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METHOD AND APPARATUS FOR THE SEPARATION OF A RUNNING STRAND COMPRISED OF A PLURALITY OF LOW TWIST YARNS

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Fig. 1.

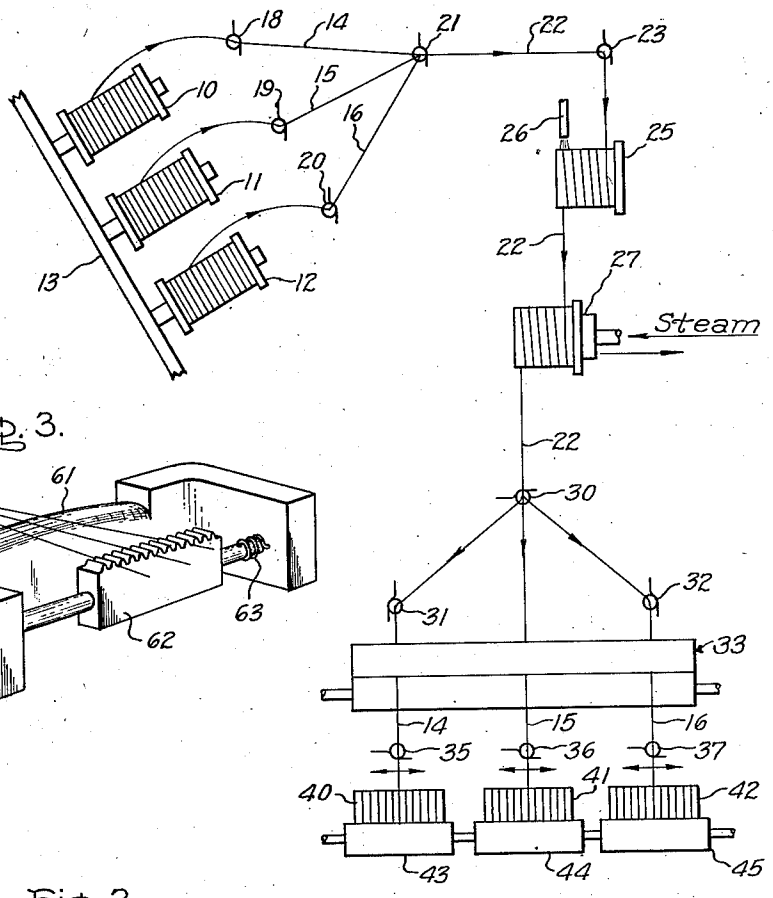
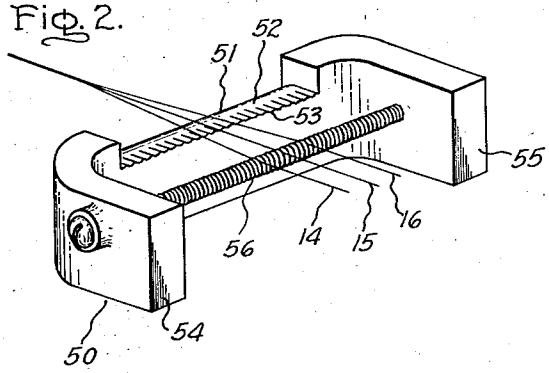


Fig. 3.

Fig. 2.



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METHOD AND APPARATUS FOR THE SEPARATION OF A RUNNING STRAND COMPRISED OF A PLURALITY OF LOW TWIST YARNS

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8 Claims. (Cl. 28—1)

This invention relates to a method and apparatus for the separation of yarns that have been brought together to form a strand for subjection to a processing treatment or treatments. More specifically, this invention relates to a method for the separation of such a strand wherein the strand forming yarns have low twists and to device for effecting the separation of the strand into constituent original yarns.

It is advantageous and economical to combine a plurality of yarns having low twist into a single bundle, or strand, wherein the yarn filaments are laid in a generally parallel relation then such strand being subjected to a processing treatment or treatments while it is advanced over a reel or a series of reels in the form of a helix. When the treatments have been completed the strand is separated while running into the original constituent individual yarns. Yarn processing apparatuses utilizing thread advancing reels can thus be more advantageously employed since more than one yarn can be processed thereon, than as generally presently practiced.

Processing of bundled yarns is advantageous if a separation of the bundle into constituent yarns can be easily and readily effected. To facilitate the separation of yarns from a strand or bundle back into constituent yarns it has been found that an imparted twist in each yarn prior to the formation of the strand will enable such yarn, after processing, to be more easily separated from the other yarns in the strand. The imparted twist in the yarns tends to helically group the filaments of each yarn isolating it from the others. The grouping of the filaments in each yarn is effected when the twist is forced back or contained to a limited length of the yarn; when each yarn is thus individualized it is readily handled and easily separated from the remaining yarns.

