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3,394,895

METHOD AND APPARATUS FOR WINDING YARNS

Filed Oct. 10, 1966

2 Sheets-Sheet 1

FIG. 1.

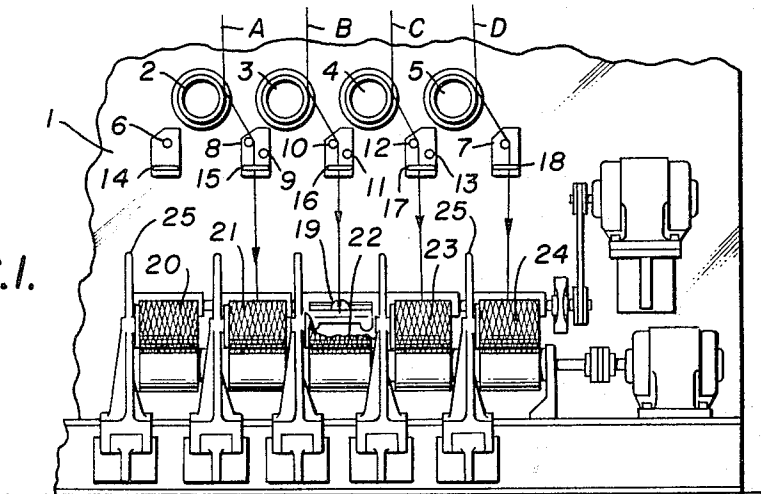


FIG. 2.

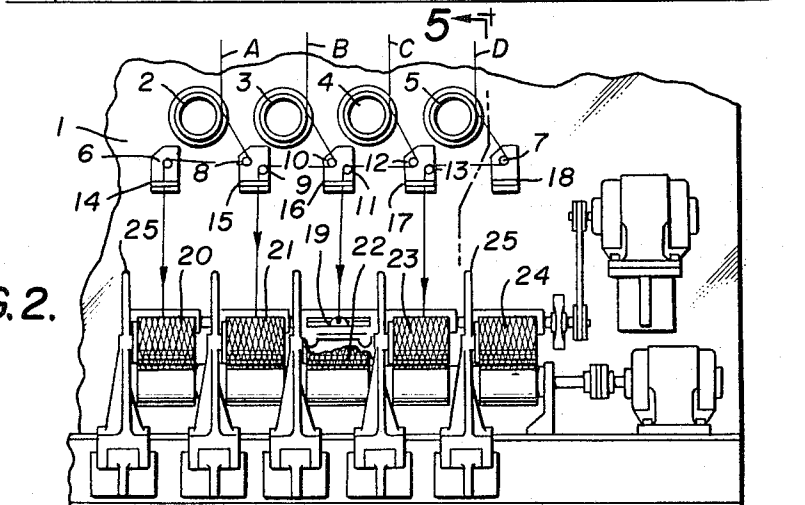


FIG. 3.

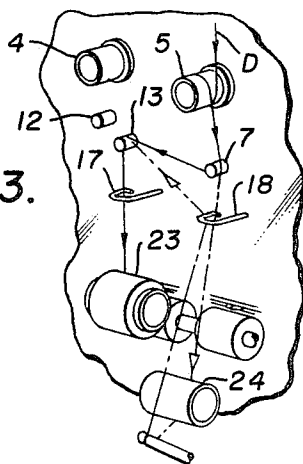
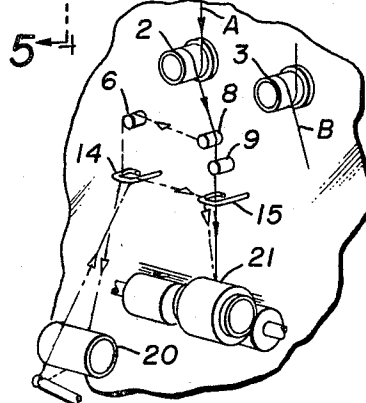


FIG. 4.



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2 Sheets-Sheet 2

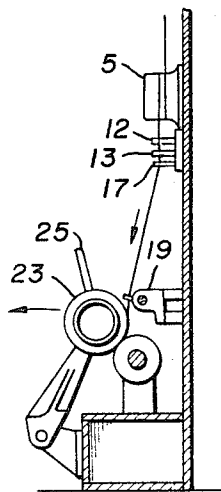


FIG. 5.

