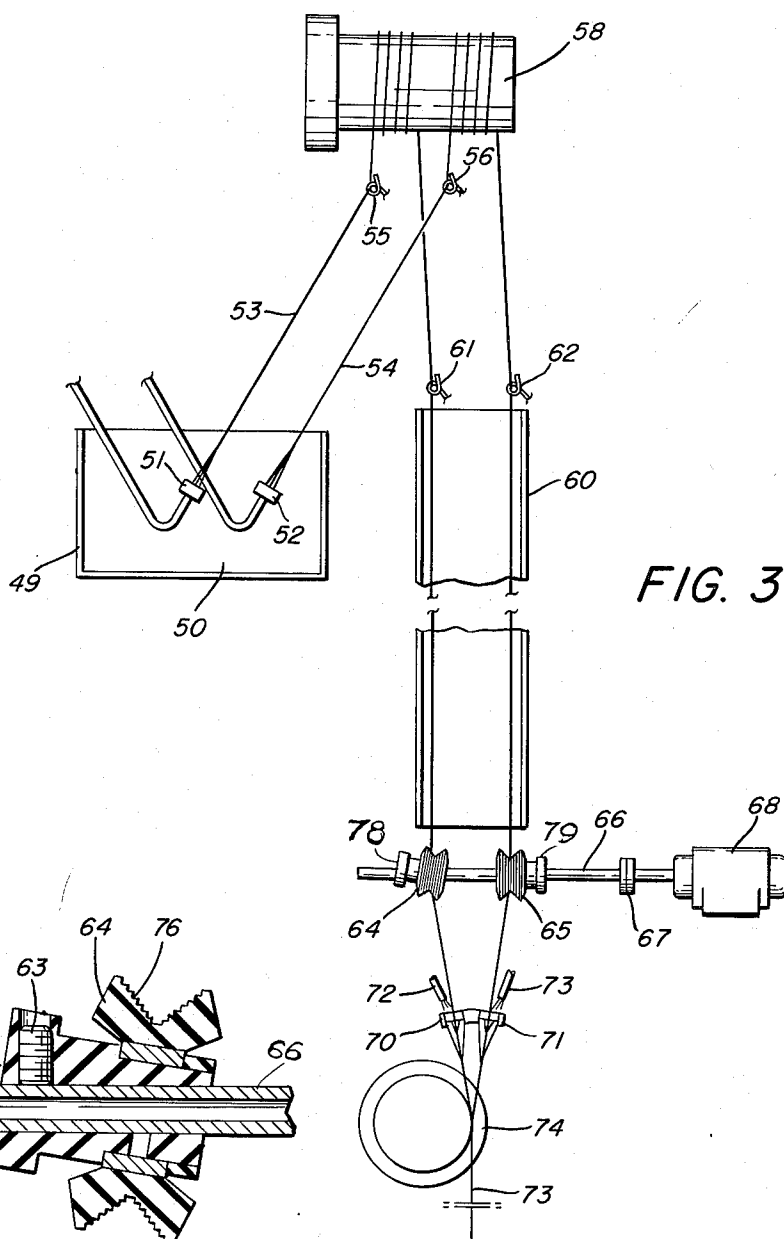


FIG. 3

FIG. 4

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METHOD OF HANDLING A PLURALITY OF YARNS DURING PROCESSING

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This invention relates to a method for handling a multiple filament yarn or a plurality of such yarns in the form of a bundle over one or more yarn-storing, yarn-advancing devices as a helix while a treatment or a plurality of treatments are performed thereon. More particularly, the method contemplates the handling during continuous spinning of at least two yarns, initially, separately formed, then subjected to a false twisting operation and thereafter combined as a unitary bundle or strand that is advanced over the handling apparatus on which one or more treatments are applied, the imparted twist enabling a manual and natural separation of the bundle and a separate collection of the constituent individual yarns.

The method is advantageous in the manufacture of viscose rayon by the continuous process. The general method for continuously spinning viscose rayon is to form a singles yarn of many filaments and aftertreat such singles yarn as it travels over various thread handling devices. Each yarn, as an individual end, is advanced over a consecutive plurality of yarn-storing and advancing devices or other devices whereon it is subjected to various aftertreatments which yield a final product of desired characteristics. The apparatus handling such yarn is complicated and expensive and, generally, it is limited to a single yarn end. It would be advantageous as well as economical to spin or handle more than one end over the same apparatus or a part of it.

