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3,149,795

HIGH SPEED APPARATUS FOR FORMING AND APPLYING TRANSFER
TAILS IN TEXTILE YARN WINDUP OPERATIONS

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FIG. 1

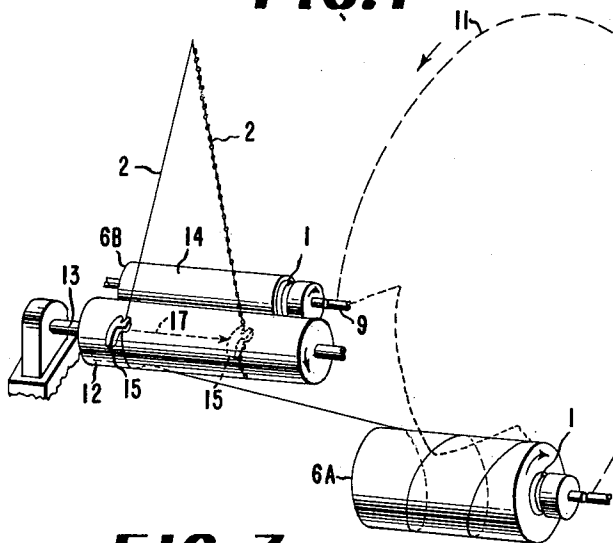


FIG. 2

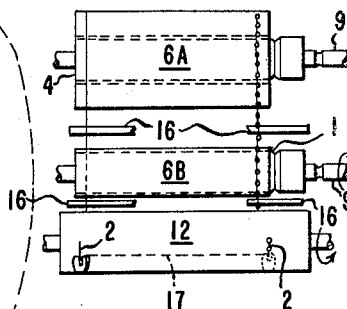


FIG. 3

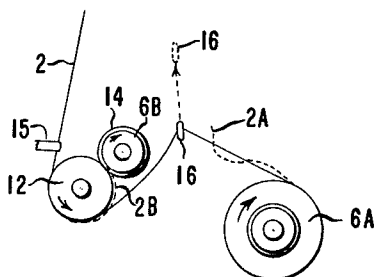


FIG. 4

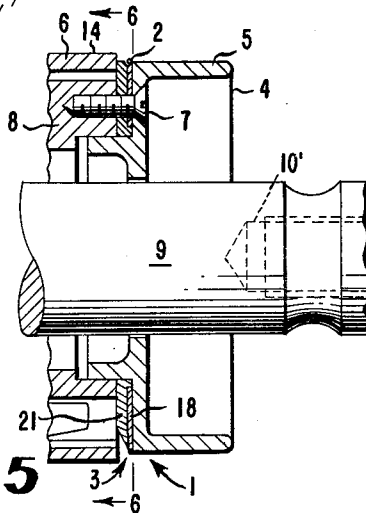


FIG. 6

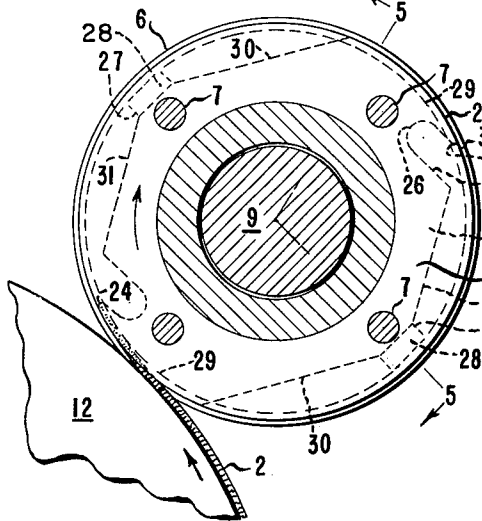
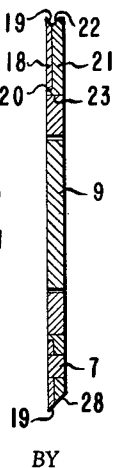


FIG. 5



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HIGH SPEED APPARATUS FOR FORMING AND APPLYING TRANSFER TAILS IN TEXTILE YARN WINDUP OPERATIONS

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This invention relates generally to textile windup apparatus and, as illustrated herein, relates more particularly to a device for cutting yarn and establishing a "transfer tail" on an empty yarn package holder.

