United States Patent [19]

Schippers

[11] **3,792,819**

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[54] **HIGH-SPEED CROSS-WINDING DEVICE FOR WINDINGS OF DIFFERENT LENGTH**

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[52] **U.S. Cl.** ..... **242/43**, 74/57, 242/18 PW, 242/158.3

[51] **Int. Cl.** **B65h 54/30**

[58] **Field of Search**.... 242/43, 158.3, 18 PW, 18 R, 242/158.5; 74/57, 58

[56] **References Cited**

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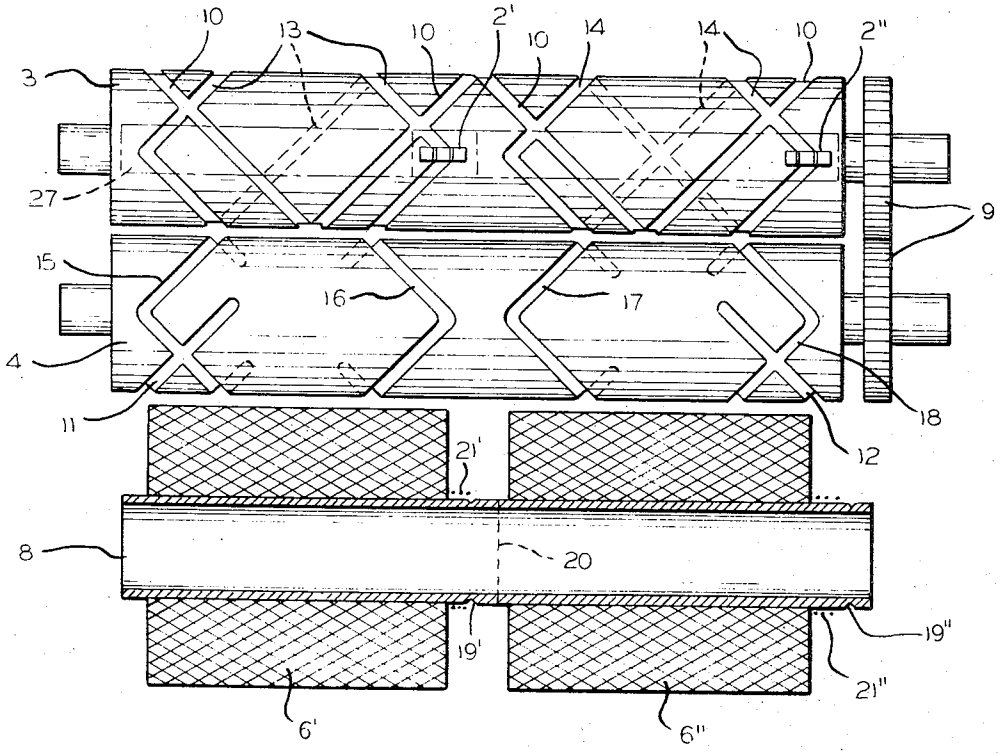
[57] **ABSTRACT**

High speed cross-winding devices embodying two thread-guiding traverse devices, one for the mid-range of the traverse stroke and the other for the stroke reversal zones, and angularly offset or changeable traverse means on each device for selectively producing one longer winding or two or more shorter windings on a given winding tube or bobbin.