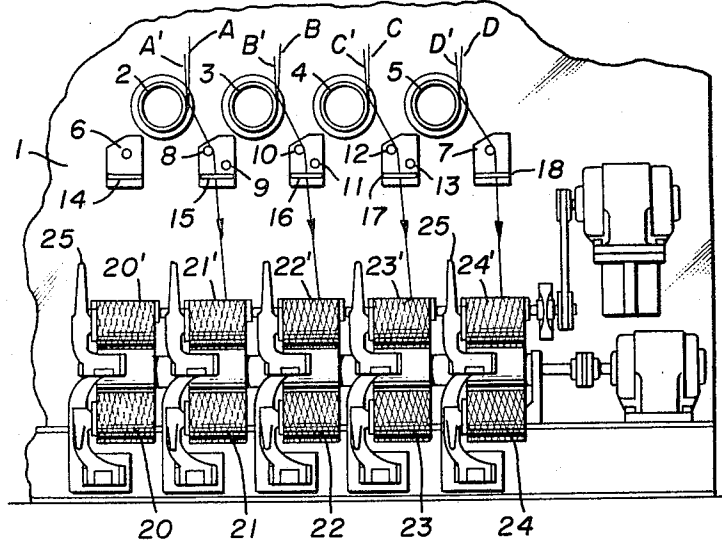


FIG. 6.

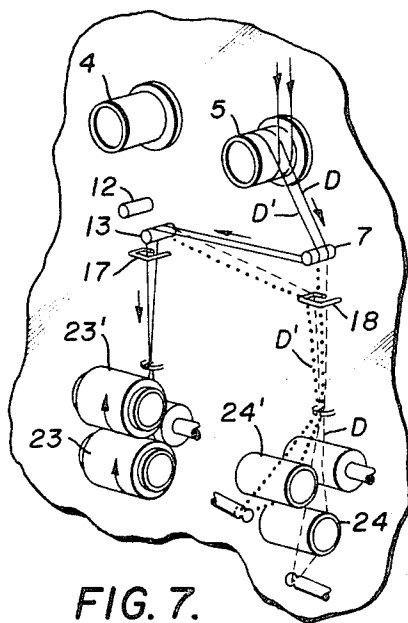


FIG. 7.

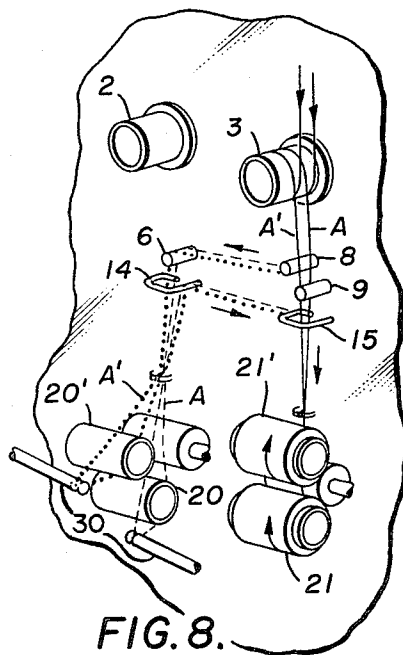


FIG. 8.

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METHOD AND APPARATUS FOR WINDING YARNS

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4 Claims. (Cl. 242—18)

ABSTRACT OF THE DISCLOSURE

A yarn winding machine having a row of winding positions, including an extra position, and an arrangement of roller and hook-end guide units adapted to permit transfer of the yarns, without operational interruption, to provide a row of yarns in a vertical string-up under one condition of operation, and a row of laterally spaced yarns in a right-angle string-up under a second condition of operation; and, a method for transferring yarns, one by one, from a take-up bobbin at a winding position to an empty bobbin at a stand-by position by forming a loop in a yarn end at a predetermined point along its length traveling to the take-up bobbin, and in one continuous step guidingly extending the loop laterally and vertically downwardly to pass around the empty bobbin and then effecting simultaneously, an automatic break in the looped yarn traveling to the take-up bobbin and a transferred take-up of yarn on the empty bobbin.