The invention is particularly suitable for use with a "print roll" type of windup apparatus operating in a continuous process at high rotational speeds. The invention will be described herein as being applied to such an arrangement, but it will be understood that it is not intended by such description to limit it to such arrangement.

Frequently, in various end uses to which yarn is applied, it becomes desirable to provide a continuous or uninterrupted supply of yarn for prolonged periods of operation. To perform this operation it becomes necessary to tie the trailing end of the yarn from a first yarn package holder onto the leading end of the yarn from a second yarn package holder, since a single yarn package or bobbin would become depleted in much too short a time.

In order that access may be had to the trailing end of the yarn on a yarn supply package, it is necessary to provide a so-called "transfer tail" to that package. This transfer tail very simply consists of the lead portion (about 6 to 12 inches in length, or longer) of the yarn first wound onto the yarn package, which portion is disposed so as to be positively secured to the package but freely available for tying directly to the leading end of a second package.

A "print roll" type of windup apparatus is one where the yarn is first passed through a reciprocating traverse guide, then around a rotary drive roll, and finally onto a yarn package holder that is being surface driven by the drive roll. Generally, the yarn descends from the traverse guide under the rotating drive roll making at least a 180° arc before being wound onto the oppositely rotating yarn package holder. During the formation of the transfer tail, the yarn is temporarily removed from the traverse guide for the purpose of accomplishing various mechanical and manipulative steps, including the step of cutting the yarn at some point intermediate a full winding and an empty winding.

Many methods and devices for winding transfer tails on rotating yarn package holders are described in the art. Also, the prior art describes various methods and devices for cutting or breaking yarns moving in continuous operations. The latter arrangements provide for transferring the severed yarn to a waste device or sucker gun while the completed package is removed (or doffed) and replaced by an empty package. While combinations of these methods and devices may be capable of cutting yarn and initiating transfer tails at winding speeds of up to several hundred yards per minute, they are generally unsuited for these purposes when it is desired to achieve continuous operating speeds of much higher yards per minute.

When yarn is being wound at these high speeds, it becomes extremely difficult to individually accomplish and collectively integrate such steps as repositioning the yarn support chucks and their yarn package holders relative their engagement with the drive roll, initiating pick-up and string-up of the moving yarn, severing the yarn,

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forming a transfer tail of relatively controlled length, maintaining constant driving contact between the drive roll and the repositioned empty yarn package holder, and initiating main package winding on the empty holder after formation of a transfer tail without seriously fraying the yarn's filaments. The problems are further compounded if rapid winding changeover is to be achieved without wasting yarn.

Therefore, it is one object of the present invention to provide an improved device for cutting yarns and producing transfer tails extending from rotating yarn package holders.

Another object is to provide a device for producing transfer tails of relatively controlled lengths on yarn packages rotating at high speeds.

A further object of this invention is to provide a device for changing yarn winding on a rotating full yarn package to winding on a rotating empty yarn package, without removing the yarn from a reciprocating traversing guide and without loss of yarn during the cutting thereof.

Still another object is to provide an improved device for receiving and severing a yarn line that is being reciprocated by a traverse guide; and then restraining the yarn to establish formation of a transfer tail.

Yet another object of this invention is to provide a device for guiding a moving yarn line out of its normal traversing path, without removing the yarn from its traversing guide, to accomplish yarn cutting, establishment of a transfer tail, and initiation of main yarn package winding on a package holder that is rotating at a very high speed.

Other objects will become apparent from the description and discussion to follow, taken with the drawings in which:

FIGURE 1 is a partial perspective view of a textile yarn windup arrangement embodying features of this invention, with selected parts partially shown.

FIGURE 2 is a plan view of the arrangement of FIGURE 1 embodying features of this invention.

FIGURE 3 is a side elevation of an arrangement of this invention showing roll positioning and yarn movement at a time shortly after that depicted in FIGURE 2, with dotted lines showing the yarn ends immediately after cutting.

