

March 28, 1944.

H. WORTHINGTON

2,345,544

YARN WINDING

Filed June 17, 1942

6 Sheets-Sheet 1

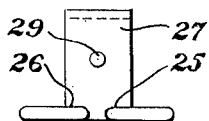


Fig. 3

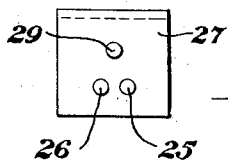


Fig. 5

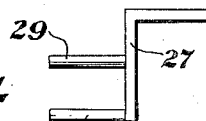


Fig. 4

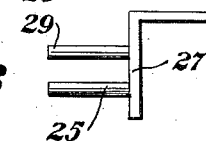


Fig. 6

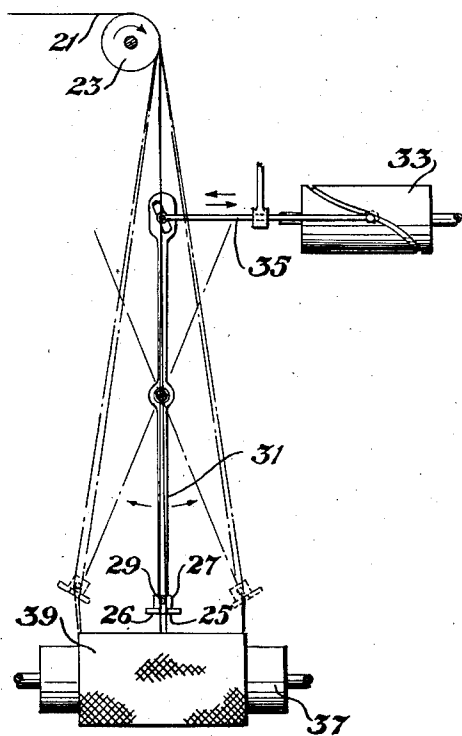


Fig. 1

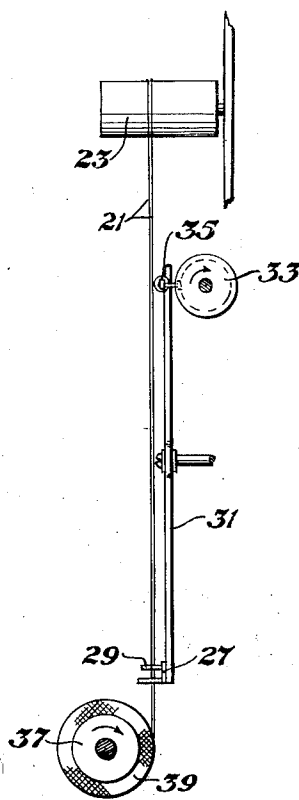


Fig. 2

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YARN WINDING

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6 Sheets-Sheet 2