14 Claims, 10 Drawing Figures



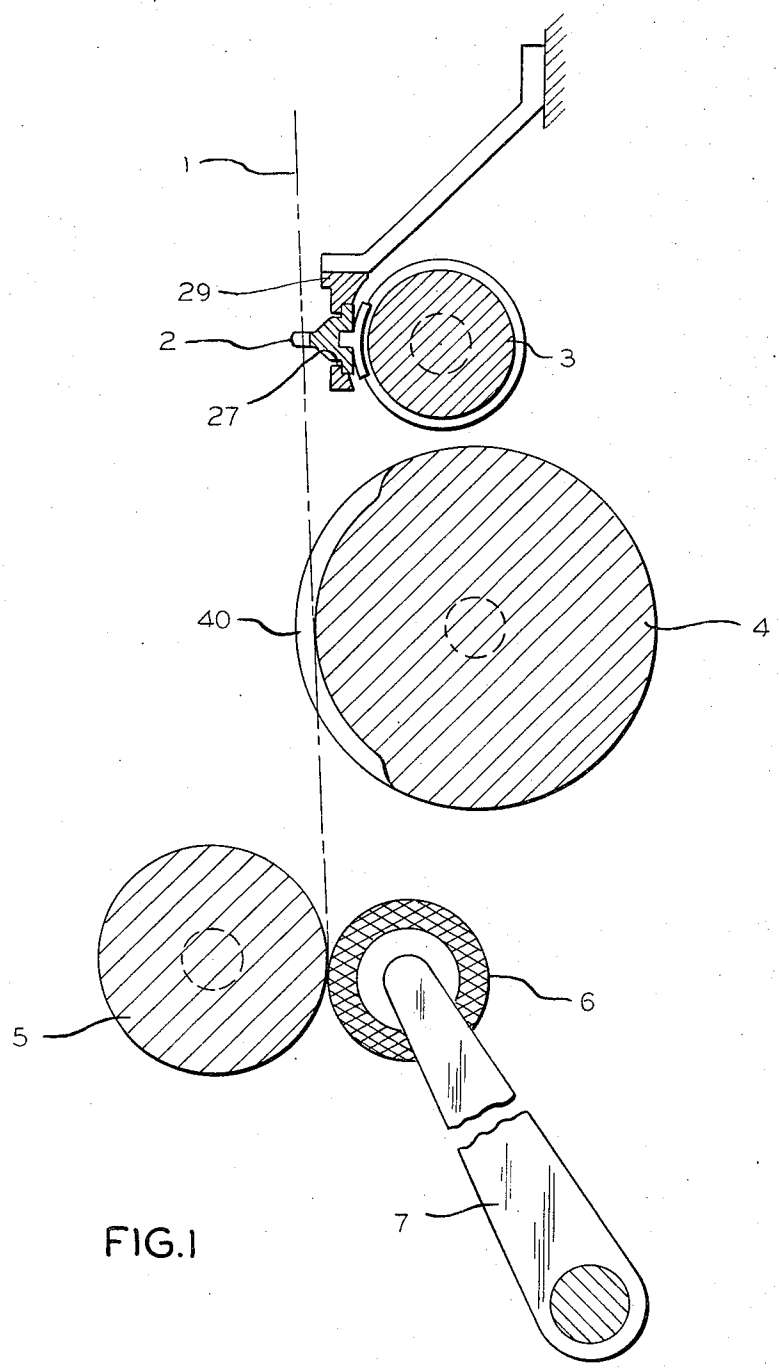


FIG.1

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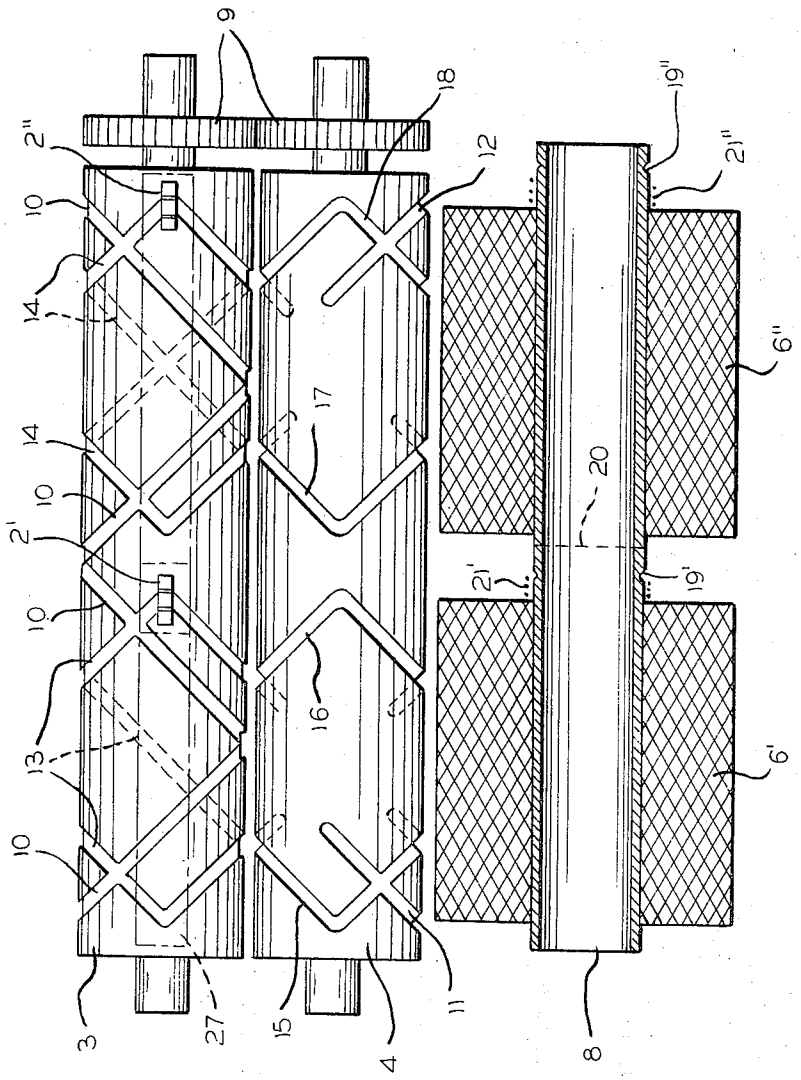

