Jan. 28, 1964 W. E. DAVIS ETAL 3,119,225

METHOD AND APPARATUS FOR TWISTING YARN

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Fig. 1.

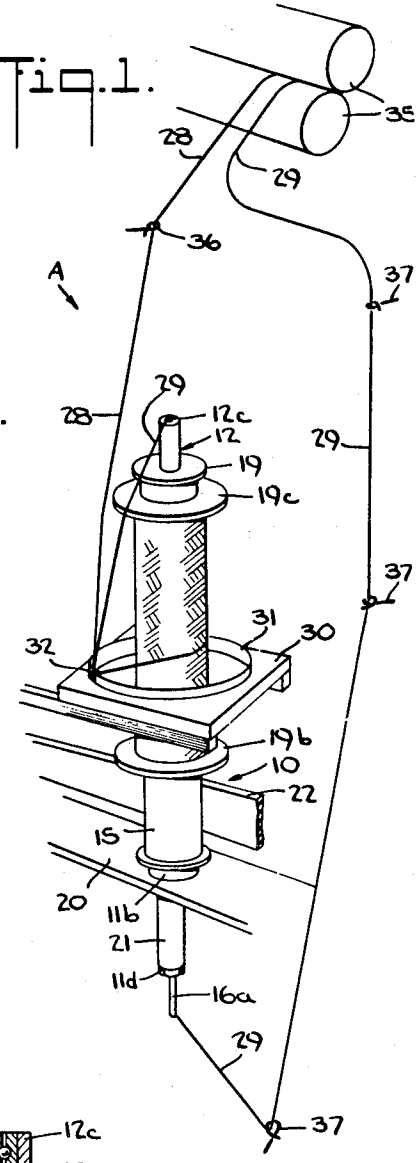


Fig. 2.

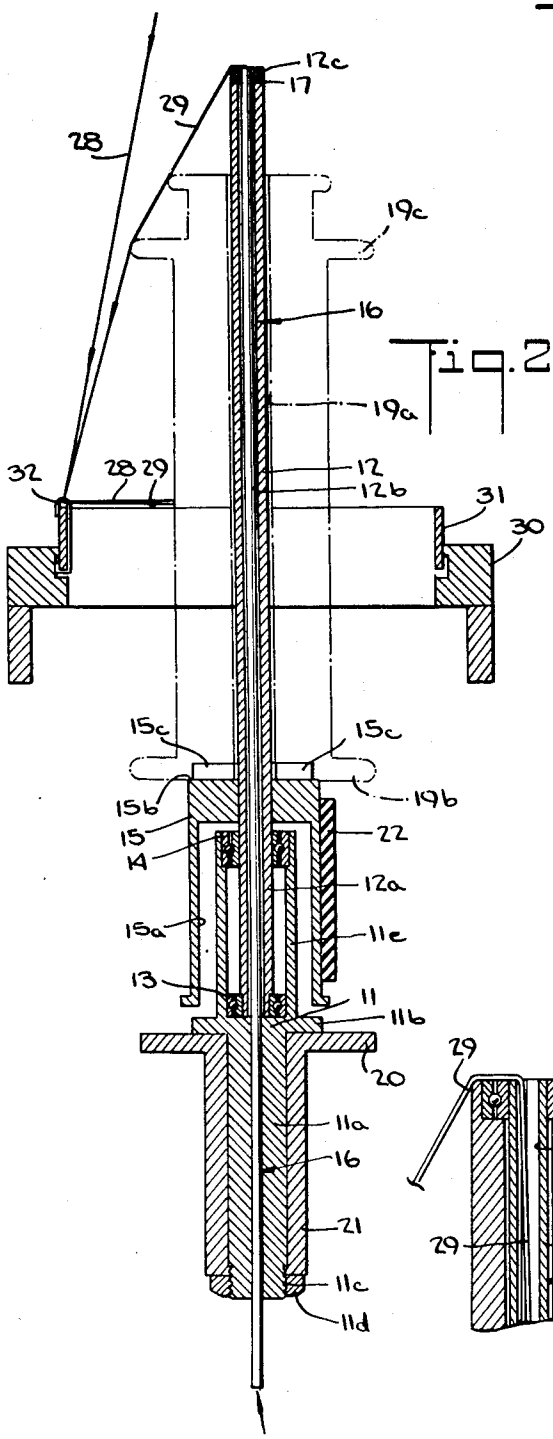


Fig. 3.