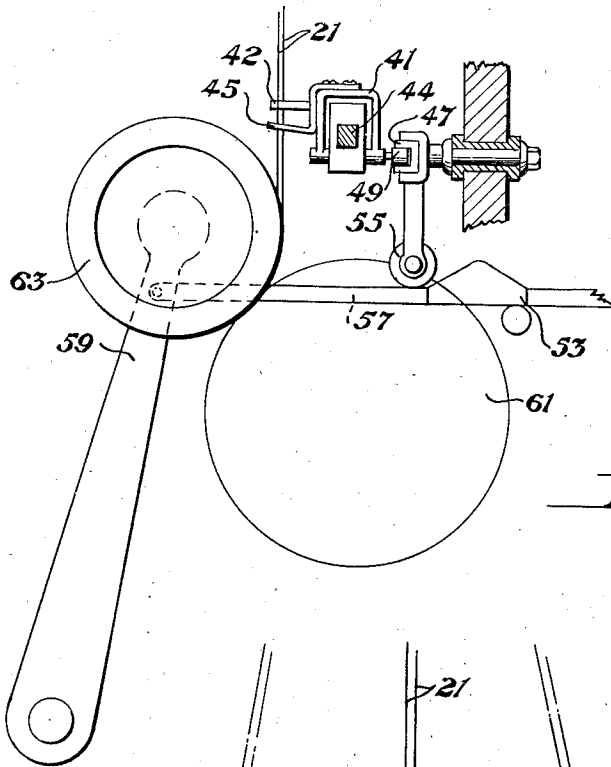


Fig. 8

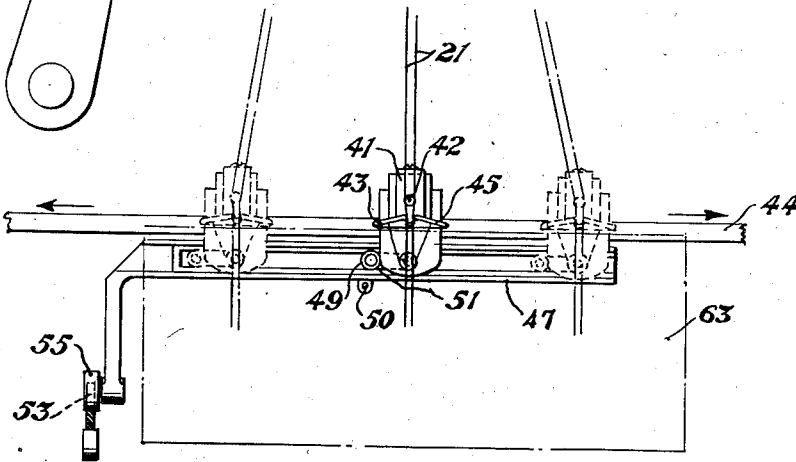


Fig. 7

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YARN WINDING

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6 Sheets-Sheet 3

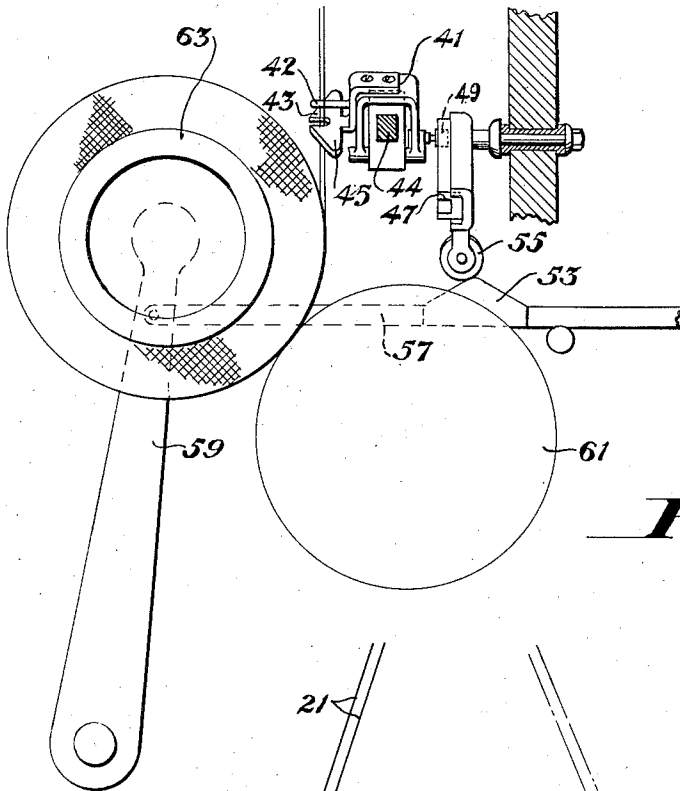


Fig. 10

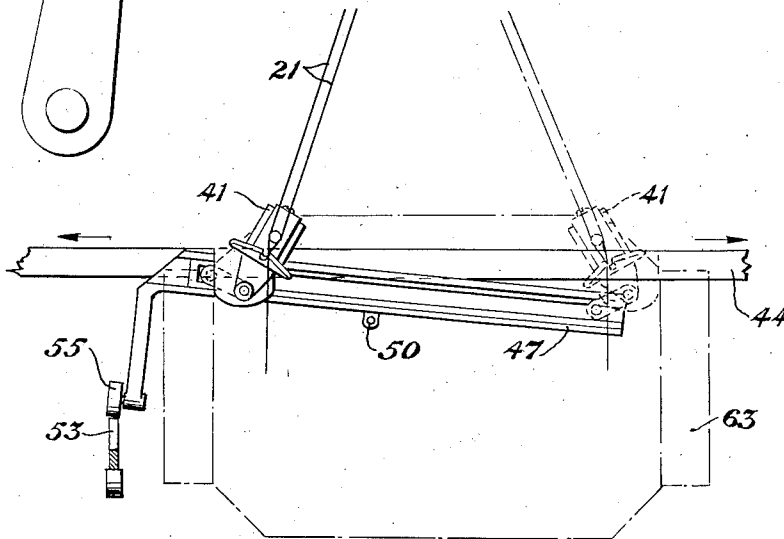


Fig. 9

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YARN WINDING

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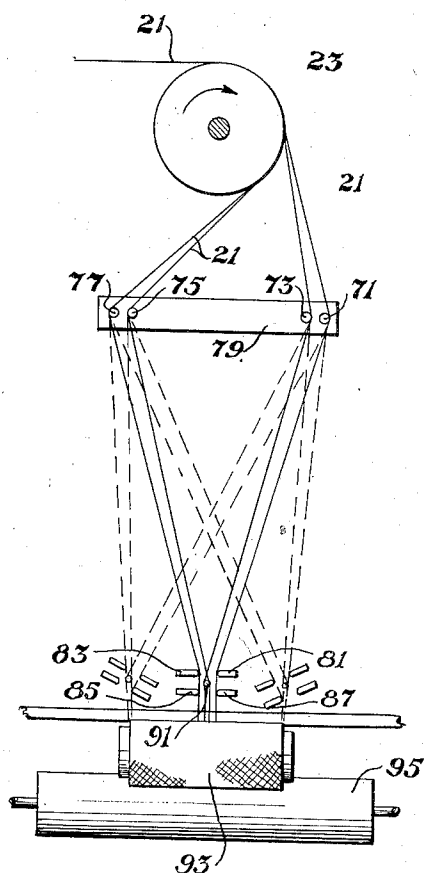