FIGURE 4 is an enlargement of the yarn cutting and transfer tail establishing device shown in FIGURES 1, 2, and 3, with certain associated parts shown partially cut-away.

FIGURE 5 is a sectional view taken through line 5—5 of FIGURE 6.

FIGURE 6 is a transverse cross-sectional view taken through line 6—6 of FIGURE 4, showing the position of a moving, incoming yarn line in the device immediately after cutting and just prior to establishing the transfer tail.

The objects of this invention are achieved by an arrangement generally providing for first cutting a moving yarn line, establishing a transfer tail of relatively controlled length, and then permitting the yarn line to be traversed and form the main yarn package; preferably all of this being accomplished while maintaining the yarn line in the reciprocating traverse guide, and without collecting and disposing of any part of the moving yarn line.

Referring now to the drawings in which like characters of reference designate similar parts in the various views and representations, the yarn cutting and transfer tail establishing device 1 is best shown in FIGURES 4, 5, and 6 wherein the device 1 is shown relative its positioning with and action upon a moving yarn line 2. The device 1 comprises a disc mechanism 3 rotatably mounted in a

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yarn suport chuck 4 between a brake drum 5 and an expansion cylinder 8 by means of flat head socket screws 7. A yarn package holder 6 is frictionally fitted over the expansion cylinder 8. The yarn support chuck 4, the yarn package holder 6, and the disc mechanism 3 are all supported by and freely rotatable together around a spindle 9 fixedly attached to a swing arm (not shown) by means of a pivot pin 10.

The swing arms of a print roll type of textile windup apparatus are constructed and arranged to sequentially rotate at least two spindles 9 in a generally counterclockwise path 11, as shown in FIGURE 1, during the windup initiation and doffing, respectively, of empty and full yarn package holders 6 thus maintaining continuity of yarn winding. In the embodiment illustrated in FIGURE 1, the full yarn package holder 6A is shown being withdrawn from rotary driving roll 12, and empty yarn package holder 6B is being positioned for starting of winding thereon. During main package winding of the moving yarn line 2 on empty yarn package holder 6B, holder 6B is rotated in a clockwise direction by means of the counterclockwise rotation of rotary driving roll 12 mounted on drive shaft 13, which driving roll frictionally engages the outer surface 14 of said holder 6B, or of the yarn 2 wound thereon, while the yarn is distributed along the length of a yarn package holder by the action of traversing guide 15, shown alternately in its extreme positions. The traversing guide 15 and the drive shaft 13 are both suitably mounted in the supporting structure (not shown) of the windup apparatus.

FIGURE 2 illustrates the position of empty yarn package holder 6B with respect to rotary driving roll 12 at the moment, in point of time, when the full yarn package holder 6A has been removed from engagement with the driving roll 12 so as to be made available for doffing (removal) from its yarn support chuck 4. The empty holder 6B, already positioned on its yarn support chuck 4, is about to establish surface contact with rotary driving roll 12. It will be seen that sufficient spacing exists at the very moment depicted wherein guiding and deflecting means 16 (partially shown in four alternate positions) may be employed to offset or deflect moving yarn line 2 from its normal traversing path 17 into the rotational path of the yarn cutting and transfer tail establishing device 1. It will be noted that means 16, which may be manually actuated, may be employed from either the fixed side or the free side of spindles 9, and the functioning thereof may be accomplished either manually or mechanically.

FIGURE 3 illustrates positioning of the driving roll 12 and yarn package holders 6A and 6B at a point in time just subsequent to that in FIGURE 2, in other words, the empty yarn package holder's outer surface 14 is in engagement with the rotary driving roll 12 and is being rotated thereby in a clockwise direction.

Referring again to FIGURES 4, 5, and 6, the disc mechanism 3 preferably comprises mating members designated as the first annular member 18 and the second annular member 21. The first annular member 18 comprises a thin annular portion having a beveled outer edge 19 and a chamfered inner edge 20 for mating fit with the second annular member 21. Member 18 is positioned between the brake drum 5 and the second annular member 21.