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METHOD AND APPARATUS FOR TWISTING YARN

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This invention relates to twisting and winding yarn and more particularly is directed to an improved twist spindle device and a method for simultaneously feeding, twisting and winding dual ends of yarn to provide a bobbin package for subsequent removal of the yarn therefrom simultaneously and separately.

Among the objects of the invention is to provide an improved twist spindle apparatus and method for simultaneously twisting and winding two separately fed ends or threads of yarn onto a bobbin package, the dual ends of yarn being wound thereon in parallel relation and having substantially the same twist level but with one end containing S twist, the other Z twist and adapted to be subsequently simultaneously removed onto separate packages or utilized directly as a dual or parallel thread, which method shall be capable of performance on existing machinery after minor and inexpensive modification and by conventionally trained operators, which apparatus shall require a minimum of maintenance, be dependable, practical and efficient to a high degree in use.

Other objects of the invention will in part be obvious and in part hereinafter pointed out.

The invention accordingly comprises the steps of the method, features of construction, combination of elements and arrangement of parts which shall be exemplified in the method, apparatus and article hereinafter described, the scope of the application of which will be indicated in the claims following.

In the accompanying drawing in which an illustrative embodiment of the invention is shown:

FIG. 1 is a perspective view of a portion of a twisting and winding apparatus constructed to embody the invention showing two ends of yarns being fed, one directly to a ring traveler and the other through a bore provided in a spindle shaft and then to the ring traveler, and then being simultaneously wound on a bobbin.

FIG. 2 is an enlarged vertical section taken through the spindle shaft showing the novel bore construction with one end of yarn extending therethrough, and

FIG. 3 is a detailed vertical section of the upper end of the spindle shaft shown in FIG. 2.

Referring in detail to the drawing, "A" generally denotes a twisting and winding machine incorporating novel spindle **10**, constructed to embody the invention, shown mounted on stationary spindle rail **20** to extend vertically and concentrically through ring **31** mounted in an opening in ring rail **30**, the latter being adapted to reciprocate vertically by means of conventional mechanism (not shown).

As seen in FIG. 2, spindle **10** may comprise a rotatable upper spindle shaft **12** and a fixed lower end portion **11** having a stud shaft **11***a* extending from an intermediate lateral flange **11***b* forming a supporting base against spindle rail **20**, stud shaft **11***a* being seated in open ended well **21** and terminating in a projecting threaded end **11***c* to receive lock nut **11***d* for removably securing spindle **10** on rail **20**. Extending upwardly from flange **11***b* and concentric with stud shaft **11***a* is a journal-box **11***e* in which lower end **12***a* of spindle shaft **12** may be suitably journaled as by spaced ball bearings **13** and **14**. A spindle whorl **15** is mounted, as by force fitting, to turn with spindle shaft **12** and, for proper alignment with driving belt **22** of machine A spindle whorl **15** may be bell shaped to provide an open bottom hollow core **15***a* accommodating journal-box **11***e* in spaced concentric relation.

Spindle shaft **12** may comprise an elongated hollow tube herein shown as substantially uniform in cross-section and proportioned in length to extend through and project beyond the axial bore **19***a* of a bobbin **19** or other yarn reeling device adapted to be mounted thereon above whorl **15**. Any suitable means may be provided on spindle shaft **12** for supporting and engaging bobbin **19** for axial rotation therewith. To this end upper surface **15***b* of whorl **15** may be adapted to support bobbin **19** and carries projecting lugs **15***c* for positive interconnection with registering recesses formed in the lower bobbin flange **19***b*.