Fig. 11

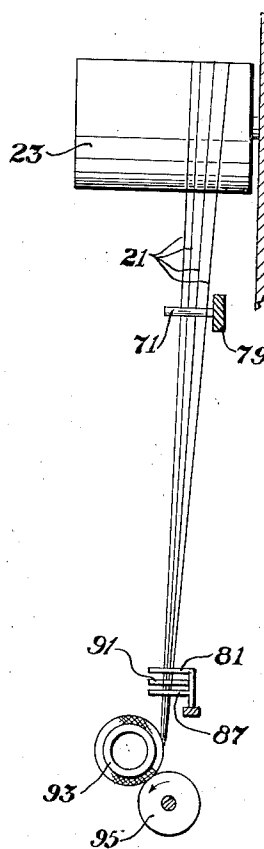


Fig. 12

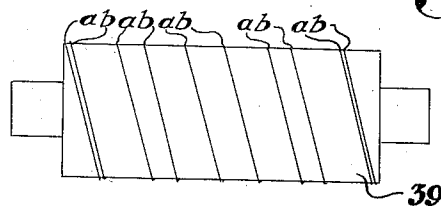


Fig. 20

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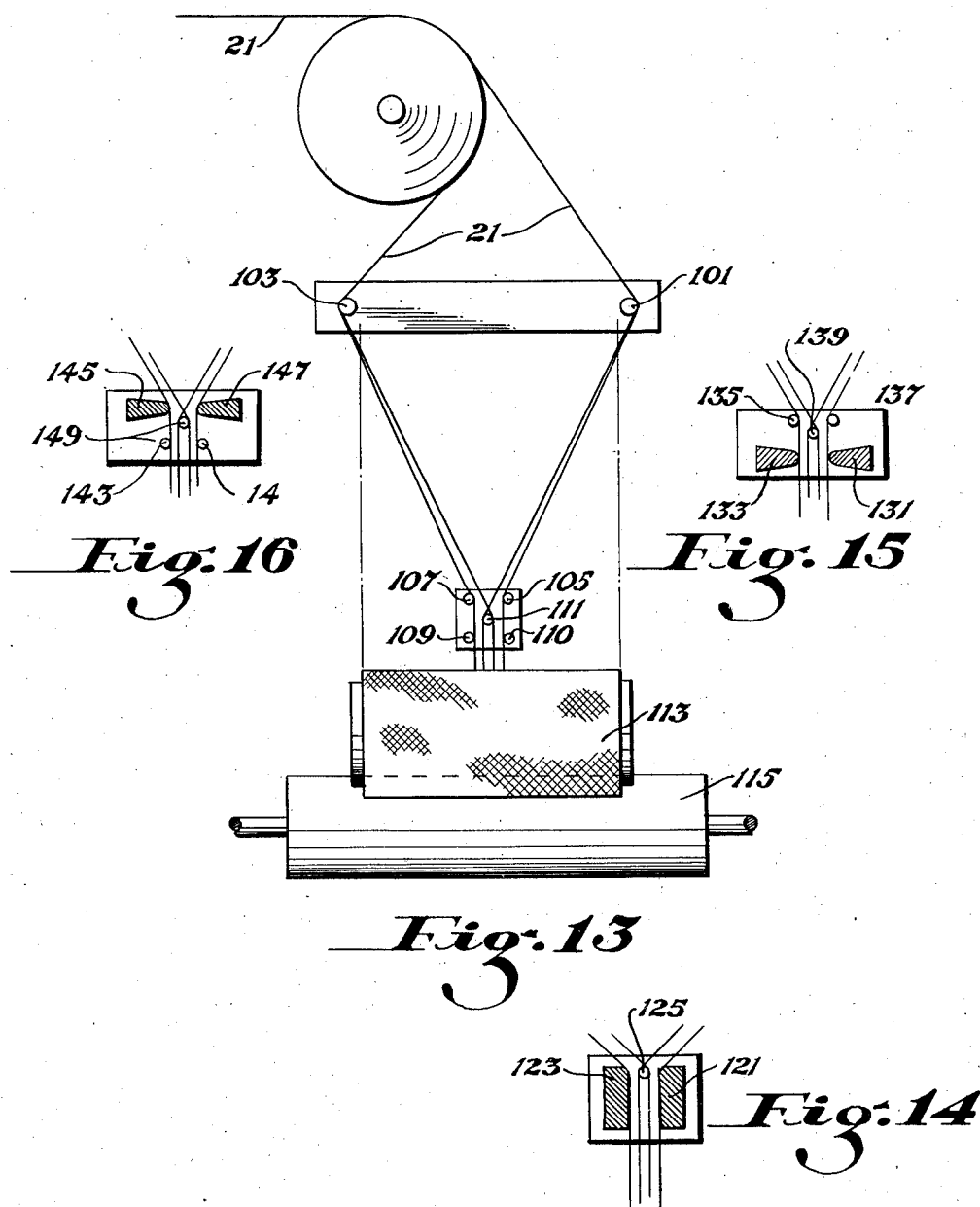
H. WORTHINGTON