Conventional yarn winding apparatus, in general, comprises an upright arrangement of a plurality of side-by-side yarn winding positions each serving to take up a single yarn end. At each winding position, there is a driven feed roll that forwards a yarn end to a traverse device which in turn leads the yarn to a driven bobbin upon which the yarn is collected. In doffing a packaged bobbin, conventionally, an operator cuts or breaks the yarn being taken up on a bobbin, pulls the packaged bobbin away from a drive roll, and replaces the packaged bobbin with empty bobbin. While the packaged bobbin is being doffed, one end of the cut yarn winds around and collects on the driven feed roll. After lacing the yarn onto the empty bobbin an operator must remove the waste yarn accumulated on the driven feed roll. When this procedure is carried out at each position, a high percentage of operating time is lost and a large quantity of waste yarn is produced.

To improve upon conventional practice, it has been proposed to place two bobbin drives in side-by-side alignment at each winding position and to make one bobbin a stand-by bobbin to which the yarn is transferred when its companion bobbin is fully packaged. In such an arrangement, one bobbin at each position remains idle at all times producing an expensive operation.

Tandem windup, that is, taking up two yarn ends simultaneously at one position on tandemly driven bobbins is also employed. Tandem windup, however, is a system still requiring separate position operation with consequent loss of time in the transfer of yarn ends.

Recent development is in the direction of providing an uninterrupted system where the transfer of yarn ends is integrated through all of the winding positions in a more simplified and less expensive manner.

It is an object of this invention to provide a novel integrated yarn winding method and apparatus.

Another object of the invention is to provide a yarn winding apparatus with means providing a procedure for transferring moving yarn ends from packaged to empty bobbins, serially, back and forth through all of the winding positions without interruption and with each separation of yarn from a packaged bobbin and lace-up

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upon an empty bobbin occurring simultaneously and automatically.

Another object of the invention is to provide a simplified, expeditious and inexpensive method and apparatus for handling the winding and doffing of yarn packages on a tandem position winding machine.

In brief, the novel apparatus comprises a plurality of single and multiple roll guide units, J-guides, traverse means and bobbin chuck drives arranged on an upright frame in predetermined organization to form an inter-related winding system. A plurality of driven feed rolls, one less than the number of winding positions, forward the yarn ends to the winding positions. In operation, one winding position is always a spare or idle position. For purposes of description the apparatus is divided into winding positions and feed rolls; however, it will be understood that the apparatus is integrated in structure.

In method, each of a plurality of yarn ends passes around a respective feed roll and is delivered to a winding position to be collected on a bobbin. In one operating condition, all of the yarn ends travel directly from the feed roll into a winding position and are taken up. In a second condition the yarns taken up at each position and are taken up. In a second condition the yarns taken up at each position are delivered from a guide roll of an adjacent position. In both conditions of operation, one end winding position is idle. A transfer operation is begun by changing the path of travel of the yarn to cause the yarn being taken up in the position next to the idle position to detour through the idle position and then to effect an automatic break in the yarn end between the idle and take up positions. The winding position from which the yarn end was transferred to the idle position then becomes the idle winding position, after the packaged bobbin is replaced with an empty bobbin, and the yarn end being taken up at the adjacent winding position is then detoured to it and a transfer effected thereto. The same procedure is followed, serially, through all of the winding positions.

The method of deviating the path of the yarn end from one position to the other when the yarns are being taken up in the one condition is to form a loop within the yarn end and to extend the loop from the yarn take up position through the idle position. When the yarns are being taken up under the second condition, the yarn is already passing over a roll guide of the idle position and it is only necessary to form a loop therefrom through the other components of the idle position. In both operating conditions, the loop passes around the spare bobbin which is in a doff position removed from the drive roll. An automatic break in the yarn is effected by bringing the spare bobbin into engagement with its corresponding drive roll after an extra loop of the yarn is taken around the spare bobbin.

The spring-up of the yarns is organized so that the paths of the yarns do not intersect and so that the yarns are not traveling in overlayed relation. One feed roll is adapted to deliver yarn to two positions in alternate sequence.

A better understanding of the invention will be gained by referring to the following more detailed description and to the accompanying drawings.