Spindle **10** is provided with a longitudinal axial bore **10***a* adapted to serve as a conduit through which an end of yarn may be threaded in accordance with the invention in the manner hereinafter more fully described. Said axial bore **10***a* is shown formed as the bore of an inner tube **16** rigidly supported, as by force fit, to coaxially extend through stud shaft **11***a* with lower end **16***a* projecting therefrom. The upper portion of inner tube **16** upon emerging from stud shaft **11***a* extends through bore **12***b* of spindle shaft **12** in coaxial spaced relation and terminates at the upper end **12***c* of spindle shaft **12** with ball bearing **17** fitted therebetween.

Conventional feed rolls **35** driven by suitable means (not shown) of machine A may be mounted above spindle **10** to continuously supply two ends of yarn **28** and **29** from any suitable source (not shown) to ring traveler **32** for twisting and winding onto bobbin **19**.

As illustrated in FIG. 1, end of yarn **28** is directed from feed rolls **35** through any required intermediate guides (not shown) to balloon guide **36** then through ring traveler **32** onto bobbin **19** in the well understood manner. In accordance with the invention second end of yarn **29** is directed from feed rolls **35** through a plurality of guides **37** to pass upwardly through axial bore **10***a* of spindle **10**, entering at projecting lower end **16***a* of inner tube **16**, emerging at the top of spindle shaft **12**, then passing down through ring traveler **32** and paralleling end of yarn **28** onto bobbin **19**.

From the above description and drawings, the operation of Machine A for forming the novel bobbin package wound with two separate and parallel ends of yarn, one with Z twist, the other with S twist will now be readily understood.

Rolls **35** feed end of yarn **28** froom the source at a desired predetermined rate for winding onto bobbin **19** which is being rotated with spindle shaft **12** by driving belt **22** engaging spindle whorl **15** and lugs **15***c* in turn engaging bobbin **19**. The r.p.m. of bobbin **19** is timed to provide a peripheral speed greater than the rate of feeding of end of yarn **28** by rolls **35** thus causing a tension on yarn **28** to effect a whirling of ring traveler **32** around bobbin **19** thereby imparting the desired twist level to the yarn. Ring rail **30** is caused to reciprocate vertically by machine A in proper timed relation to the winding of the yarn on bobbin **19** for even distribution therealong. Said feeding, whirling, winding and reciprocating are accomplished in the manner well understood in the art.

The improved apparatus provides for simultaneously feeding the second end of yarn **29** at the same rate as end of yarn **28**, as by the same rolls **35**, but bypassing bobbin **19** directs end of yarn **29** through intermediate guides **37** into spindle axial bore **10***a*, entering at projecting lower end **16***a* of inner tube **16**, passing through bore **10***a* and emerging at spindle shaft upper end **12***c* above bobbin **19**. Thereafter, end of yarn **29**, reversing direction, passes through ring traveler **32** and is wound up on bobbin **19** in separate and parallel relation to end of yarn **28**. By sharing the same ring traveler **32**, being fed at the same rate by rolls **35** and being subjected to the same tension by the peripheral speed of bobbin **19** both ends of yarn

28 and 29 will have imparted thereto the same twist level but in opposite directions to provide one with Z twist and the other with S twist.

