

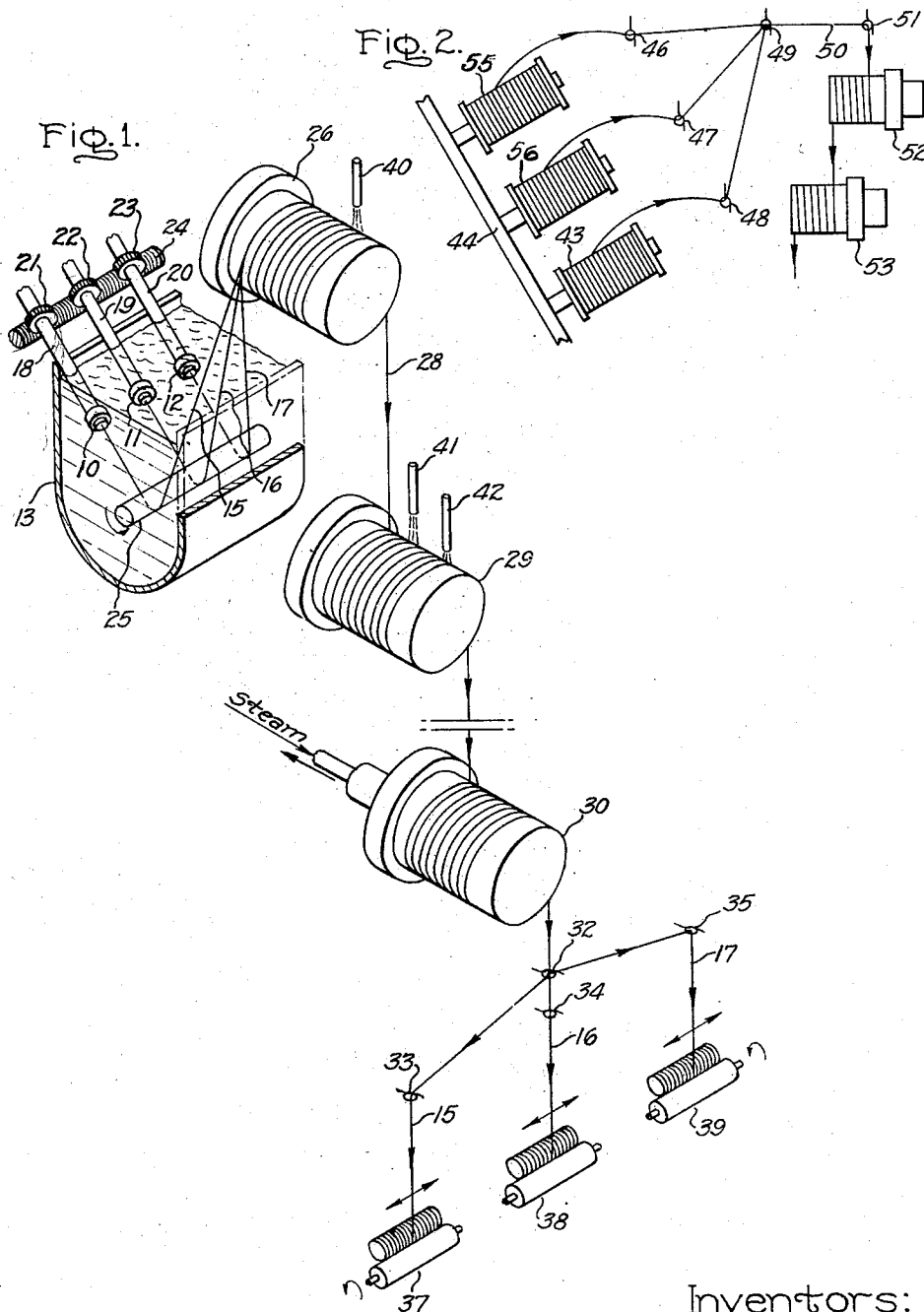
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METHOD FOR HANDLING A PLURALITY OF YARNS

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METHOD FOR HANDLING A PLURALITY OF YARNS

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This invention relates to a method for handling a plurality of yarns as a single helix over a yarn-storing, yarn-advancing device, or in a continuous manner over a plurality of yarn-storing and yarn-advancing devices. More particularly, the invention relates to a method for handling a plurality of yarns (at least two), initially separately formed, but thereafter conducted as a unitary bundle or strand, over a yarn-storing, yarn-advancing device or a plurality of such devices in the form of a helix subjected to one or more treatments, then separated and collected as individual yarns.