A twist may be imparted to the yarns at a yarn supply source prior to combination with other yarns to form a strand or bundle for subsequent processing over threads advancing reels, or the twist may be imparted to the yarns at the time of their spinning or formation by means of rotating spinnerets. Generally, a low twist is preferred since the strand is more thoroughly and readily processed when the filaments comprising each yarn are laid in a relatively parallel relation.

The strand separating device of this invention is adapted to be manually manipulated to easily affect a separation of yarns. Generally, it comprises a preliminary strand flattening surface then a separating surface, serrated or comb-like, for separating and maintaining and guiding separated yarns until they are placed upon their respective take-up devices. A running strand or bundle is first laid onto a surface, flattened thereon, then substantially immediately brought into contact with the serrated or comb-like surface forcing a separation by forcing back the twist in each yarn. Should stray filaments of an adjacent yarn be in the same depression of the serrated surface as the twist is backed up they will be pulled into their respective constituent yarn.

The operation for the separation of the yarns from the strand having at least two or three yarns can be readily performed in a matter of a few seconds. The undulating or serrated surface is brought into contact with a running strand somewhere between two spaced points of support. A slight pressure on the strand by the separator flattens the filaments of the yarns in the strand, spreading them. Some filaments will immediately slip into grooves or depressions of the separator and others of the same yarn will follow. Also, some filaments from adjacent yarns will tend to, momentarily, follow those already in grooves. Such stray filaments are quickly pulled back by the parent yarn as the twist in that yarn is forced back, or localized, by a raised portion or projection of the separator surface tending to group all of the filaments into a unit yarn. The grouping of these spread filaments is effected by a high point or a serration of the separator protruding through the spread filaments and against which the twist is brought the grouped filaments, as a yarn, eventually slipping thereover into a depression of the separator and continuing therein until manually displaced onto a subsequent advancing or collecting device. More specifically, a strand travelling at about 100 meters per minute and formed of at least three yarns of about 50 denier each, and each yarn having a twist of about one turn for every 200 inches, a separation can be effected in about three to about seven seconds.

The aforesaid advantages of the strand separating device will be more fully understood from the following description taken in connection with the accompanying drawing where:

Figure 1 represents a processing apparatus whereon a strand, being advanced in the form of a helix, is subjected to one or more processing steps;

Figure 2 represents the strand separating device of this invention; and

Figure 3 represents a modification of the device of Figure 2.

It has been found that a plurality of yarns can be advantageously and economically bundled together without regard to their separate maintenance while on a thread advancing device and processed thereon as a single strand. As many as three or four yarns of low denier can be brought together, similarly processed, then separated for individual collection. The strand, by means of this invention, can be readily separated into the constituent components forming it after processing.

Referring to the drawing a plurality of packages **10**, **11**, **12** are suitably mounted on a creel **13** (generally shown) and yarns **14**, **15**, **16**, having only the twist imparted to them while being drawn, are withdrawn from them through guides **18**, **19**, **20** positioned so as to impart a twist in each yarn. The yarns **14**, **15**, **16** are then bundled or gathered by guide **21** to form a strand **22** of generally parallel yarns each having a low twist. The strand **22** is then led through guide **23** to a processing reel **25** whereon it is formed into a helix and advanced therethrough to a subsequent processing reel **27**, on which it is dried. The reels may be of unitary construction based on the principles disclosed in the Knebusch Patent 2,210,914, or they may be of double rollers. While on the reel **25** the strand helix is subjected to a processing step as generally indicated by the liquid applying tube **26**. The strand may be washed, oiled, or some other desired liquid treatment may be applied.

After a liquid processing step the strand **22** is led to the drying reel **27** whereon it is also formed into a helix and advanced therethrough. The drying reel **27** can be heated by the circulation of steam (or a hot liquid) through its interior. After the drying step the strand is then divided into its constituent yarns by backing up the twist in each yarn, and each of the yarns then separately collected.