In the drawings:

FIGURE 1 is a front elevation of the novel winding apparatus illustrating a plurality of yarn ends laced within the apparatus with all of the yarn ends being processed to the right of the winding apparatus,

FIGURE 2 is a front elevation of the novel apparatus illustrating all of the yarn ends being processed to the left of the winding apparatus,

FIGURE 3 is a perspective view of a portion of the winding machine schematically illustrating the manner of

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shifting the yarn ends rightwardly on the winding machine.

FIGURE 4 is a perspective view of a portion of the winding machine schematically illustrating the manner of shifting the yarn ends leftwardly on the winding machine.

FIGURE 5 is a section view taken through 5—5 of FIG. 2.

FIGURE 6 is an elevation view showing the invention applied in a tandem winding arrangement.

FIGURE 7 is a perspective view of a portion of the tandem winding arrangement illustrating schematically the manner of shifting the yarn ends rightwardly, and

FIGURE 8 is a perspective view of a portion of the tandem winding arrangement illustrating schematically the manner of shifting the yarn ends leftwardly on the tandem winding machine.

Referring to the drawings, the novel yarn winding apparatus is shown in one embodiment in FIGS. 1 and 2. The illustrated configuration is designed for processing four yarn ends; however, it will be understood that the apparatus may be constructed for processing more or less number of yarn ends. The yarn winder comprises an upright frame 1 having a plurality of driven feed rolls 2, 3, 4 and 5 mounted in spaced, horizontal row alignment along the upper end of the frame. Four yarn ends A, B, C and D, generally forwarded directly from a spinnerette, are each laced around a feed roll 2, 3, 4 and 5, respectively. Below the feed rolls there is a horizontal alignment of five roll guide units. A single roll guide 6 is mounted below and to the left side of feed roll 2 and another single roll guide 7 is mounted below and to the right side of feed roll 5. Three pairs of closely spaced and angularly off-set roll guides 8 and 9, 10 and 11, 12 and 13 are arranged between and below the driven feed rolls. The rolls of the guide units, preferably, are rotatable. In the double roll units, one roll is mounted lower than the other and off-set to one side thereof to permit traversing and transfer of the yarn ends as will be explained later. At a level below and in line with each of the five roll guide units, that is, the two single and three double units, there are J-shaped guides 14, 15, 16, 17 and 18. The J-guides have a predetermined width at the mouth between the arms to permit the yarn to move back and forth therein without contacting the arms of the guides when the yarn is being traversed. The free arms of the J-guides are further provided with hooked ends. In line and below each J-guide there is a traverse means 19, only one of which is shown for purposes of clarity of illustration. Below and in vertical alignment with each traverse guide there is a bobbin chuck with a respective bobbin 20, 21, 22, 23 and 24 mounted on each chuck. The bobbins are each driven by respective drive rolls driven through a main shaft. A pivotal swing arm 25 at each winding position is provided for moving the bobbins away from their corresponding drive rolls into a doff position out of engagement with the drive rolls.

In one yarn lace up, each of the four yarn ends A, B, C and D is wound around a respective feed roll 2, 3, 4, and 5. Yarn end A is wound around driven feed roll 2 and is forwarded downwardly to roll guides 8 and 9, as shown in FIG. 1. The yarn end contacts roll guide 8, only, and moves downwardly in the plane of and within the mouth of, but not in contact with, J-guide 15 and then travels downwardly into lace-up within traverse guide 19 and then is taken up on bobbin 21. Yarn ends B, C and D are laced up similarly with the yarn ends contacting roll guides 10, 12, and 7, respectively. In this lace, up the yarn will be taken up on bobbins 21—24 with the roll guide 6, J-guide 14, and bobbin 20 not being used but acting as spares. Bobbin 20 is in a doff position removed from its drive roll.

Assume that bobbins 21—24 are packaged with yarn and a transfer or shift of the yarn ends is to be effected from right to left, that is, transferring all of the yarn ends one by one to an adjacent bobbin on the left.

