PLURALITY END CRIMPING
3 Claims, 5 Drawing Figs.

U.S. Cl. .................................................. 57/157R, 28/72.14
Int. Cl. .................................................. D02g 3/28
Field of Search ....................................... 28/1.6, 72.14; 242/42; 57/157, 34

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Primary Examiner—Louis K. Rimrodt
Attorney—Birch, Swindler, McKie & Beckett

ABSTRACT: The method of crimping yarn in a stuffcrimper wherein two or more ends are introduced side by side into the crimmer chamber to form cores of crimped filaments which are advanced together through the crimmer. The crimped ends are extracted from the respective cores at the discharge end of the crimmer, and are combined and wound together onto a winding to form a yarn composed of readily identifiable ends.
PLURALITY END CRIMPING

This invention relates to a method for crimping continuous filament yarn and has for an object to provide a method having improved operating characteristics.

Another object is to provide a method of the above type which eliminates various difficulties heretofore encountered in crimping certain types of filaments in a stuffer crimmer.

Another object is to provide a method for crimping filaments in a stuffer crimmer in which filament breakage and looping is reduced.

Another object is to produce a product having a more uniform bulk, even though the crimps along the individual yarns may be somewhat nonuniform.

Various other objects and advantages will be apparent as the nature of the invention is more fully disclosed.

In one embodiment the invention may be applied to the crimping of yarn ends having little or no twist; for example, one-half or less turns per inch along the length of the yarn. Such yarn ends are difficult to crimp in a stuffer crimmer because the individual filaments tend to bloom out, form loops and entangle with themselves as they are crimped in the space between the feed rolls and the nosepiece of the crimping chamber causing undesirable slubs, loops, and broken filaments in the crimped yarn product.

Low twist polyester yarns, in particular, require special handling in a stuffer crimmer due to the tendency of the filaments to break when subjected to tension in removing them from the crimping chamber after crimping and setting. For example, in order to obtain a desirable crimp frequency, it has been found necessary to apply a substantial back pressure to the core of crimped yarn in the crimping chamber. If this is applied by a weight resting on the top of the core, it has been found that the tension required to extract the crimped yarn from under such a weight increased the tendency for filament breakage.

These and other difficulties are overcome in accordance with the present invention by feeding two or more ends of the low twist or nonwist type side by side but separated to the bite of the feed rolls of a stuffer crimmer and causing the two or more ends to be crimped individually and to form separate cores of crimped yarn which are fed together but in side-by-side relationship along the crimping and setting chamber to a discharge point. At the discharge point, they are extracted from their respective cores and are wound together on a package. During the winding, the two or more ends are rolled or twisted somewhat due to the traverse along the winding and form in effect a yarn composed of readily identifiable yarn ends.

In this method, since the ends are crimped individually, the crimps in the ends are out of phase with respect to each other and the irregularities in one end are masked or compensated for by the other end or ends when they are combined and become of the product of this method.

The accompanying drawing illustrates one form of crimping apparatus which is suitable for carrying out the present process.

In the drawing:

FIG. 1 is an elevation of a stuffer crimmer which is adapted for the above purpose;

FIG. 2 is a transverse section taken on the line 2—2 of FIG. 1 showing the construction of the guide roll;

FIG. 3 is a section taken on the line 3—3 of FIG. 1 showing the relative positions of the ends as fed into the stuffer crimmer;

FIG. 4 is a section taken on the line 4—4 of FIG. 1 showing the cramped ends as extracted from the stuffer crimmer; and

FIG. 5 is a section taken on the line 5—5 of FIG. 1 showing the ends as wound onto the winder package.

Referring to the drawing more in detail, the invention is shown as embodied in a stuffer crimmer comprising a heater block 10 mounted on suitable support members 11 and carrying a tube 12 forming a crimping and setting chamber and having heating elements 13 disposed in bores parallel to the tube 12 and adapted to supply heat to the portion of the tube within the block 10. A pair of feed rolls 14 and 15 is disposed below the end of the tube 12 in a position to feed a pair of yarns 16 into the tube to be folded over and crimped against a mass of previously crimped yarn held as cores 17 in said tube. The lower end of the tube 12 is formed with a saddle 18 extending over the bite of the feed rolls 14, 15 to form a confined crimping chamber.

The feed roll 14 is mounted on a shaft 19 journaled in a bearing in a support bracket 20 and the feed roll 15 is mounted on shaft 21 journaled in a pivoted bracket 22 and is biased for pressure engagement with the yarn 16 as they are fed between the feed rolls into the tube 12. The shafts 19 and 21 are geared together for operation in union by gears 23 and the shaft 19 is driven by suitable means such as a feed motor not shown.

A guide shown as a roll 24 is mounted adjacent the feed roll 14 and is provided with a pair of spaced annular grooves 25 for guiding the yarn ends 16 around feed roll 14 and into the saddle 18, for crimping in side-by-side relationship and forming a pair of cores 17 which are advanced together in side-by-side relationship along the tube 12. The ends 16 which may comprise of bundles of filaments having a low twist are fed from pins 26 through tension gates 27 to the guide roll 24. Guiding the yarn ends around feed roll 14 flattens out the yarn bundles and facilitates the folding over and crimping of the individual filaments in the saddle 18. It is important that the yarn bundles be properly spaced as they are fed into the saddle so that they will maintain their individual cores in the chamber. Preferably each end should be spaced so that it uses a proportionately equal amount of volume in the saddle.