FIG.2

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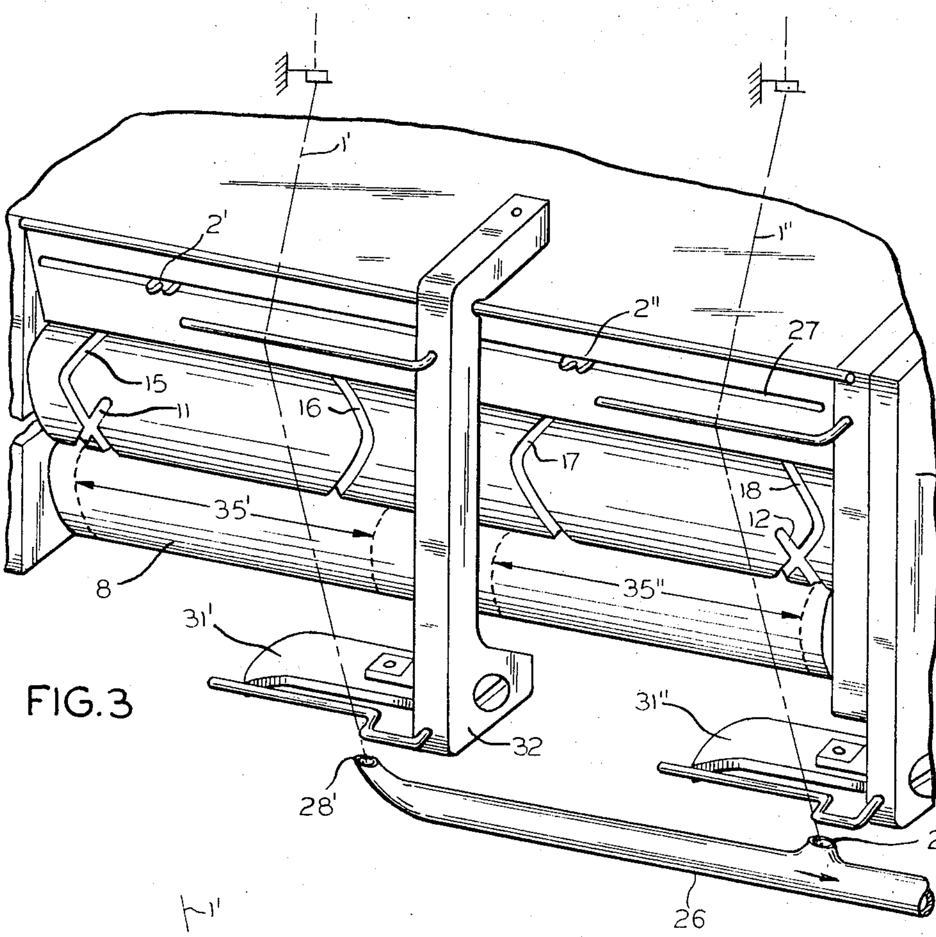