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YARN WINDING

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6 Sheets-Sheet 5



Hood Worthington

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YARN WINDING

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6 Sheets-Sheet 6

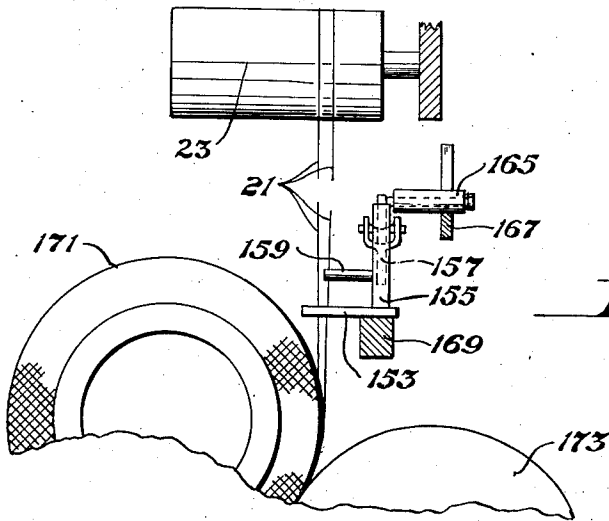


Fig. 17

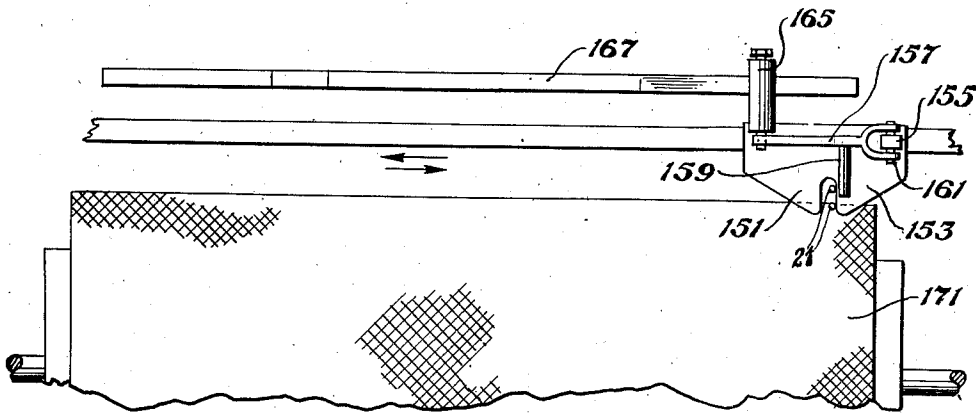


Fig. 18

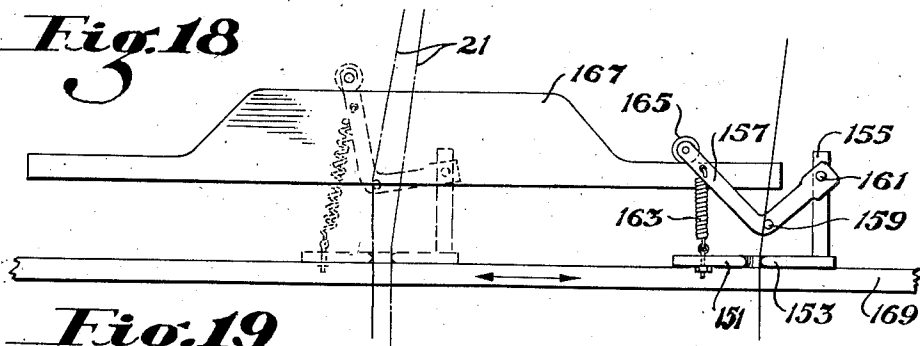


Fig. 19

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UNITED STATES PATENT OFFICE

2,345,544

YARN WINDING

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Application June 17, 1942, Serial No. 447,481

10 Claims. (Cl. 242—42)

This invention relates to yarn winding and, more particularly, it relates to a new and improved wound yarn package and method and apparatus for obtaining the same. More specifically, the invention relates generally to a yarn package comprising a plurality of yarns wound substantially in side-by-side relationship in a new manner on to a yarn support, and a new and unique method and apparatus for winding the same.

It has been known, heretofore, to wind a plurality of yarns in substantial side-by-side relationship on to a yarn support. It has also been known to traverse said plurality of yarns across the full length of the winding surface.

Such previously known methods for winding and traversing a plurality of yarns on to a single yarn support were particularly defective if the yarns were made up of parallel bundles of untwisted filaments. If the plurality of untwisted yarns is laid down on the yarn package in a single bundle, it is difficult to separate the yarns again when they are unwound, since the filaments of the several yarns will entangle with each other. If the yarns are maintained separate from each other as they are wound and traversed from end to end of the yarn package, the extremities, or shoulders, of the package are excessively soft.