As shown in the drawing, after leaving the drier reel **27**, the strand **22** is led through a guide **30**, beyond which it is separated into the three constituent yarns **14**, **15**, **16**. The division of the strand **22** into the original three yarns is effected readily by the apparatus or device shown in Figure 2 of the drawing. After division the yarns **14**, **15**, **16** are led through guides **31**, **32** and then to a pair of draw rollers, generally indicated at **33**. The draw or nip rollers **33** correlate the drawing rate of the yarns to the let-off rate of the strand **22** from the drier reel **27**. The strand is then passed through guides **35**, **36**, **37** to the collecting packages **40**, **41**, **42** surface driven by rollers **43**, **44**, **45**. The draw rolls **33** also insure the constant feed of the yarns to their take-ups, and they provide for a holding device for the yarns during their division.

The strand separating device of Figure 2 is formed of a generally U-shaped support **50** having a recessed base **51**. The base **51** has an initial surface **52** that is smooth and rounded in the transverse direction. The surface then becomes gently serrated or undulated as at **53**. There is positioned in the extensions or sides **54**, **55** of the U support **50** a threaded bolt **56**. The helical screw surface of the bolt **56** provides further well defined serrations which are utilized for final yarn separation.

When the strand **22** passes through the guide **30** of Figure 1 it is generally placed into a conveniently positioned aspirating tube (not shown) so as to continue the drawing off of the strand **22** from the last processing reel **27**. The device of Figure 2 is brought into frictional contact with the strand **22** after the guide **30**; the surface **52** of the guide being first to frictionally contact the strand, then the undulations **53**, and finally the serrations of the screw **56**. When the strand **22** is initially laid on the smooth surface **51** it is flattened out and the filaments in the respective yarns substantially immediately tend to regroup. The slight pressure on the strand thus effects an initial rough separation of the yarns because of a backing up of the twist in each of the yarns comprising the strand, the twist entwining and grouping the filaments of each yarn. The flattened yarns and the separated filaments are then separated to a greater extent by the undulations **53** beyond the smooth, initial contacting surface **52**. The undulations tend to more definitely back up the twist by protruding into the spread yarns to divide out the constituent filaments to the respective yarns. Once the separation is substantially effected by the undulations **53** the yarns are then passed over the screw **56** wherein they tend to find a recess and become bundled therein. Should a filament or several filaments from adjacent yarns become temporarily associated with another yarn then the twist in the yarn to which the filament rightfully belongs will draw it back into the yarn as it is backed up by the protrusion of the raised portion of the serrated surface into the spread yarns. In effect, the backed-up twist is like a knot about the filaments.

The aforesaid separation of a strand is effected quite rapidly by the described process. Depending upon the diameters of the supply spools **10**, **11**, **12** a twist of about one turn for every 15 inches is imparted to the yarns during drawing. Higher twists are generally undesirable for a higher twisted yarn is an individualized yarn and a processing of such yarn would not be as practicable nor as economical when formed into a bundle as when the yarns contain low twist, and also the herein described method hardly useable. A strand formed of three 150 denier spun yarns having a twist of about one turn for every 200 inches can be separated in about three to seven seconds traveling at a rate of about 100 meters per minute.

A modification of a strand separating device is shown in Figure 3. The initial contacting surface **61** contained in the base of the U-shaped member **60** is rounded in the transverse direction and arcuate in the longitudinal direction. The arcuate surface **61** when in physical contact with the strand **22** will cause the separation of the filaments spreading them and simultaneously backing up

the twist in the running yarns by the frictional contact. The backing of the twist in the yarns effects a preliminary but substantial separation of the yarns by grouping. Immediately thereafter the preliminary grouped yarns are placed into contact with a comb **62** each moving yarn finding a recess therein. Should stray filaments occur then a tooth will effect a backing up of the twist in the particular yarn which will group its respective filaments. The comb **62** advantageously may be provided with a light coil spring **63** at one end to resist the backed up twist with only enough tension to maintain the comb in its upright position but to yield when a backed up twist passes over one of its teeth. The comb **62** also may be provided with a lever **64**, if desired, to overcome the operation of the coil spring **63**.

The devices of Figure 2 and Figure 3, because of their practicability, advantageously enable the processing of a plurality of fine denier yarns over the same reel or reels. The disadvantages heretofore encountered in processing a plurality of yarns over the same thread advancing devices where the yarns have to be kept apart in their travel over the reels are overcome through the use of the separating apparatus shown in Figures 2 and 3.

This invention is advantageous with continuous spinning apparatus where twist can be imparted to yarns at their formation, or with processing apparatuses where thread already has a twist, or into which thread twist is imparted, in which thread-advancing reels are utilized. Generally, a single yarn is advanced over the reels in such apparatuses. Proposals have been made to process a plurality of yarns advanced in the form of a helix but particular protection against overwinding is usually practiced so that the yarns are separately advanced in adjacent helices. As here described no separation of yarns need be had, they are bundled to form a strand then separated after processing.