Generally, in the manufacture of viscose rayon by the continuous process, it is the custom to form and then after-treat a single yarn composed of a plurality of filaments. During processing, such a yarn is advanced over a consecutive plurality of yarn-storing and advancing reels in the form of a helix. While in the form of a helix, various after-treatments are applied to the yarn to finally yield a product having desired characteristics. Thus, yarn is spun, after-treated, and collected as a single yarn. It would, of course, be advantageous and economical to spin or handle a plurality of separate yarns as a single strand over the same yarn-storing, yarn-advancing reels.

Various methods have been suggested for the handling of a plurality of yarns over the same helix forming and advancing reels. Generally all of these proposals teach that the separate yarns are maintained apart and out of contact with each other and that no over-lapping of turns should occur while being advanced over a reel. These proposals show the utilization of additional and specific yarn guiding and handling devices usually before and after a reel, and provide that the reel itself should be of a critical construction so as to prevent an overlap of the separate yarns being advanced. Bundling of yarns by these proposals is avoided because of over-winding or under-winding of the thread turns and resultant breakage.

In accordance with this invention a plurality of yarns (two or more) are brought together and advanced together as a substantially united single strand over one or more reels whereon it is subjected to one or more treating steps. While running at its processing speed the strand is then separated into its original, constituent, individual yarns, and then collected on separate collecting devices. Initially, and prior to the formation of a single strand of the plurality of yarns, there is imparted a twist to each of the yarns, or the yarns may already have a twist, and the strand is formed of a plurality of such initially twisted yarns. The twist given the yarns advantageously may be low so when the yarns are gathered into a strand the filaments of the yarns are laid generally parallel to each other in their advance over a reel. Such low twist yarns are advantageously more receptive to liquid treatment. A still further advantage in advancing a unitary strand bundle of yarn is that the pitch of a reel need not be as closely controlled as would be necessary should the yarns be maintained separately.

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After the yarn treatment and upon leaving a processing reel the running strand is separated into the individual yarns which are separately collected. The separation of the yarns is generally quickly effected by a containment of the twist in each of the yarns forming the bundle. A containment of the twist, or that point in a length of running yarn to which the twist is backed, is readily had by means of a pointed instrument (e.g. a pin) thrust into a moving, running strand which tends to individualize the yarns by driving back or forcing the twist in each yarn to back up and thereby group its constituent filaments. Once the filaments are grouped they are then placed onto separate collecting means, and formed into respective packages.

The initial yarns may be spun and the spinnerets rotated to impart a twist or, if desired, the yarn source may comprise wound packages with or without twist. Yarn from packages without twist can be pulled over-end to give a minimum twist. Yarns from any such source are then bundled to form a single strand and subjected to after treatments over a continuous processing apparatus.

A further advantage in processing a plurality of yarns in the form of a unitary bundle or strand over a reel is the ability of such a strand to clear the reel of broken filaments, i.e. stray or fugitive filaments, and thus to reduce yarn breakage. Where under normal circumstances a single yarn would be processed and filaments become broken during its helical travel over a reel the broken filaments would quickly build up to form a wrap which would eventually break the yarn. Where a plurality of yarns are advanced over a reel then each assists in carrying away or stripping off stray or broken filaments before causing complete breaks.

The advantages of this invention will become apparent from the following detailed description and the accompanying drawing where:

Figure 1 represents a continuous viscose rayon spinning apparatus adapted to handle a plurality of yarns; and

Figure 2 shows the adaptability of the apparatus for handling a plurality of formed yarns for processing.

Referring to the drawing there is shown in abbreviated form an apparatus for the continuous spinning of viscose rayon. A plurality of rotating spinnerets 10, 11, 12 are positioned in an acid coagulating bath contained in trough 13; and from each there is extruded a viscose solution which is regenerated by the bath to form yarns 15, 16, 17. The spinnerets are positioned in rotating mass tubes 18, 19, 20, being driven through gears 21, 22, 23, respectively, by the common drive shaft 24. The formed yarns 15, 16, 17 are twisted at the time of extrusion at a slow rate, a turn may be imparted at about every 200 to 600 inches of travel. The three separate twisted yarns are then passed about a rotating roll 25 supported in the trough 13 rotating at a rate correlated to the rate of extrusion of the viscose solution and to the rate of take-up of the yarns by the reel 26 positioned above the trough 13.

The three twisted yarns 15, 16, 17 are led from the bath to the take-up reel 26, each being laid thereon at about the same point on the reel surface to form a single enlarged yarn or strand for further advance in the form of a helix. From reel 26 the strand 28 is then led to and advanced over subsequent reels 29, 30 for further processing, and thereafter it is divided into the individual yarns 15, 16, 17. Upon leaving the drier reel 30 the strand 28 is passed through separating guides 32, 33, 34 and 35 to individual take-ups 37, 38, 39 where each is wound into a package.