FIG. 3

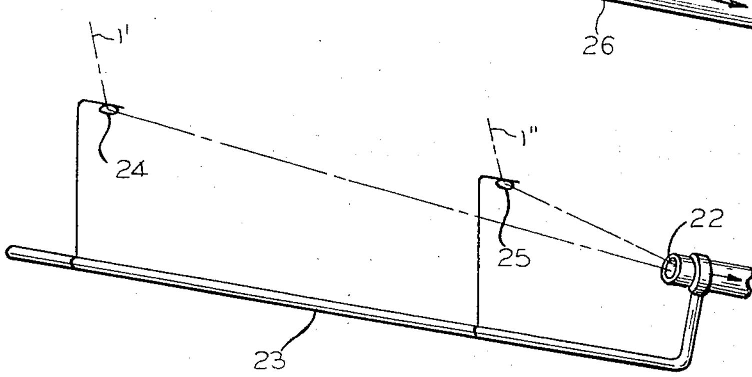

FIG. 4

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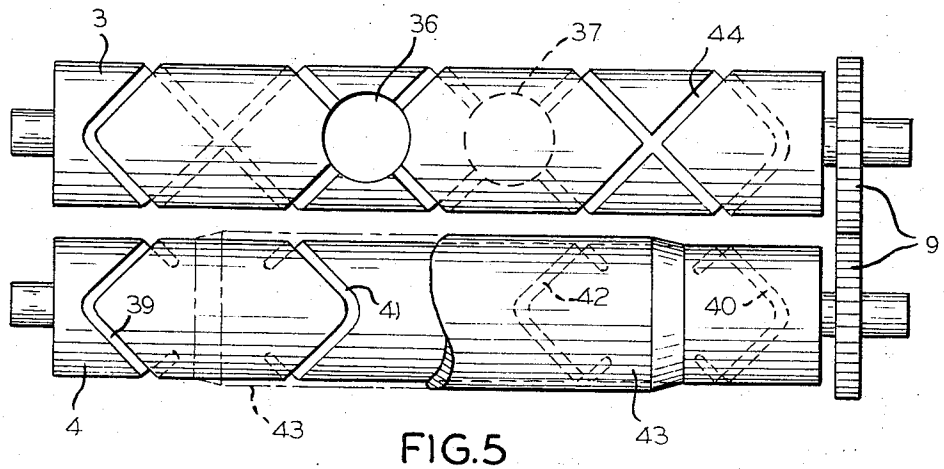
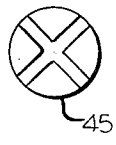


FIG.5

FIG. 7



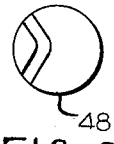


FIG. 8

FIG. 9

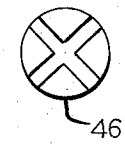


FIG. 10

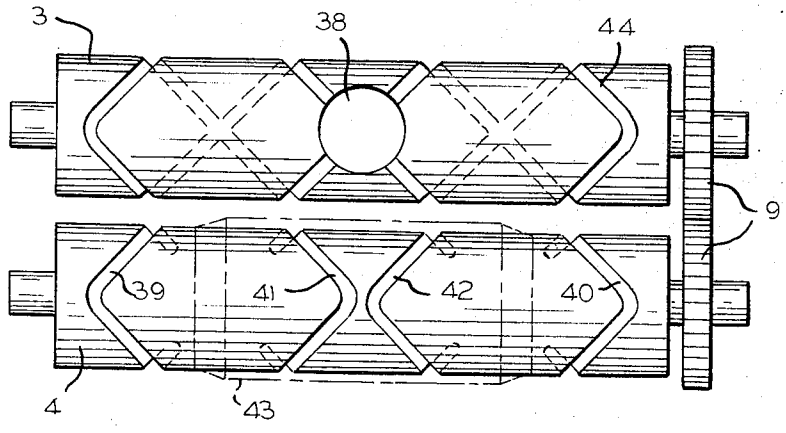


FIG.6

FIG. 11

FIG. 12

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HIGH-SPEED CROSS-WINDING DEVICE FOR WINDINGS OF DIFFERENT LENGTH

RELATED APPLICATION

This invention concerns improvements of the high speed winding devices disclosed in my application Ser. No. 884,933, filed Dec. 15, 1969, the disclosure of which is incorporated herein by reference.

INTRODUCTION

These cross winding devices serve for the winding of synthetic threads or filaments of various denier at high thread velocities. In order to keep the lost time during bobbin change low, it is expedient to wind threads of greater denier onto large and, in particular, longer bobbins than threads or filaments of smaller deniers. Advantageously there are used for this purpose cross winding devices, on which bobbins of different length can be produced.