It is an object of the present invention to produce a firm-shouldered yarn package comprising a plurality of yarns wound in side-by-side relationship and free from objectionable intertwining of yarn filaments of the respective yarns.

It is another object of the present invention to produce a firm-shouldered yarn package comprising a plurality of yarns wound in side-by-side relationship and traversed from end to end of the package, said package being free from objectionable intertwining of yarn filaments of the respective yarns.

It is another object of this invention to wind a plurality of yarns in side-by-side relationship on to a yarn support from which the wound yarns can be removed with a minimum of yarn degradation.

The objects of this invention may be accomplished, in general, by simultaneously winding and traversing a plurality of yarns on to a yarn support with the yarns spaced from each other on the central portion of the support and substantially contiguous with each other adjacent to the ends of the support, the relative position of the yarns to each other being the same in both directions of traverse.

Other objects of the invention will appear hereinafter.

The details of the invention will be more clearly apparent by reference to the following detailed description when taken in connection with the accompanying illustrations, in which:

Figure 1 is a front elevational view of one construction of apparatus suitable for use in carrying out the present invention.

Figure 2 is an end elevational view of the apparatus shown in Figure 1.

Figure 3 is an enlarged front elevational view of a yarn guide constructed in accordance with the details of the invention.

Figure 4 is an end elevational view of the guide shown in Figure 3.

Figure 5 is a front elevational view of a modified yarn guide for use in accordance with the invention.

Figure 6 is an end elevational view of Figure 5.

Figure 7 is a front elevational view of a modified form of yarn traversing apparatus for use in the present invention.

Figure 8 is an end elevational view of the apparatus shown in Figure 7.

Figure 9 is a front elevational view of the traversing apparatus shown in Figure 7 as the package approaches completion of wind.

Figure 10 is an end elevational view of the apparatus shown in Figure 9.

Figure 11 is a diagrammatic front elevational view of a modified form of yarn traversing mechanism for use in winding four yarns.

Figure 12 is an end elevational view of the apparatus shown in Figure 11.

Figure 13 is a front elevational view of still another modified form of yarn winding and traversing apparatus constructed in accordance with the present invention.

Figures 14, 15 and 16 are enlarged front elevational views of modified forms of yarn guides.

Figure 17 is an end elevational view of still another modified form of yarn winding and traversing apparatus constructed in accordance with the present invention.

Figure 18 is a top plan view of the apparatus shown in Figure 17.

Figure 19 is a front elevational view of the apparatus shown in Figure 17.

Figure 20 is a diagrammatic side elevational view showing a yarn package wound in accordance with the present invention.

Referring to Figures 1 and 2 of the drawings, reference numeral 21 designates two yarns drawn from a synthetic yarn spinning apparatus, or

other source (not shown) by means of feed roll 23. The yarns 21 are fed to a yarn guide 27 comprising two spaced yarn guiding elements 25 and 26 and a yarn separating pin 29. The yarns 21 are passed through the guide slot defined by guiding elements 25 and 26, one yarn being passed on each side of separating pin 29. Yarn guide 27 is oscillated substantially longitudinally of the axis of yarn package 39 being formed on yarn support 37. The yarn guide 27 is oscillated by means of pivoted bar 31, reciprocating bar 35, and grooved cylinder cam 33 in a known manner to traverse the yarn being wound on the package 39.

As the yarn guide 27 is oscillated, it is tilted at the ends of the traverse stroke. The pin 29 maintains the yarns 21 separated from each other across the space between the guide elements 25 and 26 when the guide 27 is positioned adjacent the central portion of the yarn package 39. When the guide 27 is tilted at the ends of the traverse strokes, as shown in dotted lines in Figure 1, the two yarns are substantially contiguous to each other thereby forming a firm shoulder at the ends of the yarn package. It will furthermore be noted that the yarns are not caused to cross each other but maintain the same relative position to each other in both directions of traverse.

Figures 3 and 4 of the drawings show in greater detail the yarn guide 27. The separating pin 29 is preferably positioned sufficiently above guiding elements 25 and 26 to bring the yarns into contiguity with each other when the guide 27 is tilted at the ends of the traverse stroke.

Figures 5 and 6 show a slightly modified form of traverse guide 27 in which the yarn guiding elements 25 and 26 as well as the yarn separating member 29 all consist of pins which are spaced from each other.