The improved method embodying the invention will be seen to comprise the steps of simultaneously feeding two ends of yarn 28 and 29 at the same rate, passing one of the ends of yarn 28 to a point, such as balloon guide 36, located beyond or above an upper bobbin flange 19c, simultaneously passing the other end of yarn 29 to a point bypassing bobbin 19, such as lower end 16a of inner tube 16 located beyond or below opposite or lower bobbin flange 19b then through bobbin 19 along its axis of rotation, such as through stationary inner tube 16, to a point, such as upper end 12c of spindle shaft 12, above or beyond upper bobbin flange 19c, bringing ends of yarn 28 and 29 into close proximity and whirling them simultaneously about bobbin 19, such as by passing ends of yarn 28 and 29 through ring traveler 32, and then passing ends of yarn 28 and 29 in parallel relation to each other onto bobbin 19, the latter being rotated in timed relation to the rate of feeding of the ends of yarn 28 and 29 to provide a peripheral speed to bobbin 19 greater than said feeding rate to effect said whirling of yarn 28 and 29 in ring traveler 32 around bobbin 19 thereby simultaneously imparting the desired twist level to both ends of yarn 28 and 29, but one with Z twist and the other with S twist. Thereafter when bobbin 19 is fully wound and removed from spindle 10, ends of yarn 28 and 29 may be simultaneously unwound from bobbin 19, separated and rewound individually onto separate yarn packages, such as cones, or cheese packages (not shown).

While the appparatus and method have been described in connection with the winding of a single bobbin 19, it is to be understood, in accordance with the usual practice in the art that machine A may provide, by duplication of parts, for carrying out the feeding, twisting and winding operations simultaneously in connection with a plurality of bobbins.

It will thus be seen that the above described apparatus and method manufacture a novel yarn package of two ends of yarn, one with a Z twist, the other with an S twist inserted therein to the same twist level, wound in parallel relation on suitable skeins, spools or cheeses and may be used as a dual or parallel thread.

It will also be apparent from the above description that ends of yarn 28 and 29 when finally wound together on bobbin 19 may contain other than equal and opposite twist. Thus, where two ends of yarn at their source initially have their respective twist differing in direction and/or degree, the above described method and apparatus will impart a predetermined degree of twist applied in one direction to one of the ends of yarn and an equal degree of twist but applied in an opposite direction to the other of said ends of yarn, the final direction and degree of twist being the resultant of the initial and applied twist.

It will thus be seen that there is provided a method and apparatus for simultaneously twisting and winding two ends of yarn to form a novel bobbin package in which the several objects of the invention are achieved and which are well adapted to meet the conditions of practical use.

As various other possible embodiments might be made of the above invention and as various changes in the embodiment above set forth might be made, it is to be understood that all matters herein set forth or shown in the accompanying drawing are to be interpreted as illustrative and not in a limiting sense.

Having thus described our invention, we claim as new and desire to secure by Letters Patent:

1. A method for feeding, twisting and winding yarn comprising the steps of:

(a) simultaneously feeding at the same predetermined rate two ends of yarn from a supply source to be taken up and wound onto a bobbin having a rotational axial bore,

(b) rotating said bobbin on its axis at a predetermined r.p.m. to impart a peripheral rate of speed to the bobbin in timed relation to and greater than said feeding rate,

(c) simultaneously passing one of said ends of yarn along a first predetermined path to the periphery of said bobbin and the other of said ends of yarn along a second predetermined path through said bobbin rotational axial bore to the periphery of said bobbin, and

(d) bringing said first and second paths together after said second path leaves said bobbin rotational axial bore for simultaneous whirling about the axis of said bobbin thereby imparting Z twist to one of said ends of yarn and S twist to the other.

2. The method defined in claim 1 including the step of:

(e) winding both ends of yarn, one imparted with Z twist and the other with S twist in parallel relation to each other onto said rotating bobbin to form a bobbin package,

(f) unwinding both ends of yarn simultaneously from the bobbin package, and

(g) separating and rewinding each end of yarn individually onto separate yarn packages, one containing Z twist, the other S twist.