It is a known practice to provide on a machine thread guide arrangements with differing, adjustable stroke lengths. These winding machines are not suited, on the one hand, for the winding of synthetic threads at high thread velocities. They have, moreover, the drawback that the machine capacity is utilized only in a correspondingly small degree in operations using the smaller strokes.

THE INVENTION

In the light of this, it is the objective of the present invention to combine the advantages of the invention according to the aforesaid application for the winding of synthetic threads at high thread velocities with the possibility of being able to produce at will short or long bobbin windings and also to utilize approximately the entire stroke length in the production of short bobbins. There is accomplished, in particular, the further objective of constructing the cross winding device in such a way that it can be shifted over from one winding length to the other without great expenditure in personnel, time and skill.

For this, in further development of a cross winding device according to said application, the invention herein provides for the production at will of two or more short bobbins instead of one long bobbin by an additional drive device for two or more reciprocated thread guides with short stroke and, in addition, two rotating thread guide means, each at the stroke reversal end of the short stroke ranges, in which the sum of the short stroke lengths is approximately equal to the full stroke length for the long winding. These additional elements can be disposed in the cross winding device as a constantly present, second set of alternative traverse grooves or else as exchangable elements which modify the grooves of the traverse devices.

An especially space-saving as well as easily and rapidly convertible embodiment of the invention consists of incorporation of the additional drive elements for the plural, short stroke, reciprocated thread guides on a cam drum or roller, preferably as a reverse-thread roller for the reciprocated, long stroke, first traverse device. Two additional thread guide means at the stroke reversal zones are provided on the second traverse device, e.g., a continuous cylinder or roller with two sets of angularly staggered thread guide grooves. Both traverse devices are adjustable at will for the production of one long bobbin winding or two or more shorter bobbin windings.

The cam drum or the reverse-thread roller is provided, in addition to the cam or the reverse thread for the long stroke, with two or more cams or reverse threads for the short strokes. The continuous cylinder or roller for stroke reversals has, besides the thread guide grooves or slits for reversal of the long stroke, in each case two thread guide grooves for reversal of each short stroke. The cam or the reverse thread for the long stroke is staggered angularly with respect to those for short strokes preferably by the same phase angle as the thread guide grooves with large stroke with respect to those with small stroke.

The changeover of the cross winding device from one stroke length to another is, with this preferred form, very simple. Upon installation of thread guides into the long-stroke or into the short-stroke reverse thread, the second, stroke reversal, traverse arrangement, which is driven synchronously to the first traverse device, automatically adjusts itself correctly.

In a second form, the reverse-thread roller has at suitable crossing points of the reverse thread used for the long stroke respective cavities in which may be placed an insert or plug with thread grooves crossing each other or, for the drive of the two or more reciprocated thread guides, an insert or plug with stroke reversing threads. Between the thread guide grooves for the long stroke of the stroke reversal roller there are provided additional thread guide grooves essentially without circumferential offsetting or staggering for the ends of the two or more short stroke ranges. In this arrangement the additional thread guide grooves or slits are preferably covered or otherwise inactivated in the production of long bobbins.

For the formation of the thread reserves in the winding of two or more short bobbins, an arrangement for the providing of a thread reserve is provided for each stroke length. In the winding of two or more short bobbin windings, the threads are simultaneously applied by means of a common thread-applying member guided substantially parallel to the traverse motion from the side face of the cross-winding device.

With "thread reserve" I mean an end of the thread, which serves during the continued processing of the bobbin for joining the thread of another bobbin, which is generally marked as transfer-tail.

As equipment of the cross-winding device for the applying of threads to the bobbins, there are two features. First, the winding device has a suction arrangement for the applying of the threads, which is characterized by two or more nozzles for applying the threads, the nozzles being arranged with spacings for providing the thread reserves. Second, the cross-winding device has a suction arrangement and a device for applying the threads and is characterized by a holder serving as thread-applying member with two or more thread guides which are spaced at distances for providing the thread reserves.

If two or more bobbin packs are to be produced, this can be done on several short tubes in the one case. For the simplification of the bobbin change the winding device, however, is also designed for operation with two windings on a single long tube. Such tubes have in some cases a groove or slit for the initial catching of the thread. It is proposed, therefore, that for each separate

winding there be provided on the common long tube a catching groove or a catching slit.

THE DRAWINGS

In the following there are described, with the aid of the drawings, preferred embodiments of the invention, in which one long winding or two short windings can be produced.