Methods have been proposed for the handling of a plurality of yarn ends over the same helix forming devices, the ends, however, are run separately as individual, parallel helices and not as a unitary bundle in the form of a strand. Where the yarns are permitted to bundle the final product generally is in the form of a rope or strand which is not divided out or separated into individual yarn ends. Where the yarn ends form parallel helices and no overlapping of the turns are permitted, substantial duplication of apparatus is required. The ends are separated throughout a processing treatment essentially for purposes of maintaining division for individual yarn end collection.

The present invention advantageously inserts a false twist into each yarn end prior to combining them into a unitary bundle that is to be subjected to a processing step. The inserted false twist alternates in direction and the points of reversal are staggered relative each other along their yarn lengths. The insertion of the false twist is continuous so long as the yarns are spun, thus retaining their identity while bundled as a single strand during subsequent treatments when in the form of a passing helix, after which they are readily, naturally, separated and collected as individual yarns.

A further advantage of this method lies in that a relatively simple means can be utilized to insert the false twist in the yarns and that such means are flexible in that they may be installed at a most advantageous point in a continuous process where bundling of the yarn ends is found to be desirable for economical operation. Except for the twist imparting mechanism no further duplication of apparatus is required. The two or more ends travel as one over a continuous process apparatus.

The advantages of this invention will be apparent from

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the following detailed description taken in connection with the accompanying drawing where:

FIGURE 1 represents, in diagrammatic form, a process for continuously spinning at least two yarns;

FIGURE 2 represents the one form of device for imparting false twists to the spun yarns shown being included in FIGURE 1;

FIGURE 3 represents a modification in position and another form of a twist imparting device; and

FIGURE 4 represents the further modification of a twist imparting device shown in FIGURE 3.

Referring to FIGURE 1, a viscose spinning process arrangement, two (or more) spinnerets 12 and 13, are disposed in a tank 10, containing a suitable, conventional acid spinning bath 11. Each spinneret extrudes a thread 15, 16 which pass over separate twist imparting rollers 17 and 18 respectively, the rollers rotating freely on their axes passing thereover in frictional contact to the first of a series of yarn processing and thread advancing reels 20. The combined yarn bundle advances over the take-up or withdrawing reel 20 in generally helical form, each turn being separated from adjacent turns. Thread advancing reels as described in the Knebusch U.S. Patent No. 2,210,914, or double roller devices spaced and askew relative each other allow chemical and physical yarn preparation by providing storage, orientation and chemical treatment, as by a chemical solution spray 38.

The yarns 15 and 16 may be combined on the first of the reels 20, as shown in FIGURE 1, or on a later reel (reel 74 in FIGURE 3) but there is an advantage in being able to handle the multiple bundle as a single thread initially by obtaining threading up of as many of the following processing reels as early in the process as possible, as in FIGURE 1. As the combined threaded yarn 35 leaves the last of the processing reels 37 whereon it is advantageously dried, it is passed through a guiding means 40 where it is separated into original yarns and these are then separately taken up as packages 43 and 45, led thereto by separating guides 41 and 42 onto package winders 44 and 46.

The purpose of the rollers 17 and 18, is to impart a false twist to the individual yarns 15 and 16, to enable them to be temporarily combined as a single thread 35, and in a manner that the false twist will preserve their identity during processing and handling until their separation at guide 40 into the original yarns 15, 16. To false twist the individual yarns for such purpose it is necessary that one or both bundles be individually twisted, preferably alternately in one direction and then in the opposite direction. False twisting in one direction only would shortly make identity preservation difficult because the twisting ability of the twisting device, such as rollers 17 or 18, would cause a certain number of turns to be accumulated in the yarn prior to its contacting of the said rollers, and the twist in the yarn passing from the rollers onward would approach zero turns per inch. If the twisting ability of the false twisting device is periodically, or preferably continuously varied, the number of turns per inch in the yarn approaching the twisting device will for more than an instant equal the instantaneous twisting ability of the twisting device; the difference in turns per inch will pass through the device to the bundles, enabling their temporary bundling for subsequent processing procedures. For example, if at a given instant the yarn 15 entering the twisting device 17 contained 0.1 turn per inch twist in the S direction when the pulley 17 was so oriented as to be capable of inserting 0.3 turn per inch in the S direction to the approaching yarn, the yarn 15 leaving the roller 17 would have an instantaneous twist of about 0.3 minus 0.1 or 0.2 turn per inch in the Z direction. In another example, at another