The take-up reel 26 and all subsequent reels 29, 30, preferably are constructed on the principles disclosed in the Knebusch Patent 2,210,914. Thread and the like are advanced over such reels in the form of helices which,

depending upon the pitch between thread turns, present substantial lengths of thread for processing. Although preference is indicated for the Knebusch reel, other reels, either of unitary construction or spaced and skewed rollers can be advantageously utilized, since each is adapted to form a store of thread in the shape of a helix for economical processing.

The strand 28, formed of the three yarns 15, 16, 17, while on the reels 26, 29, 30 and while in the form of a helix, can be subjected to a desired liquid treatment or treatments that ordinarily are applied to viscose rayon yarns such as wash treatments, desulfurizing, bleaching, etc. The treatments are generally applied through tubes 40, 41, 42, the liquids spreading over and blanketing the strand helix, each yarn being equally subjected to the treatment so that upon subsequent separation each will have uniform and similar final characteristics. After liquid processing the final treatment on the strand is that of drying. As shown, drying of the strand 28 is performed on the last reel 30 through which steam is circulated. The strand 28 is then led through guide 32 beyond which it is divided into the individual yarns 15, 16, 17, each yarn being advanced to its respective collecting device 37, 38, 39, after first passing through its respective guides 33, 34, 35.

The reason for imparting a twist into the yarns 15, 16, 17 is to enable their separation after the strand 28 leaves the drier reel 30. One method successfully utilized to separate out the yarns is to thrust a sharp pointed instrument, such as a pin, into the travelling strand 28 to thus effect a backing up of the twist, or forming a node, at that point in the particular strand portion or in the particular yarn of said strand where it is pierced. This backed-up twist substantially immediately contains the twist and thus groups the filaments of the particular yarn as if tying them together by means of a knot. Another method is one where the composite strand is flattened while running over an arcuate or convex surface under a slight tension, the spread filaments are gathered or sorted by the twist into the component yarns and an interjection of a pin readily divides out the specific yarn. The individualized yarn is then temporarily passed to an air aspirator tube collecting device (not shown) leaving the operator free to effect the further division of the remaining two yarns. Once a separation of the three yarns is effected they are then passed on to their winding or collecting devices.

It has been found that there exists a relationship between the running speed of the strand bundle and the number of turns of twist for separation purposes. In general, lower twists per unit length are employed at the higher strand speeds. Thus, for example, at strand speeds of about 60 to 100 meters per minute, speeds usually employed in continuous spinning and processing methods, it is advantageous to employ one twist in lengths ranging from about 200 inches to 600 inches. For speeds lower than 60 meters per minute or for about 20 to 50 meters one may employ a twist for a shorter running strand length, e.g. ranging from about 60 to 180 inches. Also, a low twist advantageously permits the laying of the yarns, while in the strand, in a generally parallel manner for more effective processing. Furthermore, a twist in the yarn also will tend to restrict broken filaments to the original yarn body as the strand passes over the reel. The remaining yarns in the strand also assist in helping to keep the reel clean of possible fugitive wraps.

In Figure 2 of the drawing there is shown a modification of the source of supply of yarns which are formed into a strand for subsequent processing over a plurality of reels. At least three supply packages 55, 56, 43 of flat wound yarn are positioned in a creel 44 (generally shown). The flat wound yarn is withdrawn over-end through guides 46, 47, 48 positioned ahead of them then through gathering guide 49 where the yarns are combined into a strand 50 which is led through another guide 51

onto a reel 52, and thence onto subsequent reels 53, etc. While on reels 52, 53, etc. the strand 50 can be subjected to various desired processing treatments then later separated into individual yarns 55, 56, 43 in the manner hereinbefore described, and wound on separate bobbins by separate collecting means. Where yarn is withdrawn from packages and the twist is more frequent the rate of strand travel is slower, lesser drawing speeds are necessary for purposes of later separation.

The process of the present invention may be employed for the treatment of continuous-filament yarns of all types—natural fibers, e.g. silk; artificial fibers, e.g. viscose rayon, cellulose acetate or other regenerated cellulose fibers; and also synthetic fibers, e.g. those made from linear polyesters, polyamides or polyacrylics such as vinyl polymers or copolymers including those made from acrylonitrile. The new process is particularly suited to continuous-spinning methods where the extrusion and subsequent fiber processing is performed in a continuous sequence of operations such as in certain viscose rayon and cuprammonium methods. The process, however, is also advantageously suited to those methods where the spinning continuity is interrupted after the extrusion and coagulation step. Such spinning methods are usually employed in the melt and dry-spinning fields because the extrusion speed is far in excess of the speed at which the coagulated or solidified fiber could be processed on thread-advancing devices. It is with these methods that the method of Figure 2 could be employed with advantage. Thus, for example, a melt-spun polyester or polyamide fiber is first collected as a flat yarn on a package at the rate of about 1000 meters per minute. A plurality of yarns from such packages, thereafter, can be subjected to one or more treatments on a series of thread-advancing devices travelling at 30 to possibly 150 meters per minute in accordance with the method of Figure 2. Among the yarn treatments that may be applied in accordance with this invention are, applying regenerating or purifying liquids, washing with water to remove impurities; stretching, bleaching, dyeing, applying finishing or sizing materials, and drying. In the processing and after-treatment of viscose rayon which has been extruded into an acid coagulating bath, are the steps of dilute acid regeneration, stretching, washing with water, desulfurizing, bleaching, oiling and drying.