Referring to Figures 7 to 10 of the drawings, two yarns 21 are passed on opposite sides of separating pin 42 and between spaced yarn guiding elements 43 and 45. The yarn guiding member, generally designated by 41, is reciprocated back and forth adjacent yarn support 63 by means of reciprocating traverse bar 44. The yarn guiding member 41 and the guiding elements 43 and 45 receive a purely reciprocating motion, as is clearly shown in Figure 7, during the first part of the winding operation. As the yarn package increases in size, the yarn guiding member including elements 43 and 45 is caused to tilt at the ends of the traverse strokes by means of pivoted track 47, cam 53 and cam follower 55. The yarn guiding member 41 is provided with a roller 49 operating in a groove in track 47. The roller 49 is positioned at the end of a small bell crank lever 51 which in turn is connected to the yarn guiding member 41. As the yarn package builds up on yarn support 63, the swing arm 59 will move away from the surface drive roller 61. The cam 53 is positioned on an arm 57, which in turn is connected to swing arm 59. The cam 53 will, therefore, be drawn under the cam follower 55 causing track 47 to be pivoted about its pivot point 50. As clearly shown in Figures 9 and 10, when the track 47 is tilted as shown the yarn guiding member 41 will be tilted inwardly at each end of its stroke due to the action of bell crank lever 51 and roller 49, the latter being positioned within the groove of track 47.

At the beginning of the yarn winding operation, the yarns will be maintained separated from each other as they are wound on to the yarn sup-

port from one extreme to the other extreme of the package. As the yarn package increases in size, however, the yarn guiding member 41 will tilt inwardly thereby causing the yarns to be laid down in contiguity at the ends of the package, but in spaced relationship to each other in the central portion of the package. In this modification, the ends of the yarn package are also gradually beveled as shown in Figure 9.

Referring to Figures 11 and 12 of the drawings, four yarns 21 are passed from the feed roll 23 to a yarn guide comprising two spaced upper yarn guiding elements 81 and 83 and two spaced lower guiding elements 85 and 87 as well as a centrally located yarn separating pin 91. The yarns passing between the feed roll 23 and the yarn guide are passed about a series of fixed pins 71, 73, 75 and 77 positioned on a support 79. The yarn 21 passed about fixed pin 71 is passed over spaced yarn guiding elements 81 and 87. The yarn 21 which is passed about fixed pin 73 is passed about the lefthand side (as viewed in the drawings) of pin 91. The yarn passing about fixed pin 75 is passed about the righthand side of pin 91 and the yarn passing about fixed pin 77 passes over spaced yarn guiding elements 73 and 75. In this manner, the four yarns are clearly separated from each other when the yarn guide composed of the guiding elements and separating member is positioned against the central point of the yarn package. The yarn guide is traversed by means of an oscillating or curvilinear motion whereby the guide is tilted in the same manner as above described with reference to Figures 1 and 2. At the ends of the traverse strokes, due to the tilting of the yarn guide, the plurality of yarns are all laid down in close contiguity with each other to form a firm shoulder on the yarn package 93. The yarn package 93 may be rotated by means of a surface drive roll 95. The yarn guide may be given an oscillating or curvilinear motion in any desired manner, for example, by means of apparatus such as shown in Figures 1 and 2 or 7 to 10 of the drawings.

Figure 13 of the drawings illustrates a modification of the invention in which four yarns are wound and traversed on to a package by means of only two fixed pins 101 and 103. Two of the yarns 21 are passed about fixed pin 101. These two yarns are split, one of them passing over spaced yarn guiding pins 105 and 110 and the other passing on the lefthand side of separating pin 111. The other two yarns 21 are passed about fixed pin 103 and then split, one of the yarns passing about spaced yarn guiding pins 107 and 109 and the other passing on the righthand side of separating pin 111. The four yarns are in this manner clearly separated from each other when they are being wound on the central portion of the yarn package 113. Yarn package 113 may be rotated by means of surface drive roller 115. The several yarn guiding pins 105, 107, 109 and 110 are tilted at the ends of their traverse strokes in the manner illustrated in Figure 11 of the drawings, and thus the yarns are wound in separated relationship to each other at the central portion of the package but in contiguity with each other at the ends of the package.

Figure 14 illustrates a modified form of yarn guiding member useful in guiding four yarns on to a package. In place of two sets of spaced yarn guiding elements, two elongated projections 121 and 123 are formed on the yarn guide. The

yarn separating pin 125 is positioned between these members.

Figure 15 of the drawings is a modified form of yarn guiding member in which two spaced yarn guiding pins 135 and 137 are mounted above two elongated yarn guiding elements 133 and 131. A separating pin 139 is positioned between these four members and preferably slightly closer to the pins 135 and 137 than to elements 133 and 131.

Figure 16 illustrates another modified form of guide in which elongated yarn guiding elements 145 and 147 are positioned above spaced yarn guiding pins 143 and 141. Although this is a somewhat obvious modification of the other elements shown, it is illustrative of the many modifications which can be made in the apparatus of the present invention.