The second annular member 21 comprises an annular portion preferably of about three or four times the thickness of member 18, and having a partially beveled outer edge 22 oppositely faced to the beveled outer edge 19 of the first member 18. Member 21 is positioned between the first annular member 18 and the expansion cylinder 8 adjacent the yarn package holder 6, its inner edge 23, being of slightly smaller diameter than that of chamfered inner edge 20, and, said member 21 is fitted around an extended portion of the brake drum 5. The first annular member 18 and the second annular member 21 in cooperation with other structure of the device 1 form in

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the embodiment shown an irregularly defined circumferentially extending groove or channel therebetween. The outer surface 14 of yarn package holder 6 forms a slight annular lip adjacent to the disc mechanism 3.

Member 21 is further characterized by its alternating cutting and gripping means. Said means is comprised of at least one sharp cutting edge 24 adapted to sever a moving yarn line 2. Outer edge 22 is notched, as shown at 25 in FIGURE 6, at the cutting edge 24, the notch ending in a curved well portion 26 adapted to receive and frictionally hold any individually cut filaments of the moving yarn line 2 just prior to complete severance of the yarn 2. The alternating cutting and gripping means is further comprised of at least one projecting forwarding extension 27 spaced from the cutting edge 24. This forwarding extension 27 is beveled at 28 in the same direction as the beveled outer edge 19 of the first annular member 18 so as to form with the expansion cylinder 8 a pinch point for receiving and gripping a lead portion of the yarn 2. The outer peripheral edge of member 21 is uniformly beveled in the arcuate region 29. This latter bevel then ends, and the outer peripheral edge tapers in substantially a straight-line direction 30 to the forwarding extension 27 from which it then follows another substantially straight-line direction 31 to a lip of notch 25 opposite a second lip formed by the sharp cutting edge 24.

The shape and movement of the disc mechanism 3 is such that yarn receiving and gripping by the region of the groove may occur, timewise, either just prior to yarn cutting or simultaneously therewith. While the preferred embodiment of the yarn cutting and transfer tail establishing device 1, as partially shown in FIGURE 6, discloses annular members 18 and 21 of the disc mechanism 3 as having two sharp cutting edges 24 alternating with two forwarding extensions 27; the disc mechanism 3 may be constructed with only one annular member having one or more cutting edges alternating with one or more forwarding extensions. It has been found, however, that in order to lengthen cutting edge life and to improve the quality of transfer tails, it is desirable to use the embodiment of FIGURE 6.

A preferred operation of the novel arrangement of this invention is best described as follows. A full yarn package 6A which has been receiving and winding an incoming traversing yarn line 2 is withdrawn from surface engagement with the rotary driving roll 12. Empty yarn package 6B is simultaneously being rotated in a descending direction, from a position above the moving yarn line 2, towards a position of surface driven engagement with the driving roll 12. At this moment, manually or mechanically actuated guiding and deflecting means 16 is moved between the driving roll 12 and the full yarn package 6A to guide and deflect the moving yarn line 2 in an axial direction along the empty yarn package holder 6B. The yarn 2, although engaged in the traversing guide, is moved and held by means 16 out of the yarn's normal traversing path 17 and subsequently moved into the rotational path of yarn cutting and transfer tail establishing device 1, which device is rotating rapidly with its empty yarn package holder 6B. The yarn 2 may be optionally guided to a position either above or below the device 1.

The moving yarn line 2, which is still in the traversing guide 15 and is still being continuously fed to the full yarn package holder 6A for winding thereon, is then further guided into the disc mechanism 3 to establish contact with the alternating cutting and gripping means. Since the yarn 2 is continuously tensioned up to this moment by the still spinning full yarn package holder 6A, yarn cutting occurs upon contact of the yarn with the rotating device's 1 sharp cutting edge 24. The yarn immediately ahead of the "cut" (designated 2A in FIGURE 3) finishes winding on the full holder 6A which is still rotating at a decelerating speed. And, the yarn im-

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mediately behind the "cut" (designated 2B in FIGURE 3) moves, or is pulled, further into engagement with the device 1 by engagement with the cutter element 24 and/or the forwarding extension 27. Thus a transfer tail for the empty holder 6B is established as winding momentarily commences in the region of the disc mechanism 3 adjacent holder 6B. However, almost immediately the trailing yarn of the new yarn end portion 2B is drawn by the traversing guide 15 into the nip of the holder 6B and driving roll 12 to start winding of the new yarn package along the normal traversing path 17 and terminate winding of the transfer tail. The yarn between the cutting point in the disc mechanism 3 and the new yarn package is the transfer tail.