time the yarn might be entering the twister with 1.0 turn per inch S when the roller was so oriented as to insert only 1.0 turn per inch S in the approaching yarn, in which case the yarn leaving the roller would instantaneously have zero twist. In a third example, at a later time, the approaching yarn might have a twist 0.5 turn per inch S, when the twister was oriented to produce a twist of 0.1 turn per inch in the Z direction in the approaching yarn; in this case since the incoming twist which passes through is in the direction to aid or augment the twist being inserted by the twisting device, the yarn leaving the device would have an instantaneous twist of 0.5 plus 0.1 or about 0.6 turn per inch in the S direction. The apparent anomaly in the twist directions given in the examples arises from the inherent character of false twisting wherein a device which twists yarn "falsely," that is by rotating a section of material with respect to its ends, inserts twist in one direction in the yarn approaching it and in the opposite direction in the yarn leaving it.

In the twist inserting embodiment shown in FIGURES 1 and 2, the twisting capability can be continuously and gradually varied by changing the position of the plane containing line 2—2, which includes the axes of both rollers, with respect to each of the planes which include the yarn leaving and approaching its roller. The rollers 17, 18 are supported by a common yoke 22, which is in turn supported by shafts 23 and 24, whose axis preferably passes through the rollers. The yoke position is changed continuously by arm 25, link 26, and lever 27 pivoted about fulcrum 28, as the follower 32 rides the surface of the yoke positioning cam 29, mounted on and driven through shaft 30 secured to a prime mover 31.

The cam 29 advantageously is made so that (a) the rollers 17 and 18 spend minimum time at the ends of the stroke where the false twist passed on to the process is zero, because, as in the example, the twist before the rollers equals their twist insertion capability, and (b) the rate of change of angle is approximately constant during the rest of the stroke, to produce as evenly distributed false twist as possible in the separate yarn bundles. If the two yarns are joined on the reel an equal yarn length from the rollers, as illustrated, the zero twist points will be adjacent in the combined thread during processing. By initially stringing the threads so that one has a few turns of helix before it is joined by the other, a staggered zero twist condition is obtained.

In the more detailed view of the rollers and yoke of FIGURE 2, it is shown that although the axes of the rollers 17 and 18 are coplanar and, as described above, also coplanar with the yoke 22 supporting axles 23 and 24, there is an angle-X by which the roller axes may be made nonparallel. This angle is required to keep threads 15 and 16 from rolling off of either roller 17 or 18, despite the fact that their points of origin are not identical, due to the necessary spacing of the spinnerets 12 and 13.

A further embodiment of my invention is shown in FIGURES 3 and 4 where advantage is taken of the normal spinning machine construction to provide a simple, rugged, inexpensive method of application in an area where the yarns are substantially set-up. The single yarns 53, 54, which are to be bundled as a single thread bundle for later separation, originate in the extrusion spinnerets 51 and 52, positioned in a spinning tank 49 containing a desirable spinning bath 50. The yarns are separately drawn by and individually stored on the first processing reel 58, initially as separated packages, the identity of each being maintained by the positioning guides 55 and 56 on the supply side and guides 61 and 62 on the removal side of the reel. The separated yarns then pass through the transfer chute 60 and make a small angle contact with false twisting pulleys or sheaves 64 and 65. The threads pass a short distance beyond the pulleys to guides 70 and 71 where a treating solution can be applied with applicators such as 72 and 73. The guides 70 and 71 may advantageously be oriented so that each

thread can pass in a substantially straight path to a joining point on the circumference of the next processing reel 74. Thenceforth, the two yarns can be handled as a single thread bundle as in FIGURE 1, until they are separated for winding into separate packages.