Referring to Figures 17, 18 and 19 of the drawings, two yarns 21 are passed to the yarn package 171 which is rotated by means of surface drive roller 173. A yarn traversing means is interposed between the feed roll 23 and the yarn package 171. The traversing means comprises two spaced yarn guiding elements 151 and 153 which are fastened to a reciprocating traverse bar 169. A yarn separating pin 159 is mounted slightly above the yarn guide elements 151 and 153 to contact only one of the two yarns 21. The yarn separating pin is brought into and out of contact with the one yarn 21 to periodically separate the two yarns across the space between the guiding elements 151 and 153. The pin 159 is moved into and out of contact with the one yarn 21 by mounting the same on a bell crank lever 157, one end of which is pivoted to a projecting support 155 and the other end of which is mounted to travel along a cam surface 167. A cam surface following member 165 is mounted on the end of the bell crank lever 157. The yarn separating pin 159 is mounted in the elbow portion of the bell crank lever. The bell crank lever is so pivoted to the support 155 that upon raising of the lever by means of follower pin 165, the separating pin 159 will be moved perpendicularly above the slot defined by yarn separating elements 151 and 153 thus forcing one of the two yarns 21 into contact with the yarn guiding element opposite to the one which it would normally contact. This is clearly shown by dotted lines in Figure 19. The cam following pin 165 is maintained in contact with the cam surface by means of coil spring 163. A bell crank lever is pivoted to the support 155 at 161.

It will be noted that the yarn separating pin 159 functions to separate the two yarns 21 in only one direction of traverse of the traverse bar. In the apparatus shown, the yarns are separated only when the traverse bar moves the yarn guiding and separating elements in the lefthand direction as viewed in the drawings. In this form of apparatus, the yarn guiding elements may be reciprocated in a linear movement as shown.

Referring to Figure 20 of the drawings, reference characters *a* and *b* designate the convolutions of the two yarns which are simultaneously wound on to a yarn package 39 by the method generally illustrated in Figures 1 and 2 of the drawings. The yarns *a* and *b* as shown in the drawings, represent the last wound layer of yarn and clearly show how the two yarns will be spaced from each other on all portions of the yarn package except that portion adjacent the ends of the yarn package where they are substantially contiguous with each other.

The method and apparatus of the present invention is suitable for use in the winding of a plurality of yarns on to a single yarn support. The yarns may be passed to the winding apparatus from any desired source, for example, yarn spinning apparatus, separate yarn packages or the like. The yarns, of course, may be composed of natural fibers, nylon, viscose, cellulose derivatives, or any other fiber- or filament-forming materials. While the invention is obviously of particular utility in the winding of a plurality of yarns with untwisted filament bundles, it will be understood that it can be used with equal facility in the winding of yarns containing more or less twist.

A number of modifications of a winding and traversing mechanism for use in accordance with the present invention have been illustrated. Obviously, many further modified forms of traversing mechanism can be used within the nature and spirit of the invention. It is only necessary that the mechanism operate to wind the yarns in separated relationship along the central portion of the yarn package, and in substantial contiguity with each other adjacent the ends of the yarn package. It is not necessary, of course, that the yarns be laid in close contact with each other at the ends of the package. It is sufficient if the yarns are close enough to each other at the ends of the yarn package so as to wind a yarn package with desirably firm shoulders.

In constructing the apparatus illustrated above, it is desired that the separating pin as well as the spaced yarn guiding elements be smooth and of sufficiently hard material to prevent abrasion and give long wearing characteristics to the apparatus. The dimensions of the yarn separating pin and the space between the yarn guiding elements are not critical except that the space between the guiding elements and the distance of the yarn separating pin above the guiding elements must be such that upon traverse of the yarn guide, the yarns will be brought into materially closer contact with each other adjacent to the ends of the yarn package than at the central portion of the yarn package. For example, the yarn separating pin may be of the order of $\frac{1}{2}$ inch in length and $\frac{1}{8}$ inch in diameter. Preferably, the diameter of the yarn separating pin is less than four times the width of the slot defined by the spaced yarn guiding elements. The yarn separating pin may be positioned between $\frac{1}{8}$ inch and 1 inch above the yarn guiding elements.

The yarn separating pin may be attached directly to the yarn guiding elements; however, the invention is not so limited. It is only necessary that the yarn separating pin move along with the yarn guiding elements to effectively maintain the separation of the yarns as they are wound on the central portion of the package. As shown in Figures 17, 18 and 19, the yarn separating pin may be movable relative to the yarn guiding elements to be placed into and out of contact with one of the yarns so as to effect a separation of the yarns being wound.

In many of the modifications illustrated and described, the plurality of yarns are gradually moved from their separated positions adjacent the central portion of the package to their position in substantial contiguity to each other at the ends of the package. Such a gradual, or progressive, movement of the yarns towards each other is not essential in accordance with the present invention. The yarns may be maintained separated from each other to an equal extent

throughout the major portion of the traverse stroke but brought into contact with each other rapidly adjacent the ends of strokes in the manner shown in Figures 17, 18 and 19.

It is, however, essential in accordance with the present invention that the plurality of yarns be maintained in the same relative position to each other in both directions of traverse, i. e., a given yarn will always be in the lead when the yarns are traversed in the righthand direction and another given yarn will always be in the lead when the yarns are traversed in the lefthand direction. This will prevent crossing of the yarns adjacent the package ends. Such crossing of the yarns adjacent the package ends is objectionable when the yarns are to be unwound from the package by drawing the same from one end thereof.