3. A method of twisting and winding two ends of yarn fed simultaneously from a supply source at a predetermined rate through a ring traveler onto a bobbin having an axial bore and spaced flanges comprising the steps of:

(a) passing one of said ends of yarn from the supply source to a first point located beyond one of said bobbin flanges and then through the ring traveler,

(b) simultaneously passing the other of said ends of yarn from the supply source to a second point beyond the other of said bobbin flanges then through the bobbin axial bore along the axis of rotation thereof to a third point beyond said first mentioned bobbin flange then through the ring traveler,

(c) rotating said bobbin on its axis at a predetermined r.p.m. to impart a peripheral speed greater than said rate of feeding of said ends of yarn, and

(d) winding both ends of yarn from the ring traveler in parallel relation to each other onto said rotating bobbin whereby one of the ends of yarn has imparted thereto a Z twist and the other an S twist.

4. The method defined in claim 3 including the step of:

(e) separating said ends of yarn by

(1) unwinding the latter simultaneously from the bobbin and

(2) rewinding each end of yarn individually onto separate yarn packages, one containing Z twist, the other S twist.

5. A method of the character described comprising the steps of:

(a) simultaneously feeding at the same predetermined rate two ends of yarn from a supply source to be taken up and wound onto a bobbin rotating on its axis at a predetermined r.p.m. to impart a peripheral rate of speed to the bobbin in timed relation to and greater than said feeding rate,

(b) simultaneously whirling both of said ends of yarn about said bobbin to impart a twist thereto after reversing the feed of one of said ends of yarn to impart Z twist to one of said ends and S twist to the other,

(c) winding both ends of yarn, one with Z twist the other with S twist, in parallel relation to each other onto said rotating bobbin until the latter is full,

(d) unwinding both ends of yarn simultaneously from the full bobbin, and

(e) separating and rewinding each end of yarn individually onto separate yarn packages, one containing Z twist, the other S twist.

6. An apparatus for feeding, twisting and winding yarn comprising:

(a) a bobbin supported for rotation and having a rotational axial bore,

(b) means for simultaneously feeding at the same predetermined rate two ends of yarn from a supply source,

(c) means for rotating said bobbin at a predetermined r.p.m. to impart a peripheral rate of speed to the bobbin in timed relation to and greater than said feeding rate,

(d) means for whirling both ends of yarn about said bobbin imparting a twist to said ends of yarn in compensating for said differences between the feeding and peripheral rates,

(e) means for guiding one of said ends of yarn in a relatively direct path from said feeding means to said whirling means and onto the bobbin and for guiding the other of said ends of yarn in a path from said feeding means through said bobbin axial bore along its axis of rotation to said whirling means and onto the bobbin in parallel relation to said first end of yarn whereby one of said ends of yarn has Z twist and the other S twist.

7. An apparatus for feeding, twisting and winding yarn comprising:

(a) a bobbin having a rotational axial bore,

(b) a spindle having an axial bore extending into said bobbin axial bore supporting the bobbin for rotation therewith,

(c) a ring traveler mounted for revolving about said spindle and bobbin,

(d) means for simultaneously feeding two ends of yarn from a supply source to said bobbin,

(e) a first means for guiding one of said ends of yarn in a relatively direct path from said feeding means to said ring traveler and onto the bobbin, and

(f) a second means for guiding the other of said ends of yarn in a path from said feeding means through said spindle axial bore along the axis of rotation of the spindle and bobbin to said ring traveler and onto the bobbin in parallel relation to said first end of yarn whereby one of said ends of yarn has Z twist and the other S twist.

8. In an apparatus having means for feeding, twisting in one direction, and winding a first end of yarn onto a bobbin mounted on a spindle for rotation on a axis, the combination of:

(a) means for feeding a second end of yarn for winding onto said bobbin in parallel relation to said first end of yarn,

(b) said spindle having an axial bore,

(c) means for guiding said second end of yarn from said feeding means through said spindle axial bore to said twisting means,

(d) said guiding means, spindle bore and twisting means being constructed and arranged to impart a twist to said second end of yarn opposite in direction to that of said first end of yarn.