FIG. 1 is a schematic side elevation in cross section of the cross winding devices of the invention;

FIG. 2 is a front elevation of one embodiment of the thread-traversing mechanisms;

FIG. 3 is a front perspective view of a winding device with thread reserve-forming guide members;

FIG. 4 is a side elevation of a thread feed, suction unit; and

FIGS. 5 and 6 are front elevations of alternate forms of traverse mechanisms.

FIGS. 7–10 illustrate grooved plugs insertable in the traverse mechanism of FIG. 5, and FIGS. 11 and 12 illustrate plugs insertable in the traverse mechanism of FIG. 6.

For the cross-winding device according to U.S. application Ser. No. 884,933, several embodiments are proposed. The present invention relates to those embodiments in which the rotating, thread reversal guide means 4 are arranged axially parallel to the first traverse device 2,3.

The schematic view of FIG. 1 shows such an embodiment with drive roller drive. The thread 1 runs through the reciprocable thread guide 2 driven by the reverse-thread roller 3 and over the rotating thread guide means 4 onto the bobbin 6, which is driven by means of the drive roller 5. As the bobbin diameter increases, either the bobbin 6 can shift by means of swinging arm 7 or (not illustrated in the drawing) the combination of drive roller 5 and traverse means 2 to 4 joined as one unit can shift relative to the bobbin. The rotating thread guide means 4 are, as seen in FIG. 2, cylinders or rollers with thread guide grooves in the stroke reversal zones. The reverse-thread roller 3 and the cylinder 4 are connected over gears 9 with the gear ratio of 1:1. The thread guide 2 reciprocates the thread over the mid-range of the traverse stroke. In the stroke reversal zones, the thread is caught in the thread guide grooves of the roller 4, which take over the thread guiding formation in these zones.

If the cross-winding device is to be set for another traverse stroke or bobbin winding length, then there is provided, in the one case, the innovation of changing the reverse-thread roller 3 and the stroke reversal roller or cylinder 4 for ones dimensioned for the different stroke or length. According to a preferred embodiment the drive and traverse means can be changed over without dismantling to effect the change. For this, as illustrated in FIG. 2, the reverse-thread thread roller has a circumferential reversing thread or groove 10 to provide the large stroke of the guide 2 and two circumferential reversing threads 13 and 14 angularly offset to the groove or thread 10 in circumferential direction by about 90° to provide the small stroke for two guides 2′ and 2″. The set of thread guide grooves 11 and 12 on the cylinder 4 correspond and coact with the thread or groove 10. The set of shorter stroke, reversing threads or grooves 13 and 14 coact with the thread guide grooves 15 and 16 or 17 and 18. In the case of FIGS. 2 and 3, there are two thread guides 2′ and 2″ which are reciprocally driven by the reverse-thread roller 3, namely the shorter stroke reversing threads or grooves 13 and 14. These guides are guided in a straight line reciprocation in the slit 27 of the front plate 29 (FIG. 1). Correspondingly on the winding tube 8 there are formed two winding packages 6′ and 6″ (FIG. 2) and two winding zones 35′ and 35″ (FIG. 3).

For the shifting over of the cross-winding device from one to two winding packages, or vice versa, the thread guides 2 have to be changed and installed in the corresponding reversing threads. For this it is merely necessary to remove the front plate 29. A special adjustment of the roller 4 to the desired traverse function, however, is not required if the long-stroke traverse means are offset with respect to the short-stroke traverse means, as is provided by the invention, by the same phase angle in relation to the translation ratio between the reverse-thread roller 3 and the cylinder 4 and in consideration of their diameters. They are offset in such a way that only the traverse means corresponding to each other can be in engagement. In the example shown, the long-stroke traverse means are offset with respect to the short-stroke traverse means by the same angle (90°), since the translation ratio and the ratio of the diameters is 1:1.

The changeover of the cross-winding device for the production of windings of different length is also possible, however, without the reversing thread or thread guide grooves for the large stroke being offset at all with respect to those with small stroke or by a certain angle. For this case, FIGS. 5 and 5*a* and 6 and 6*a* each show a suitable embodiment. Their particular feature resides in the fact that the reversing thread as well as the thread guide grooves for the large stroke range are used also in the production of short bobbins. For this the roller 3 has, in the zone of such crossing points of the reversing thread or groove 44 for the long stroke as yield a suitable limitation of the short stroke ranges, recesses or cavities 36 and 37 (FIG. 5) or 38 (FIG. 6), which are suited for the reception of the inserts or plugs represented in FIGS. 5*a* and 6*a*. The changeover of the reverse-thread roller 3 in either FIG. 5 or FIG. 6 from the one winding length to the other is accomplished by selection of the plugs or inserts shown in FIGS. 5a and 6a, respectively, to be used in the reverse-thread roller 3.