The construction of the false twisting pulleys 64 and 65 of FIGURE 3 is made clearer by FIGURE 4, where one of them is shown in greater detail. Each individual bundle makes a small angle contact and change of direction in passing behind its pulley, 64 or 65; the change in direction is such as to include a small degree of wrapping, in a plane perpendicular to the pulley support shaft 66, and at the same time convert the threads from parallel to convergent paths, as illustrated. Referring to FIGURE 4, the surface 76, contacted by the yarn, is prepared by concentric minute grooving to increase the frictional torque for imparting the twist. The pulley 64, itself is freely rotatably mounted on an antifriction bearing surface portion of an eccentric bushing 78 which in turn is affixed firmly to the shaft 66 by the set screw 63. The shaft 66 is rotated slowly through coupling means 67, by a prime mover 68. The coupling means 67, may, if desired, be arranged to provide nonconstant rotational programming. As the eccentric bushings 78, 79 are rotated by the rotation of supporting and programming shaft 66, the planes of rotation of the pulleys 64 and 65 nutate, causing the required continuous variation in false twister twisting capacity.

A requirement for optimum practice of my invention consists in providing adequate twist "storage" distance. This, in FIGURE 1, is the distance between the rollers 15 or 17, and spinnerets 12 or 13, for each thread and, in FIGURE 3, the distances between the pulleys 64 or 65 and the guides 61 or 62, which constitute the last frictional restraint above the transfer chute 60. The longer the storage distance in a programmed false twister the greater the lengths of twisted yarn between twist reversal points which can be produced. It should be noted that for a given yarn speed and denier, the more rapidly shaft 66, of FIGURE 3 or cam 29 of FIGURE 1 is rotated the higher the false twist produced and the shorter the length of twisted yarn between twist reversal points; the total number of turns which can be provided between reversal points is a constant when thread speed, twisting device total angular excursion and bundle diameter are constant.

An advantageous feature of the FIGURE 3 embodiment is that by merely properly setting the eccentric bushings, 78, 79, of pulleys 64 and 65, it can be arranged that the angle subtended between the intersections of the planes including both the axis of shaft 66 and the eccentric axes of the eccentric bushings in a plane perpendicular to shaft 66 can be of any desired size; this establishes the condition that the temporarily joined, separately false twisted threads will not proceed through the process with zero twist points adjacent each other in the separate yarns which condition aids final thread separation.

Generally, and as stated in the examples, the amount of false twist inserted into the running is sufficient to naturally separate the yarn bundling after a final drying step. The individual yarns tend to naturally assume their identities so that no further step is generally needed to divide them. An operator can readily manually separate the divided out yarns by merely providing a momentary condition of low tension, manually. Of course where the false twist is of a very low value of perhaps one turn to about 20 to 40 inches then a further means, such as a serrated surface would be temporarily needed to back up the twist and thus cause a bundling of the filaments of each yarn to itself. Such low twist, however, being not best for ease of operation of the separation step, natural separation is to be preferred.

What is claimed is:

1. Method for the separation of at least two yarns combined into a unit bundle for subsequent processing com-

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prising, a source of at least two yarns, inserting a periodic false twist into each of said yarns, combining the oppositely twisted yarns into a bundle, processing said bundle, and dividing out said bundle, the division being effected naturally by the contained twist in each of said yarns.

2. Method for the separation of at least two yarns combined into a unit bundle for subsequent processing comprising, a source of at least two yarns, inserting a periodic false twist into each of said yarns, said insertion being staggered so that the zero twist transition points do not coincide, combining the false twist yarns into a bundle, processing said bundle, and dividing out said bundle, the division being effected naturally by the false twist contained in each of said yarns.

3. The method described in claim 2 where the false twist is inserted into each yarn before a processing step.

4. The method described in claim 2 where the false twist is inserted substantially immediately after formation of said yarns.

5. The method described in claim 2 where the false twist is inserted into each of said yarns prior to their take-up by a thread advancing device.

6. The method described in claim 2 where the false twist inserted into each of said yarns is in the magnitude of up to about one turn per inch.

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7. The method for handling a plurality of continuously spun viscose rayon yarns comprising, extruding a viscose solution from a plurality of sources into an acid coagulating bath to form multiple filament yarns, continuously imparting false twist to each of said yarns after their formation, combining said twisted yarns into a strand, subjecting the strand to at least one processing treatment, manually dividing said strand into the constituent false twist containing yarns, and collecting said individual yarns.

8. The method of claim 7 where the strand is subjected to at least one chemical solution processing treatment and to a drying step thereafter before separation into constituent yarns.

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