The transfer tail's length is generally determined within certain limits by the position of the traversing guide 15 in its traversing path 17 and the direction of movement of the guide 15 in its path 17 at the moment of cutting. When the traversing guide 15 is adjacent to the yarn cutting and transfer tail establishing device 1, the guide 15 begins moving away towards the other (outer) end of the holder 6B. In doing so it more quickly pulls the incoming yarn into winding of the main yarn package and produces a short tail.

While the arrangement of this invention accomplishes changeover in yarn winding from a full holder 6A to an empty holder 6B without wasting yarn and is relatively simple in its operation, it will be apparent to those skilled in the art that the arrangement disclosed herein may be adapted or modified for use in arrangements employing restraining rods to temporarily remove yarns from their traversing guides during formation of the transfer tail, with sucker guns or other waste devices substituted for the full yarn holder 6A, and with other manual means for accomplishing winding changeover at lower process speeds.

Furthermore, while the detailed disclosure of the arrangement of this invention provides for mounting the disc mechanism's elements with socket screws, such elements may be slidably or frictionally mounted on or keyed to the chuck at, for example, the outboard end of the yarn support tube (or tubes wherein more than one tube is mounted on a single chuck) and the elements must be easily removable such as at the time of doffing.

In accordance with the patent laws, a preferred arrangement of this invention has been disclosed in detail. Numerous changes and modifications within the spirit of the invention will occur to those skilled in the art and all such are considered to fall within the scope of the following claims.

I claim:

1. An improved yarn cutting and transfer tail establishing device adapted for use in combination with a textile frictional drive roll windup apparatus, said apparatus comprising a supporting structure, a rotary driving roll operatively mounted on said structure, at least one freely rotatable yarn support chuck operatively mounted on said structure, said chuck being adapted for surface driven engagement with said driving roll over a substantially cylindrical surface area formed by a yarn package holder frictionally surrounding a portion of and rotating with said chuck, and a reciprocating yarn traverse guide mounted on said structure in operative association with said driving roll and said chuck; said improved yarn cutting and transfer tail establishing device comprising a disc mechanism integrally mounted on said chuck adjacent one end of said yarn package holder, said disc mechanism extending in a circumferential direction and lying in a plane substantially perpendicular to the axis of the chuck, said disc mechanism having mounted thereon alternately angularly positioned means for engaging and cutting a moving tensioned yarn line and then gripping a portion of said cut yarn to establish winding of a transfer tail in the region of said disc mechanism while maintaining the normal engagement of the yarn line in the traversing

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guide, said disc mechanism comprising a first annular member having a beveled outer peripheral edge extending in a circumferential direction and lying in a plane substantially perpendicular to said chuck's axis of rotation, and a second annular member attached to said first member and positioned adjacent said holder, said second member having a partially beveled peripheral outer edge extending in an annular direction and also lying in a plane substantially perpendicular to said chuck's axis of rotation, said second member having said cutting and gripping means defined on said second member's partially beveled outer peripheral edge.

2. The improved device of claim 1 wherein said first annular member comprises a first annular disc portion having a beveled outer peripheral edge extending in a circumferential direction and lying in a plane substantially perpendicular to said chuck's axis of rotation and having an inner edge for mating fit with said second member; said second member comprises a second annular disc portion of greater thickness than and attached to said first annular disc portion and positioned adjacent said holder; and said cutting and gripping means defined on said second annular disc portion comprises at least one radially extending yarn forwarding extension circumferentially spaced from at least one sharp cutting edge, said forwarding extension being constructed and arranged to engage and grip said new lead portion of the cut yarn after engagement and cutting thereof by said sharp cutting edge.