In order to wind a single, longer winding package on the winding tube 8, crossover plugs or inserts 45 and 46 are seated in the openings or cavities 36 and 37 (FIGS. 5 and 7– 10) or crossover plug or insert 47 is placed in the opening or cavity 38 (FIGS. 6 and 11 and 12). Also, the tube 43 with tapered ends is placed about the cylinder or roller 4 to cover the intermediate stroke reversal grooves 41 and 42 in the roller or cylinder 4 — leaving exposed only the two outermost stroke reversal grooves 39 and 40.

When winding shorter packages, the tube 43 is removed from the roller or cylinder 4. Stroke reversal plugs 48 and 49 (FIGS. 5 and 5*a*) are inserted in the cavities 36 and 37 or stroke reversal plug 50 is inserted in the cavity 38 (FIGS. 6 and 6*a*). A second traverse element, e.g. element 2″, is mounted in the device when simultaneous winding of two packages is desired.

Expediently each winding 6′ and 6″ is provided with a thread reserve 21′ and 21″ (FIG. 2). For this there are arranged on the cross-winding device the necessary number of devices for providing the thread reserves. In

the cross-winding device according to FIG. 3 there are illustrated one type of such devices 31' and 31''. Other embodiments, however, are also conceivable. A description of the embodiment represented is found in U.S. application Ser. No. 175,609, filed Aug. 27, 1971. On changeover of the cross-winding device from two or more short bobbins to one long bobbin, mounting bracket 32 for the device 31' is removed.

The cross-winding devices are connected preferably with their left side (FIG. 3) attached to the frame of the machine (for example, a spinning machine) in two or more rows packed as tightly as possible. For this reason the threads have to be applied to the cross-winding device from the face side 30. In applying two or more threads, they are placed at the devices 31' and 31'' for the providing of the thread reserves 21' and 21'' by a thread feed device 26. It consists of a rigid tube which is connected to the suction line for the drawing off of the waste thread accumulated during the bobbin change and is movable, by hand or automatically, parallel to the traverse side of the cross-winding device. The tube has two nozzles 28' and 28'' spaced at the distance of the devices 31' and 31'' from one another. The thread is laid simultaneously in the thread catching grooves 19' and 19''.

Another equivalent thread feed member is shown in FIG. 4. The threads 1' and 1'' are sucked into the nozzle 22 and by means of holder 23 and thread guides 24 and 25 kept at the correct spacing. It is likewise possible to arrange the nozzle 22 in fixed position and to make only the holder 23 with the thread guides 24 and 25 movable by hand or automatically.

For the production of two windings there can be used two short winding tubes or one longer winding tube. Independently of this there is allocated to each winding zone a circumferential groove 19' or 19'' in the tubes, for the catching of the thread at the beginning of the winding operation.

The chief advantage of the invention lies in the ease and speed of changeover of the spinning, spin-stretching or other machine on which the cross-winding device is used, from one to two or more threads per winding position and vice versa. The cross-winding devices can be changed with few manual operations to the required winding function and in any case can remain fully utilized.

It is thought that the invention and its numerous attendant advantages will be fully understood from the foregoing description, and it is obvious that numerous changes may be made in the form, construction and arrangement of the several parts without departing from the spirit or scope of the invention, or sacrificing any of its attendant advantages, the forms herein disclosed being preferred embodiments for the purpose of illustrating the invention.

The invention is hereby claimed as follows:

1. A high speed thread winding apparatus for selectively winding a long winding or a plurality of shorter windings of thread on a winding tube comprising a first traversing device embodying a reciprocable thread guide, and a second traversing device with two rotatable thread guide means respectively taking over the thread traverse stroke near the respective ends of the traverse stroke of said first device, means for driving said first and second traversing devices synchronously with each other, said first traversing device having alternate means for driving one thread guide in a long traverse stroke or two or more thread guides in respective shorter traverse stroke lengths, and additional thread guide means on said second traversing device providing thereon two rotatable thread guide means respectively taking over the thread traverse stroke near the respective ends of the traverse strokes of said thread guides used for the respective shorter traverse stroke lengths during the winding of a plurality of windings with the plurality of thread guides of said first traversing device.