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Referring now to FIG. 4, the method of transfer of yarn end A, only, will be described as the method is the same for the other yarn ends. An operator using a doff stick contacts or hooks that length of the yarn extending between roll guide 8 and J-guide 15 and moves the yarn leftwardly after hooking the yarn around the hooked arm of J-guide 15 to form a loop. The loop is lengthened leftwardly and is maneuvered around guide roll 6, is brought downwardly on the inside of J-guide 14 and then is strung down to and looped around bobbin 20 after being passed through traverse guide 19. Bobbin 20 is in a doff position removed from the drive roll. Having made the above looped string up, the yarn end A will be traveling from driven feed roll 2, around guide roll 8, around guide roll 6, through the opening of J-guide 14, through traverse guide 19, around bobbin 20, back up through the traverse guide 19, up through and over J-guide 14, over to and through J-guide 15, and down to bobbin 21 via a traverse guide 19. The operator then quickly makes another loop of the yarn around bobbin 20 and engages the latter to its corresponding drive roll. Upon engagement of bobbin 20 with the drive roll, the yarn automatically breaks in the length between bobbins 20 and 21 due to the stress applied to the yarn by the slower speed of rotation of bobbin 21 in relation to the speed of bobbin 20. One broken yarn end winds up on bobbin 21 while the other yarn begins to collect on bobbin 20. Bobbin 21 is then doffed and replaced with an empty bobbin. The same procedure is followed until all of the yarn ends are transferred to the left as is shown in FIG. 2. It will be noted that in transferring strands B, C and D leftward, the lower guide rolls 9, 11, and 13 are used to accomplish the transfer.

Assume that bobbins 20—23 are packaged with yarn and that yarn ends, A, B, C and D are to be shifted from the running paths shown in FIG. 2 back to the running paths shown in FIG. 1, rightwardly. The first transfer will be made with yarn end D and is illustrated in FIG. 3. An operator using a doff stick contacts yarn end D adjacent that length leaving guide roll 7, moves the yarn downwardly forming a loop and extends the loop through the mouth of J-guide 18, then downwardly through a traverse guide 19 and around bobbin 24. Bobbin 24 will be in a doff position. At this time, the yarn end D will be traveling from driven feed roll 5, over roll guide 7, downwardly through the mouth of J-guide 18, through a traverse guide 19, around bobbin 24, upwardly through traverse guide 19 and through J-guide 18, over to and around roll guide 13, downwardly through J-guide 17 to bobbin 23 via a traverse guide 19. The operator makes another loop around bobbin 24 and the latter is then brought into engagement with its corresponding drive roll causing the yarn to break in a portion between bobbins 23 and 24. The yarn will now be collected on bobbin 24 and will be traveling directly from feed roll 5, over roller guide 7, through the mouth of J-guide 18 but, not contacting the latter, through a traverse guide 19 and collected on bobbin 24. Packaged bobbin 23 will be doffed and an empty bobbin will be substituted therefor. The other yarn ends will be transferred rightwardly in the order C, B, A in the manner of yarn end D. At the end of the rightward shift of yarn ends, the left end winding position will be idle.

Shown in FIGURES 6—8 is an application of the invention in a tandem windup system. Although there are two bobbins at each position, the operation is similar to that of the single bobbin arrangement shown in FIGS. 1—5. As illustrated in FIGS. 6—8, two yarn ends are wound at each winding position. FIGURE 6 shows the lace-up of yarns in the tandem arrangement wherein all of the yarn ends are shifted rightwardly. It will be understood that the lace-up of the yarns with all shifted leftwardly will be similar to that shown in FIG. 2.

The manner of shifting the two yarn ends from one position to the other is shown in FIGS. 7 and 8—FIG. 7

showing a rightward shift and FIG. 8 showing a leftward shift.

Viewing FIG. 7, the two yarn ends D, D' are shifted one at a time. With both empty bobbins 24 and 24' in a doff position, the first yarn end D is transferred to the lower bobbin 24. The manner of transfer is similar to that explained for the single bobbin arrangement as described for FIG. 3. The yarn end D is looped around the end of bobbin 24 and by making an additional loop around bobbin 24 and moving the bobbin into engagement with the drive roll a break in the yarn end D is effected so that yarn end D is collected on lower bobbin 24. The yarn end D will be traveling over the drive roll and then between the nip of the drive roll and bobbin. The second yarn end D' then is transferred to the upper bobbin in the same manner as was the first yarn end D.

