April 2, 1968 J. TURNBULL 3,375,560

BACKWINDING A SUPPLY BEAM

Filed Dec. 9, 1965

FIG. 1a
PRIOR ART

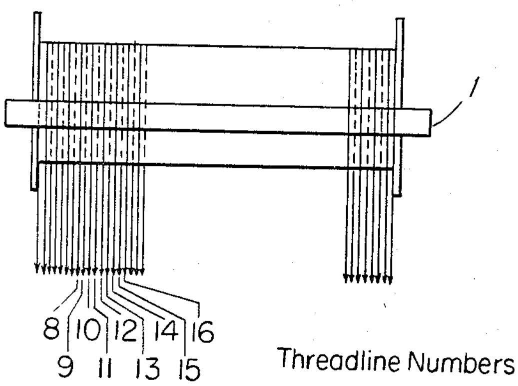
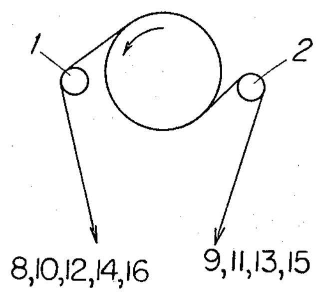


FIG. 1b
PRIOR ART



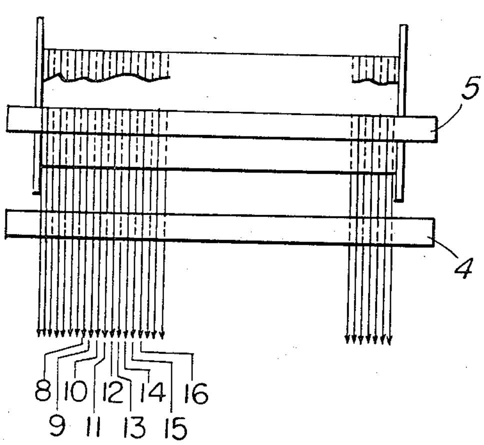


FIG. 2a

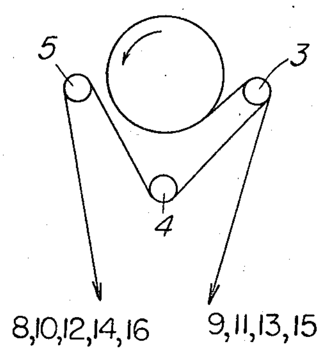


FIG. 2b

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1

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BACKWINDING A SUPPLY BEAM

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ABSTRACT OF THE DISCLOSURE

A process for backwinding a supply beam of substantially parallel continuous multifilament zero-twist yarns, without the formation of ringers, by removing individual yarn ends from the beam in the form of a sheet and then separating the individual ends at a point distant from the beam.

This invention relates to an improved method for backwinding a supply beam. More particularly, this invention is directed to an improved process for removing parallel continuous multifilament yarn ends from a supply beam wherein the individual yarn ends are to be further treated such as twisting after removal from the supply beam.

Yarn, thread, fibers and the like filamentary structures are conveniently packaged and transported on beams. Such beams are prepared by simultaneously winding with slight traversing a plurality of yarn ends maintained in a spaced, parallel, coplaner relationship as, for example, a large number of parallel individual yarns in the form of a sheet placed on the beam. Beams ordinarily may contain on the order of one hundred or more yarn ends, and upwards to many hundreds of pounds of yarn. A beam may be used by the consumer as received to provide the warp for weaving (loom beam) or as a single supply package for large-scale twisting, plying and the like textile operations (supply beam).