A sensing device is disposed on the tube 12. This device comprises a cylindrical member 30 having a conical bore 31 at its lower end inclined to rest on and engage the outer peripheries of the cores 17 and having a cylindrical bore 32 through which the cramped ends are extracted. The element 30 has pins 33 extending outwardly through slots 42 in the tube 12. A filler wire extends around the tube 12 and is engaged by the pins 33. This filler wire 41 is pivoted at 43 to actuate a microswitch 44. The switch 44 is mounted on a bracket 46 which is clamped to the tube 12 by a clamp 47 and is adjustable along the tube. The microswitch 44 is connected to control the operation of the feed motor or of the winder motor so as to vary the input or the output of the yarn in a sense to maintain the discharge point at a substantially constant level.

The sensing device 30 rests lightly on the cores 17 so as not to exert appreciable pressure thereon. Although a microswitch is shown, it may be desirable to use a non-contact or non-conductive control switch such as, for example, a mercury switch.

The cramped ends are withdrawn from the top of the core through a ceramic eye 48, tension gate 49, and slub catcher 49a and are directed through a traverse guide 54 to a constant speed winder 50 including a winding 51 and a driving roll 52 which is driven at constant speed by a motor not shown and on which the winding 51 rests and is driven at a constant peripheral speed. The tension gate 49 and slub catcher 49a are mounted on brackets 53 and 53a respectively at a point above the bracket 46. The tension gate and string-up to the winder is important in uniformly aligning the yarn ends before they are wound on the winding 51 and especially so in connection with yarns that form slubs during the crimping process.

The pair of ends which are extracted from the crimping chamber are wound together on the winding 51 and form a single yarn in which the two ends are readily identifiable. Twist may be added to this yarn in a further processing step if desired, or the yarn may be used directly for knitting or weaving, or the yarn may be further plied with other yarn ends: It should be noted that in multiples of two ends or more, this invention contemplates separating the ends into groups and winding them onto two or more windings to form two or more yarn products.

While a pair of ends have been shown as fed into the crimmer and crimped together, it is obvious that any desired
number of ends may be fed together through the crimper and wound together onto the package.

In the case of a pair of ends, the crimps in the two ends are out of phase so that, when plied together, a more uniform bulk is obtained. Also, it has been found that breakage is reduced by feeding the two ends into the crimper together, probably due to the fact that each of the ends extends around only a portion of the periphery of the saddle at the point of discharge from the bite of the feed rolls and also due to the fact that the respective ends as they fold over and crimp are more confined laterally which reduces the extent to which the filaments can flower out and loop from the axes of the yarn ends. When three ends are fed side by side into the crimper, it is found that the center end has a higher crimp frequency than the outside ends. This may be due, in part, to the fact that the core produced by the center end is supported and impeded somewhat by the outer cores with which it is in contact.

It should also be noted that the double end yarn columns move upwardly through the chamber more smoothly than is possible with single end crimping since there is twice as much thrust against the same volume of yarn in the double end crimping system and the thrust is more uniformly distributed. Since twice as much yarn is entering the chamber at the same speed as in single end crimping, this undoubtedly is a factor in achieving the improved shorter leg length crimp. Also it doubles the throughput.

Finally, it has been found that the lateral confinement provided by the adjacent yarn ends results in a higher crimp frequency at a given back pressure or conversely, a lower back pressure is required to produce a given crimp frequency. Also for any given size of crimper and denier of the yarn ends crimped, the number of ends will determine the crimp frequencies; i.e., the greater number of ends will produce a higher crimp frequency. This is so because the extent to which the yarn ends are laterally confined dictates the extent to which the ends can fold over laterally and crimp in the saddle. This is useful in connection with crimping tender yarn filaments such as polyester where it is desirable to obtain a yarn with a high crimp frequency yet it is not possible to apply a heavy back weight on the core of crimped yarn at the exit end of the chamber and still remove the yarn from the chamber under tension without breaking an excessive number of filaments.

What is claimed is:

1. In the method of producing a plied yarn from a plurality of ends composed of continuous multifilament bundles having a low degree of twist wherein said ends are crimped in a stuffer crimper having feed rolls and plied in being wound on a winder, which comprises guiding a plurality of said low twist ends in spaced parallel relationship, introducing a plurality of such ends in spaced parallel relationship while still possessing low twist into the bite of said feed rolls for feeding into said stuffer crimper to be folded over and crimped against a mass of previously crimped filaments therein, causing the crimped ends to form individual cores in said crimper, causing said cores to advance together in said crimper to a discharge point, winding said crimped ends onto a package while traversing said crimped ends along said package to interengage, roll and combine the crimped ends into the form of a plied yarn.

2. The method set forth in claim 1 wherein the ends are individually tensioned as they are extracted from said cores.

3. The method set forth in claim 1 in which said ends have a twist of not over one-half turn per inch.