The shift of the yarn ends A and A' as shown in FIG. 8 are accomplished in the manner of that explained for FIG. 7. One yarn end is shifted at a time. The method of shifting the yarn ends leftwardly through the components is similar to that explained for the single yarn ends.

It is to be noted that the J-guides are only used in the transfer of the yarn ends and that while the yarn ends are being collected on the bobbins the yarn ends move back and forth within the mouth of the J-guides without contact therewith. The displacement of the yarn ends back from the traverse devices to the roll guides and the roll guides in the double units must, therefore, also be spaced so that the yarn ends do not contact both roll guides in their traverse.

Many advantages accrue in the use of the novel yarn winding apparatus and method. The distance from the feed rolls to the take up positions is kept to a minimum. The angular travel of the yarn and the number of turns is minimized. Overlapping and criss-crossing of yarn ends is avoided. Most importantly, there is a saving of time and yarn.

It will be understood that modifications and variations from the illustrated embodiments of the invention are expected to be covered within the spirit of the invention and that the invention be limited only within the scope of the claims.

I claim:

1. A yarn winding machine comprising,
 - a row of guide units including right and left end units having a single roller guide and intermediate units having a pair of closely offset roller guides,
 - a plurality of hooked-end guides, each having an opening of predetermined size to permit lateral displacement of yarn therein and each positioned in close adjacency below a respective roller guide unit,
 - a plurality of feed rolls for forwarding a yarn to all but one of said end guide units,
 - yarn traverse and take-up means associated with each guide unit,
 wherein, according to a first operation individual yarns pass engagingly over a respective roller guide at all but one of said end guide units, pass through the opening of an associated hooked-end guide and travel to the associated traverse and take-up means, and according to a second operation, said yarns each cross over from said yarn engaged roller guides to an adjacent roller guide unit, pass engagingly over the unengaged roller guide thereof, pass through the opening of the hooked-end guide associated with the latter roller guide and are traversed and taken up by the traverse and take-up means associated with said adjacent roller guide unit, and
 - said yarns being shifted, seriatim, from one operative condition to the other, reversibly and uninterruptedly, by engagement with said hooked-end guides.
2. An improved method for shifting yarns leftwardly and rightwardly on a yarn winding machine having a plu-

rality of yarn traverse and bobbin wind-up positions in row alignment, said method comprising,

- feeding, guiding in a substantially vertical path, traversing and taking up a yarn end at all of the winding positions except one end stand-by position,
- placing an empty bobbin in a doff position on the stand-by position,
- shifting the nearest yarn end to the stand-by position by contacting the yarn at a point along its vertical length and guidingly displacing the contacted portion laterally, without disrupting the winding operation, to form a fold or loop, that is passed around an unengaged guide at the stand-by position and is guidingly extended vertically downwardly and passed around the empty bobbin, making another yarn loop around the empty bobbin and moving the empty bobbin into engagement with a driven roll effecting, simultaneously, an automatic break in the loop strand feeding to the winding position, and a traversing and take-up of the loop strand traveling to the empty bobbin,
- shifting each yarn end, one by one, to adjacent stand-by positions in the manner of the first after doffing the filled bobbins and replacing them with empty bobbins until the opposite end position becomes a stand-by position and all of the yarn ends are laterally spaced and each is being taken up in a right-angle string-up traveling substantially horizontally from one winding position to the adjacent position and vertically downwardly to a take-up bobbin,
- shifting the nearest yarn end to the opposite end stand-by position by contacting the yarn at a point in the horizontally traveling length thereof and guidingly displacing the contacted portion laterally, without disturbing the winding operation, to the stand-by position to form a fold or loop therein that is guidingly extended vertically downwardly, and passed around the stand-by empty bobbin placed in a doff position, making another yarn loop around the empty bobbin and moving the empty bobbin into engagement with a driven roll effecting, simultaneously, an automatic break in the loop strand feeding to the winding position, and a traversing and take-up of the loop strand feeding to the empty bobbin,
- shifting each yarn end, one by one, following the first shift to the opposite end stand-by position, after doffing the filled bobbins and replacing them with empty bobbins, until all of the yarn ends are in a vertical string-up.
3. An improved method for shifting yarns leftwardly and rightwardly on a yarn winding machine having a plurality of yarn traverse and bobbin wind-up positions in row alignment, said method comprising,
 - feeding, guiding in a substantially vertical path, traversing and taking up a yarn end at all of the winding positions except a left end stand-by position,
 - placing an empty bobbin in a doff position on the stand-by winding position,
 - shifting the leftmost yarn end to the stand-by winding position by contacting the yarn at a point along its vertical length and guidingly displacing the contacted portion, without disrupting the winding operation, leftwardly forming a fold or loop that is passed around an unengaged guide of the stand-by position and is guidingly extended vertically downwardly and passed around the empty bobbin, wrapping a complete yarn loop around the empty bobbin and moving the latter into engagement with a driven roll effecting, simultaneously, an automatic break in the loop strand feeding to the adjacent winding position, and a traversing and take-up of the loop strand feeding to the empty bobbin,
 - shifting each yarn end, one by one, leftwardly in the manner of the first, after doffing the filled bobbins and replacing them with empty bobbins, whereby the