9. The combination defined in claim 8 in which said spindle:

(e) has a fixed lower end portion formed with a journal-box and a hollow spindle shaft journaled at one end for rotation in said box and having a free opposite end,

(f) said fixed lower end portion having a bore communicating with and in axial alignment with said spindle shaft,

(g) a stationary tube fitted in said fixed lower end portion bore extending coaxially through said spindle shaft hollow and spaced therein, and

(h) a bearing means coacting between said tube and spindle shaft at said opposite free end, said tube serving as said spindle axial bore through which said second end of yarn is guided.

10. In a yarn feeding, twisting and winding apparatus, the combination of:

(a) a stationary spindle rail,

(b) a spindle mounted to extend vertically from said spindle rail,

(c) a ring rail mounted for reciprocation above said spindle rail having an opening through which said spindle extends,

(d) a ring traveler mounted for revolving about said opening,

(e) a bobbin mounted to rotate with said spindle,

(f) feeding rolls for simultaneously feeding two ends of yarn to said bobbin through said ring traveler,

(g) said spindle being formed with an axial bore having openings at opposite ends of the spindle, one of said openings terminating above said bobbin,

(h) means for guiding one of said ends of yarn from said feeding rolls to said ring traveler for imparting a twist thereto, and

(i) means for guiding the other of said ends of yarn from said feeding rolls into a second of said spindle bore openings, through said spindle bore, out of said first spindle bore opening and to the ring traveler for imparting a twist to said other end of yarn simultaneously with said first mentioned end of yarn, said twist of the other end of yarn being in the opposite direction to that of the first mentioned end of yarn.

11. In combination with a spindle rail having an open bottom well, a spindle comprising:

(a) a fixed lower end portion and a rotatable hollow spindle shaft,

(b) the fixed lower end portion having a stud shaft extending from an intermediate lateral flange, the stud shaft being removably seated in said well with the intermediate flange forming a support base for the spindle on said spindle rail,

(c) a journal-box extending from said lateral flange,

(d) said hollow spindle shaft having one end journaled in said box for axial rotation and an opposite free end,

(e) said stud shaft having a bore in axial alignment with and communicating said spindle shaft hollow with the open bottom of said well, and

(f) a fixed tube extending from said open bottom of the well through said stud shaft bore and said spindle shaft hollow to said opposite free end, said fixed tube forming an axial passageway through the spindle length for feeding yarn therethrough.

12. In combination with a spindle rail having an open bottom well, a spindle supporting a bobbin for a twisting and winding operation, said spindle comprising:

(a) a fixed lower end portion and a rotatable hollow spindle shaft,

(b) the fixed lower end portion having a stud shaft removably seated in said well and a journal-box extending from said stud shaft above the spindle rail,

(c) said hollow spindle shaft having one end journaled in said box for axial rotation, having a midportion for receiving said bobbin thereon for axial rotation therewith and an opposite free end extending beyond the bobbin,

(d) a spindle whorl coaxially mounted to turn with the spindle shaft for rotating the latter by engagement with a driving belt,

(e) said stud shaft having a bore in axial alignment with and communicating said spindle shaft hollow with the open bottom of said well, and

(f) a fixed tube extending from said stud shaft bore through said spindle shaft hollow to said opposite free end forming an axial passageway through the spindle length for feeding yarn therethrough for said twisting and winding operation.

13. The combination defined in claim 12 including:

(g) a bearing located between said spindle shaft and fixed tube at said spindle shaft free end for maintain-

ing said tube and spindle shaft in spaced coaxial relation.

14. A method of twisting and winding two ends of yarn simultaneously from a supply source passing through a ring traveler onto a bobbin having an axial bore:

(*a*) passing one of said ends of yarn through said bobbin axial bore to said ring traveler and the other of said ends of yarn directly to said ring traveler,

(*b*) simultaneously whirling both of said ends of yarn about said bobbin to impart a twist thereto, and

(*c*) winding both ends of yarn from the ring traveler in parallel relation to each other onto said bobbin.

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