Yarn is wound onto a beam at essentially zero helix angle since the traverse stroke during beaming normally is no greater than the yarn-to-yarn spacing in the sheet of yarns being beamed. To insure that individual filaments in the yarn bundles do not become trapped, entangled, or broken due to overlap with the filaments of adjacent or subsequently wound yarn, i.e., to insure that the yarn can be unwound (backwound) from the beam, it is necessary to apply a certain amount of twist to the individual yarn ends prior to beaming. This "producer twist" is required in order to maintain the unity of the yarn bundle, and is applied at relatively low levels (nominally about 0.5 turn per inch) as compared to "consumer twist," which may range upwards to several turns per inch. Yarn containing such "producer twist" does not form the so-called filament "ringers" (filament wraps on the beam) because any potential trapped or tangled filaments are broken and pulled along by the parent yarn during backwinding. However, without such twist, breaks which occur during backwinding lead to the formation of "ringers," which, in turn, cause considerable yarn waste and may lead to the eventual interruption of the backwinding operation. Therefore, it is required in every beaming operation that the individual yarn ends be twisted or receive an equivalent treatment prior to beaming, not to facilitate preparation of the beam, which is no problem, but to permit the yarn to be backwound therefrom, which indeed is a real problem.

Although twisting insures the formation of a backwindable beam, such twisting has involved much additional yarn handling, and is costly in terms of time and equipment required. Moreover, the mechanics of twisting and the additional handling often result in lower yarn quality. Finally, since the consumer's twist demands vary widely depending upon the end use of the yarn, and since

2

the presence of the costly initial "producer twist" in the yarn may render such subsequent twisting nonuniform, thereby affecting the fatigue and load-carrying ability of the yarn, beams of yarn with zero twist are preferred if the beams can be backwound satisfactorily. By "zero-twist" yarn is meant yarn having no substantial process twist, excluding the omnipresent slight twist in the yarn resulting from normal handling (e.g., twist resulting when removing yarn from a stationary package) which for all practical purposes is negligible. Despite the need, however, no satisfactory method for preparing backwindable beams of zero-twist yarn is known to the art.

By the process of this invention, an improved method is provided for backwinding of a beam, especially a supply beam, which contains a large number of essentially parallel continuous multifilament, zero-twist, yarn ends under tension. The yarn ends have a yarn-to-yarn spacing of less than about one-half inch between the individual yarns on the beam. The improved method involves the removal of the individual yarn ends in the form of a sheet from the beam and separating the individual yarn ends from the sheet after the sheet has left the beam. In the art as practiced for removing individual yarns for further treatment such as twisting and plying, alternate yarns are separated on the beam and directed to the further processing technique. If the yarn bundles are trapped, entangled or broken due to the overlap with the filaments of adjacent yarn bundles, ringers, i.e. filament wraps on the beam, are formed on the beam. By the process of this invention, the yarn bundles or ends are removed from the beam in the form of a sheet, separated and isolated at a point off of the beam to provide a considerable reduction in the number of faults and substantially eliminate the undesirable ringers on the beam. Under these conditions, a satisfactory method for preparing backwindable beams of zero-twist yarns is now provided without subjecting the yarns to any type of pretreatment of the yarn bundles to be placed on the beam.

The term "sheet" as used herein relates to a plurality of essentially continuous multifilament yarn ends in the same plane having a yarn-to-yarn spacing of less than about one-half inch between the individual yarn ends. The sheet of individual yarns can be composed of all or parts of the yarn in one plane on the beam without threadline gaps appearing.

The overall principle of the process of the invention relates to the fact that the individual yarns as placed on the beam are removed from the beam in the form of a sheet essentially avoiding the trapped or entangled filament effects, in the same plane, thereby avoiding ringers on the beam itself. To illustrate this principle, reference is made to the accompanying drawing wherein:

FIGURES 1(*a*) and (*b*) illustrate the prior art of removing filaments from a supply beam.

FIGURES 2(*a*) and (*b*) illustrate the process of this invention.

In FIGURE 1, the alternate yarn ends (**8**, **10**, **12**, **14** etc.) as illustrated in 1(*a*) are individually removed on one side of the beam over bar **1** illustrated in 1(*b*) while the remaining yarn ends (**9**, **11**, **13**, **15** etc.) are removed from the under side of the beam over bar **2**. It should be readily apparent that if broken or trapped filaments are present, undesirable ringers would form on the beam. It should be further noted that the yarns as removed leaves threadline gaps, i.e., a width twice the original traverse width used at beaming.