right end winding position becomes a stand-by position and all of the yarn ends are laterally spaced and each is being taken up in a right-angle string-up traveling substantially horizontally leftwardly from one winding position to the adjacent winding position and downwardly to a take-up bobbin, 5

shifting the rightmost yarn end by contacting the yarn at a point in the horizontally traveling length thereof and guidingly displacing the contacted portion rightwardly to the stand-by position forming a fold or loop therein that is extended guidingly vertically downwardly, without disrupting the winding operation, and is passed around the stand-by empty bobbin in a doff position, wrapping a complete yarn loop around the empty bobbin and moving the empty bobbin into engagement with a driven roll effecting simultaneously, an automatic break in the loop strand feeding to the winding position, and a traversing and take-up of the loop strand feeding to the empty bobbin, and 10

shifting each yarn end, one by one, rightwardly in the manner of the first, after doffing the filled bobbins and replacing them with empty bobbins, whereby all of the yarn ends are taken up in a vertical string-up. 15

4. An improved method for shifting yarns leftwardly and rightwardly on a yarn winding machine having a plurality of yarn traverse and bobbin wind-up positions in row alignment, said method comprising, 20

feeding, guiding in a substantially vertical path, traversing and taking up a yarn end at all of the winding positions except a right end stand-by position, 25

placing an empty bobbin in a doff position on the stand-by winding position, 30

shifting the rightmost yarn end to the stand-by winding position by contacting the yarn at a point along its vertical length and guidingly displacing the contacted portion, without disrupting the winding operation, rightwardly forming a fold or loop that is passed around an unengaged guide of the stand-by position and is guidingly extended vertically downwardly and passed around the empty bobbin, wrapping a complete yarn loop around the empty bobbin and moving 35

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the latter into engagement with a driven roll effecting, simultaneously, an automatic break in the loop strand feeding to the adjacent winding position, and a traversing and take-up of the loop strand feeding to the empty bobbin, 5

shifting each yarn end, one by one, rightwardly in the manner of the first, after doffing the filled bobbins and replacing them with empty bobbins, whereby the left end winding position becomes a stand-by position and all of the yarn ends are laterally spaced and each is being taken up in the right-angle string-up traveling substantially horizontally rightwardly from one winding position to the adjacent winding position and downwardly to a take-up bobbin, 10

shifting the leftmost yarn end by contacting the yarn at a point in the horizontally traveling length thereof and guidingly displacing the contacted portion leftwardly to the stand-by position forming a fold or loop therein that is extended guidingly vertically downwardly, without disrupting the winding operation, and is passed around the stand-by empty bobbin in a doff position, wrapping a complete yarn loop around the empty bobbin and moving the empty bobbin into engagement with a driven roll effecting, simultaneously, an automatic break in the loop strand feeding to the winding position, and a traversing and take-up of the loop strand feeding to the empty bobbin, and 15

shifting each yarn end, one by one, leftwardly in the manner of the first, after doffing the filled bobbins and replacing them with empty bobbins, whereby all of the yarn ends are taken up in a vertical string-up. 20

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