By combining several yarns into a strand and processing them while in strand form low denier yarns advantageously can be spun and processed more economically on a continuous apparatus. A plurality of low denier yarns can be thus more effectively treated over a thread advancing reel and with less stoppage for breaks than could be heretofore done. Further, a strand of low denier yarns can be advanced over thread advancing devices without additional care in the design of reels that are ordinarily required for the processing of yarns. While the invention has been described with reference to an apparatus processing three yarns in a strand it is not, of course, limited to that number and more than three can be readily handled in as advantageous a manner.

What is claimed is:

1. The method for handling a plurality of yarns for processing in the form of a helix, each of said yarns of said plurality having a twist, the steps comprising; bringing together as a single strand at least two separately twisted yarns; forming a helix of said strand; advancing said strand through said helix while subjecting it to a yarn treatment; passing said treated strand through said helix; separating said strand into the original constituent yarns by backing up the twist; and collecting said yarns into separate packages.

2. The method for handling a plurality of yarns for processing in the form of a helix, each of said yarns of said plurality having a twist, the steps comprising; bringing together as a single strand a plurality of separate yarns each having a twist; forming a helix of said strand;

advancing said strand through said helix while subjecting it to a yarn treatment; separating said strand into the original constituent yarns by backing up the twist of each yarn and thereby bringing together the constituent filaments corresponding to each of said plurality of yarns; and thereafter collecting said individual yarns into separate packages.

3. The method for handling a plurality of yarns as a single strand for processing while in the form of a helix comprising; forming a plurality of separate yarns; imparting a twist to each of said plurality of yarns; bringing together said plurality of yarns as a single strand; forming a helix of said strand; rotating said helix and advancing said strand therethrough; subjecting said strand while in the helix to a yarn treatment; separating said strand after it has passed through said helix into the original constituent yarns by backing up the twist of each yarn and thereby bringing together the constituent filaments corresponding to each of said plurality of yarns; and thereafter collecting said individual yarns into separate packages.

4. The method for handling a plurality of yarns as a single strand for processing while in the form of a helix comprising; forming a plurality of separate yarns; imparting a low twist to each of said plurality of yarns; bringing together said plurality of yarns as a single strand; forming a helix of said strand; advancing said strand through said helix while subjecting it to a yarn treatment; separating said strand after it has passed through said helix into the original constituent yarns by backing up the twist of each yarn and thereby bringing together the constituent filaments corresponding to each of said plurality of yarns; and thereafter collecting said individual yarns into separate packages.

5. The method for continuously spinning a plurality of yarns comprising; extruding a yarn forming solution from a plurality of sources; solidifying said extruded solution into yarns each having a plurality of filaments; imparting a twist to each of said formed yarns; combining said yarns into a single strand; forming a helix of said strand; rotating said helix and subjecting it to a yarn treat-

ment; dividing said strand after it has passed through said helix into original constituent yarns by backing up the twist of each yarn and thereby bringing together the constituent filaments corresponding to each of said plurality of yarns; and thereafter collecting said individual yarns into separate packages.

6. The method for continuously spinning viscose rayon comprising; extruding a viscose solution from a plurality of sources into an acid regenerating bath to form yarns; imparting a twist to each of said yarns; combining said plurality of yarns having twist into a single strand; forming a helix of said strand; advancing said strand through said helix and meanwhile subjecting it to treatment; dividing said strand after it has passed through said helix into constituent separate yarns by containing the twist of each yarn and thereby bringing together the constituent filaments corresponding to each of said yarns; and thereafter collecting said yarns separately.

7. The method for continuously spinning viscose rayon comprising; extruding a viscose solution from a plurality of sources into an acid regenerating bath to form yarns; imparting a twist to each of said yarns; combining said plurality of yarns having a twist into a single strand; forming a plurality of successive helices of said strand and subjecting each of said helices to at least one processing treatment; the last treatment of said plurality of processing treatments being that of drying; dividing said strand after the drying treatment into the constituent separate yarns by containing the twist of each yarn and thereby bringing together the constituent filaments corresponding to each of said yarns; and thereafter collecting said yarns separately.

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