In accordance with the present invention, it is possible to wind a plurality of yarns consisting of one or more filaments in side-by-side relationship on to a yarn support to form a highly desirable package having firm shoulders, and from which the yarns may be readily unwound without objectionable degradation of the yarns or filaments.

The apparatus of the present invention is comparatively simple and may be operated for long periods of time with high machine efficiency. The yarn package produced in accordance with the present invention may be unwound in any desired manner without degradation of the yarn filaments. The yarn may be wound from the side of the package with the package rotated by means of a surface, center, or rim drive means such as is well known in the art, or the yarn may be merely pulled from the side of the package with the package free to rotate on a spindle by the pull of the yarn. Furthermore, the yarns may be drawn from one end of the package with the package maintained substantially stationary.

Since it is obvious that many changes and modifications can be made in the above-described details without departing from the nature and spirit of the invention, it is to be understood that the invention is not to be limited to the details described herein except as set forth in the appended claims.

I claim:

1. The method of simultaneously winding a plurality of yarns on to a yarn support which comprises traversing said yarns back and forth while winding the same on to said yarn support, maintaining said yarns spaced from each other on the central portion of said support and substantially contiguous with each other adjacent to the ends of said support, the relative position of said yarns to each other being the same in both directions of traverse.

2. The method of simultaneously winding a plurality of yarns on to a yarn support which comprises traversing said yarns back and forth while winding the same onto said yarn support, maintaining said yarns spaced a given distance from each other on the central portion of said support and more closely spaced from each other adjacent to the ends of said support, the relative position of said yarns to each other being the same in both directions of traverse.

3. The method of simultaneously winding a plurality of yarns on to a yarn support which comprises traversing said yarns back and forth while winding the same on to said yarn support, maintaining said yarns spaced a given distance from each other on the central portion of said support and progressively more closely spaced from each other adjacent to the ends of said

support, the relative position of said yarns to each other being the same in both directions of traverse.

4. A wound yarn package containing a plurality of yarns wound in side-by-side relationship on a yarn support, said plurality of yarns being spaced from each other on the central portion of said package and substantially contiguous with each other at the ends of said package, the relative position of said yarns to each other being the same throughout the package.

5. A wound yarn package containing a plurality of yarns wound in side-by-side relationship on a yarn support, said plurality of yarns being spaced a given distance from each other on the central portion of said package and more closely spaced from each other at the ends of said package, the relative position of said yarns to each other being the same throughout the package.

6. A yarn winding apparatus for simultaneously winding a plurality of yarns on to a rotating yarn support, a yarn traversing mechanism, spaced yarn guiding elements on said traversing mechanism for guiding said plurality of yarns on to said yarn support, yarn separating means cooperatively positioned, relative to said guiding elements, to separate said yarns from each other across the space between said spaced guiding elements when the latter are positioned adjacent to the central portion of said support and to place said yarns substantially in contact with each other when said elements are adjacent to the ends of said support.

7. A yarn winding apparatus for simultaneously winding a plurality of yarns on to a rotating yarn support, a yarn traversing mechanism, spaced yarn guiding elements on said traversing mechanism for guiding said plurality of yarns on to said yarn support, yarn separating means, movable, relative to said guiding elements, to separate said yarns from each other across the space between said spaced guiding elements when the latter are positioned adjacent to the central portion of said support and to place said yarns substantially in contact with each other when said elements are adjacent to the ends of said support.

8. A yarn winding apparatus for simultaneously winding a plurality of yarns on to a rotating yarn support, a yarn traversing mechanism, spaced yarn guiding elements on said traversing mechanism for guiding said plurality of yarns on to said yarn support, cam controlled yarn separating means movable, relative to said guiding elements, to separate said yarns from each other across the space between said spaced guiding elements when the latter are positioned adjacent to the central portion of said support, and to place said yarns substantially in contact with each other when said elements are adjacent to the ends of said support.

9. A yarn winding apparatus for simultaneously winding a plurality of yarns on to a rotating yarn support, a yarn traversing mechanism, spaced yarn guiding elements on said traversing mechanism for guiding said plurality of yarns on to said yarn support, yarn separating means fixed relative to said guiding elements and co-operating with the latter to separate said yarns from each other across the space between said spaced guiding elements when the latter are positioned adjacent to the central portion of said support, and to place said yarns substantially in contact with each other when said elements are adjacent to the ends of said support.

10. A yarn winding apparatus for simultaneously winding a plurality of yarns on to a rotating yarn support, a yarn traversing mechanism, spaced yarn guiding elements on said traversing mechanism for guiding said plurality of yarns on to said yarn support, said yarn traversing mechanism adapted to oscillate said spaced yarn guiding elements substantially longitudinally of the axis of said yarn support, a yarn separating means fixed relative to said guiding elements and in alignment with the space between said guiding

elements, at least one of said yarns passing on one side of said separating means and at least another of said yarns passing on the other side of said separating means, said separating means positioned a sufficient distance above said yarn guiding elements to cause said yarns to be laid down, adjacent the ends of the package, in substantial contiguity with each other as a result of the oscillation of said elements.

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