3. An improved yarn cutting and transfer tail establishing device adapted for use in a yarn support chuck unit of a windup apparatus, comprising a disc mechanism mounted on the yarn support chuck unit adjacent a yarn package holder supported by said chuck and adapted for rotation with said chuck and said holder, said disc mechanism extending in a circumferential direction and lying in a plane substantially perpendicular to the chuck's axis of rotation, said disc mechanism having mounted thereon cutting and gripping means adapted to receive a moving tensioned yarn line, cut said yarn line, and grip a new lead portion of the yarn line so as to establish winding of a transfer tail adjacent said yarn package holder, said disc mechanism comprising a first annular member having a beveled outer peripheral edge extending in a circumferential direction and lying in a plane substantially perpendicular to said chuck's axis of rotation, and a second annular member attached to said first member and positioned adjacent said holder, said second member having a partially beveled peripheral outer edge extending in an annular direction and also lying in a plane substantially perpendicular to said chuck's axis of rotation, said second member having said cutting and gripping means defined on said second member's partially beveled outer peripheral edge.

4. An improved yarn cutting and transfer tail establishing device adapted for use in combination with a textile print roll windup apparatus, said apparatus comprising a supporting structure, a rotary driving roll operatively mounted on said structure, at least one freely rotatable yarn support chuck operatively mounted on said structure, said chuck being adapted for surface driven engagement with said driving roll over a substantially cylindrical surface area formed by a yarn package holder frictionally surrounding a portion of and rotating with said chuck, and a reciprocating yarn traverse guide mounted on said structure in operative association with said driving roll and said chuck; said improved yarn cutting and transfer tail establishing device comprising a disc mechanism integrally mounted on said chuck adjacent one end of said yarn package holder, said disc mechanism extending in a circumferential direction and lying in a plane substantially perpendicular to the axis of the chuck, said disc mechanism having mounted thereon alternately angularly positioned means for engaging and cutting a moving tensioned yarn line and then gripping a portion of said cut yarn to establish winding of a transfer tail in the region

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of said disc mechanism while maintaining the normal engagement of the yarn line in the traversing guide, said disc mechanism comprising a first annular member having a beveled outer peripheral edge extending in a circumferential direction and lying in a plane substantially perpendicular to said chuck's axis of rotation, and a second annular member having a partially beveled outer peripheral edge extending in an annular direction and also lying in a plane substantially perpendicular to said chuck's axis of rotation; and said alternately angularly positioned means comprising at least one sharp cutting edge and at least one radially projecting forwarding extension both formed on said second member's outer peripheral edge.

5. An improved yarn cutting and transfer tail establishing device adapted for use in combination with a textile yarn windup apparatus, said apparatus comprising a supporting structure, a rotary driving roll operatively mounted on said structure, at least one freely rotatable yarn support chuck operatively mounted on said structure, said chuck being adapted for surface driven engagement with said driving roll over a substantially cylindrical surface area formed by a yarn package holder frictionally surrounding a portion of and rotating with said chuck, and a reciprocating yarn traverse guide mounted on said structure in operative association with said driving roll and said chuck; said improved yarn cutting and transfer tail establishing device comprising a disc mechanism integrally mounted on said chuck adjacent one end of said

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yarn package holder, said disc mechanism extending in a circumferential direction and lying in a plane substantially perpendicular to the axis of the chuck, said disc mechanism having mounted thereon alternately angularly positioned means for engaging and cutting a moving tensioned yarn line and then gripping a portion of said cut yarn to establish winding of a transfer tail in the region of said disc mechanism, said disc mechanism comprising a first annular member having a beveled outer peripheral edge extending in a circumferential direction and lying in a plane substantially perpendicular to said chuck's axis of rotation, and a second annular member having a partially beveled outer peripheral edge extending in an annular direction and also lying in a plane substantially perpendicular to said chuck's axis of rotation; and said alternately angularly positioned means comprising at least one sharp cutting edge and at least one radially projecting forwarding extension both formed on said second member's outer peripheral edge.

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