In FIGURE 2, the process of the present invention, all of the yarn ends are removed as 1 unit in the form of a sheet over bar **3** which is spaced from and in axial parallel alignment with the beam and the individual yarn ends are separated on or after bar **3** wherein alternate yarn ends are passed over bar **4** and bar **5** and directed to the post treatment apparatus not shown. The remaining yarn ends are directed to the post treatment apparatus in another direction. It is well known in the art that the separation of the yarn ends as shown in FIGURES 1(*a*) and (*b*) and 2(*a*) and (*b*) is to accommodate an apparatus such as individual twisters having positions located back to back with one another for each individual yarn end.

The types of yarns which can be utilized in this process are any synthetic or natural filaments normally used in beaming operations. Suitable yarns include polyamides, polyesters, cellulose acetate, polyalkylenes, polyvinyls and the like. The improvements of the process of this invention are readily apparent when using zero-twist flat yarns or zero-twist flat cohered yarn such as described in U.S. Patent 2,985,995 or equivalents thereof, wherein the individual filaments in the yarn bundle are intermingled to provide a coherency factor of at least 2.5 and preferably in the range from about 5 to about 100 and more preferably in the range from about 5 to about 30. The coherency factor is measured in accordance with the hook drop test as described in U.S. Patent 2,985,995.

To further illustrate the process of the invention, 1260 denier polyethylene terephthalate yarn, 44 ends/2,500 yards per end were placed on individual beams. The yarns were placed in a side-side relationship as illustrated in FIGURES 1(*a*) and 2(*a*). The beams were backwound in the manner as described in FIGURE 1(*b*) and FIGURE 2(*b*) for comparison purposes. The following results were obtained:

Backwound by method shown in Fig. 1(b) (prior art) 2(b) (present invention)	No. of Ringers per Beam	Yarn Type
1(b)	6	Flat zero twist.
2(b)	2	Do.
1(b)	7	Do.
2(b)	1	Do.
1(b)	8	Do.
2(b)	2	Do.
1(b)	2	Cohered intermingled yarn zero twist coherency factor 26.
2(b)	0	Cohered intermingled yarn zero twist coherency factor 26.

From the above data, it should be readily apparent that significant improvements are obtained utilizing untreated zero-twist yarn when backwound from a beam utilizing the present invention. Additional improvements are obtained even when cohered intermingled zero-twist yarn having a coherency factor of 26, utilizing the process

of the present invention. Other improvements in the backwinding of zero-twist yarn beam can be obtained when partial sheets of yarns such as one-half of the sheet is separated from the total sheet and the individual yarns are separated from the partial sheet.

It is understood that the foregoing description is merely illustrative of preferred embodiments of the invention of which many variations may be made by those skilled in the art within the scope of the following claims without departing from the spirit thereof.

What is claimed is:

1. In the backwinding of a supply beam containing a large number of essentially parallel continuous multifilament zero-twist yarn ends under tension, having a yarn-to-yarn spacing of less than about one-half inch between the individual yarn ends on said beam and wherein the individual yarns are to be further treated on removal from said beam, the improvement of removing said individual yarn ends in the form of a sheet of substantially parallel yarn ends from said beam over a bar member spaced from and in axial parallel alignment with said beam and separating the individual yarn ends from said sheet on or at said bar member.

2. Process of claim **1** wherein the separate yarn ends are flat and have substantially zero-twist.

3. The process of claim **1** wherein the separate yarn ends are flat, have substantially zero-twist and the individual yarn filaments of said ends are intermingled to have a coherency factor in excess of 2.5.

4. The process of claim **1** wherein the separate yarn ends are flat, have substantially zero-twist and the individual yarn filaments of said ends are intermingled to have a coherency factor in the range of from about 5 to about 100.

5. The process of claim **1** wherein the separate yarn ends are flat, have substantially zero-twist and the individual yarn filaments of said ends are intermingled to have a coherency factor in the range of from about 5 to about 30.

References Cited

UNITED STATES PATENTS

1,400,026	12/1921	Chadwick	57—90 X
1,547,660	7/1925	McKean	242—35.5
1,710,656	4/1929	Chadwick	57—90 X
2,652,203	9/1953	Cone	28—32 X
2,985,995	5/1961	Bunting et al.	57—110
3,010,181	11/1961	Marks	66—125 X

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