2. A winding device as claimed in claim **1**, said first traversing device embodying a rotatable, spirally grooved drive member with means providing alternate, endless spiral groove paths for the respective traverse strokes.

3. A winding device as claimed in claim **2**, said second traversing device comprising a rotatable cylinder with respective pairs of thread guide grooves providing stroke reversal thread guiding at the reversal zones of each respective traverse stroke.

4. A winding device as claimed in claim **3**, the endless, spiral groove path in said drive member for said longer stroke being circumferentially offset relative to the endless, sprial groove paths for said shorter strokes.

5. A winding device as claimed in claim **4**, the thread guide grooves in said cylinder for said longer stroke being circumferentially offset relative to the thread guide grooves for said shorter strokes at the same angle of circumferential offset as that of said spiral groove paths.

6. A winding device as claimed in claim **3**, said second traversing device comprising a rotatable cylinder with respective pairs of thread guide grooves providing stroke reversal thread guiding at the reversal zones of each respective traverse stroke, and means to cover all but the two outermost thread guide grooves during the production of the longer windings.

7. A winding device as claimed in claim **1**, spaced, plural means for forming respective thread reserves adjacent each winding, and thread-applying means for simultaneously applying threads to said plural means from a side of said winding device along the traverse face thereof.

8. A winding device as claimed in claim **7**, said thread-applying means comprising suction means with thread-entrant nozzles spaced in correspondence to the spacing of said plural means for forming respective thread reserves.

9. A winding device as claimed in claim **7**, said thread applying means comprising a suction tube having mounted thereon a plurality of thread guide members spaced in correspondence to the spacing of said plural means for forming respective thread reserves.

10. A winding device as claimed in claim **1**, said device including a winding tube upon which a plurality of threads are wound as a plurality of said shorter, side-by-side windings, and a plurality of circumferential, axially spaced, thread-catching grooves in said tube for initiating a thread reserve winding for each of said shorter windings.

11. A high-speed cross-winding device comprising a single reciprocable thread guide member or alternatively a plurality of said guide members and a rotatable drive roller having endless spiral groove means for reciprocably driving said member or members, said spiral groove means having first groove means forming an endless, first spiral groove path with stroke reversal

groove portions at opposite ends of said roller to give a long traverse stroke of said single guide member for production of a single, longer winding and, alternatively, second groove means forming two or more endless spiral groove paths axially spaced on said roller and respectively having at least one stroke reversal groove portion in the intermediate portion of said roller for imparting shorter traverse strokes to said plurality of thread guide members reciprocably driven in the latter groove paths for production of a plurality of shorter, side-by-side windings.

12. A high-speed cross-winding device comprising a single reciprocable thread guide member or alternatively a plurality of said guide members and a rotatable drive roller having endless spiral groove means for reciprocably driving said member or members, said spiral groove means having first groove means forming an endless, first spiral groove path with stroke reversal groove portions at opposite ends of said roller to give a long traverse stroke of said single guide member for production of a single, longer winding and, alternatively, second groove means forming two or more endless spiral groove paths axially spaced on said roller and respectively having at least one stroke reversal groove portion in the intermediate portion of said roller for imparting shorter traverse strokes to said plurality of thread guide members reciprocably driven in the latter groove paths for production of a plurality of shorter, side-by-side windings, said drive roller having a recess at at least two points where the first spiral groove path would normally have crossing points, and plugs removably inserted in said recesses in said roller, said plugs respectively having therein a stroke reversal groove portion in the intermediate portion of said roller, and additional plugs having grooved crossing points alternatively insertable in said recesses.

13. A winding device as claimed in claim **11**, said device further including a winding tube upon which the thread is wound in the production of a plurality of said shorter, side-by-side windings, and a plurality of circumferential, axially spaced, thread catching grooves in said tube for initiating a thread reserve winding of each of said shorter windings whenever a plurality of shorter, side-by-side windings are wound on said winding tube.

14. A winding device as claimed in claim **2**, said last-mentioned means including plug means removably inserted in said drive element to provide said alternate, endless spiral groove paths.

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