What is claimed is:

1. The method for separating a moving strand formed of a plurality of multi-filament yarns laid in a generally parallel relation and each yarn having a twist, comprising; flattening a running strand to spread the filaments forming the yarns in the strand by passing said strand over and in contact with an undulating surface; separating the yarns from said strand by thrusting the raised surface areas of the undulating surface into the running spread yarns to back-up the twist in each of said yarns so as to thereby gather and group the respective constituent filaments to the corresponding separated yarns, the separated yarns then being laid in the depressed areas of the undulating surface.

2. The method for separating a moving strand formed of a plurality of multi-filament yarns laid in a generally parallel relation and each yarn having a twist, comprising; flattening a running strand to spread the filaments forming the yarns by passing said strand over and in contact with a first surface; and passing said substantially flattened yarns over a serrated second surface thrusting the raised surface projections thereof into the running and spread yarns to back-up the twist in each of said yarns so as to thereby gather and group the respective constituent filaments to the corresponding separated yarns, the separated yarns then being separately laid in the depressions of said serrated surface.

3. The method for separating a moving strand formed of a plurality of multi-filament yarns laid in a generally parallel relation and each yarn having a twist, comprising; flattening a running strand to spread the filaments forming the yarns by passing said strand over and in contact with an arcuate first surface; backing-up the twist in each of said running yarns to thus initially group the constituent filaments to the corresponding yarns; and passing said substantially separated yarns over a serrated second surface thrusting the raised surface projections into the running yarns to more positively back-up the twist in each of said yarns so as to thereby positively

gather and group the respective filaments to the corresponding separated yarns, the separated yarns then being separately laid in the depressions of said serrated surface.

4. The method for separating a moving strand formed of a plurality of multi-filament yarns laid in a generally parallel relation and each yarn having a low twist, comprising; passing said running strand in contact with a first surface to flatten it and to spread the filaments forming the yarns; then passing said running spread strand over and in contact with an undulating second surface; the undulations further spreading said strand and effecting a backing up of the twist in each of said yarns to thus initially group the constituent filaments of the corresponding yarns o effect a substantial separation of the yarns; and passing the substantially separated yarns over a serrated third surface thrusting the raised surface projections thereof into the running yarns to more positively back-up the twist in each of the yarns and thereby gather the respective filaments to the corresponding separated yarns, the separated yarns then being separately laid in the depression of said serrated surface.

5. An apparatus for the separation of a moving strand formed of a plurality of multi-filament yarns laid in a generally parallel relation and each of said yarns having a twist comprising; a support; and an undulating surface in said support over which the strand passes in contact substantially flattening the strand and spreading the filaments of the yarns comprising said strand; the raised portions of the undulating surface effecting a backing up of the twist in each of said moving yarns forcing the constituent filaments to the corresponding entwisted passing yarn.

6. An apparatus for the separation of a moving strand formed of a plurality of multi-filament yarns laid in a generally parallel relation and each of said yarns having a low twist comprising; a support; an arcuate first surface in said support over which the strand passes in contact substantially flattening the running strand and spreading the filaments of the yarns comprising said strand; and a second undulating surface in said support over which the spread yarns are passed, the raised portions of said undulating surface effecting a positive backing-up of the twist in each of said yarns forcing the constituent filaments to the corresponding passing yarns.

7. An apparatus for the separation of a moving strand formed of a plurality of multi-filament yarns laid in a generally parallel relation and each of said yarns having a low twist comprising; a support; a smooth first surface in said support over which the strand passes in contact for flattening the running strand and spreading the filaments of the yarns forming the strand; an undulating second surface in said support over which the running strand next passes in contact, the undulations being thrust into said spread yarns to further separate the respective yarns, generally grouping the constituent filaments to the respective yarns; and a serrated third surface in said support over which the spread yarns are passed, the serrations effecting a positive backing-up of the twist in each of said yarns forcing the constituent filaments to the corresponding passing yarn.

8. An apparatus for the separation of a moving strand formed of a plurality of multi-filament yarns laid in a generally parallel relation and each of said yarns having a low twist comprising; a support; an arcuate and a smooth first surface in said support over which the strand passes in contact for flattening the running strand and spreading the filaments of the yarns forming the strand; a rotatably mounted comb in said support over which the running strand next passes in contact, the projections of the comb effecting a positive backing-up of the twist in each of said yarns to thus group the constituent filaments to the corresponding moving yarn; resilient means in said support for resisting the rotation of said comb; and a lever attached to said comb for turning said comb.

No references cited.