Nov. 5, 1968 J. CAMPBELL ET AL 3,409,238

CONTINUOUS YARN WINDUP APPARATUS

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FIG. 2

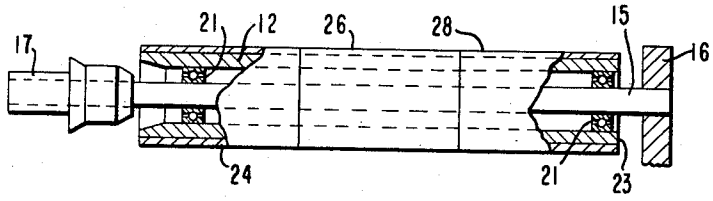


FIG. 1

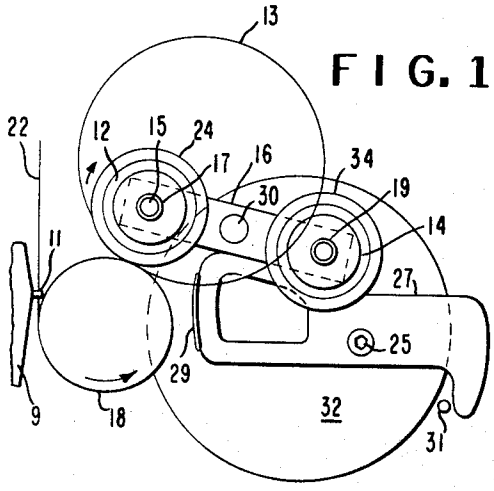


FIG. 3

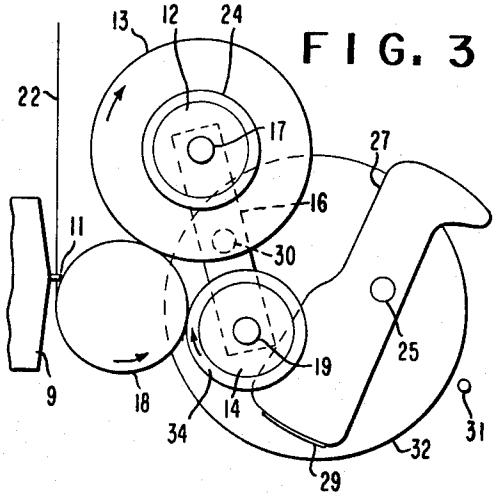


FIG. 4

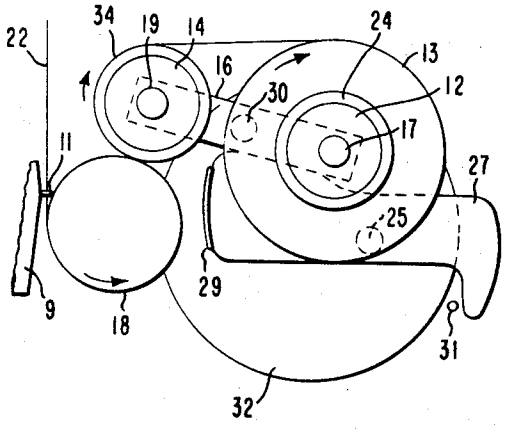
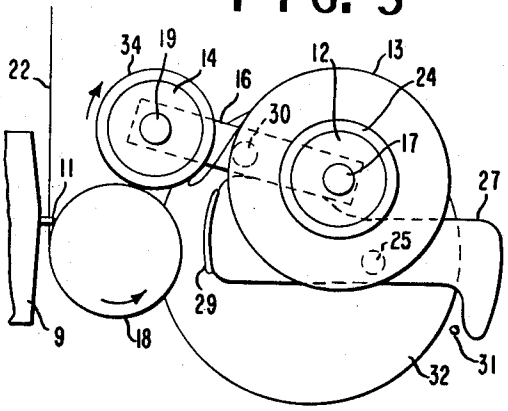


FIG. 5



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FIG. 6

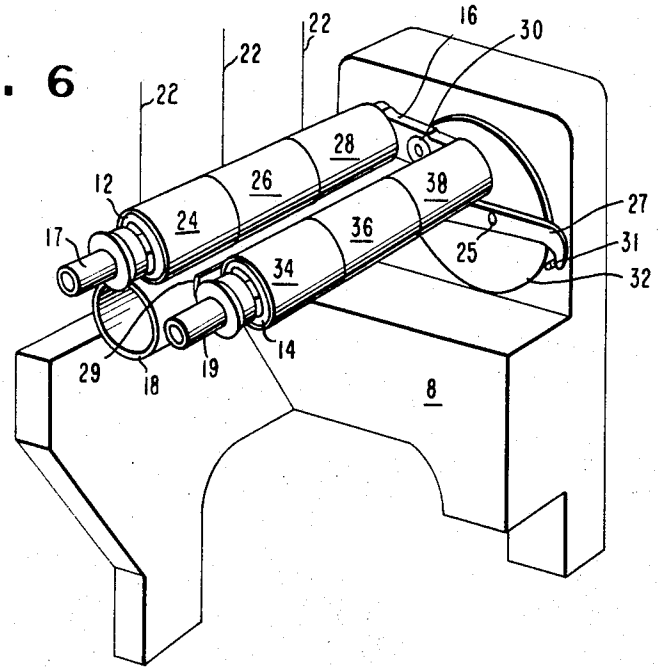
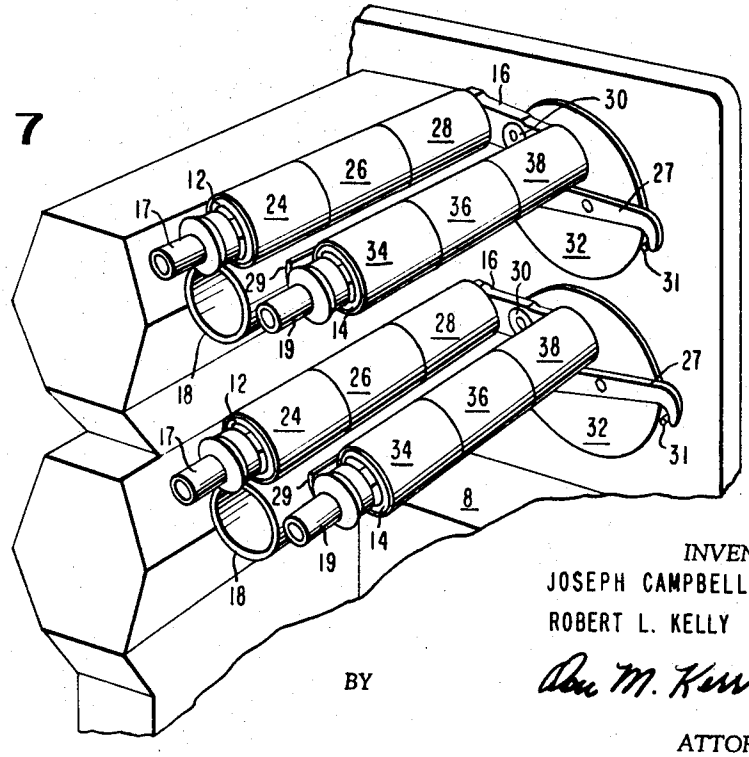


FIG. 7



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CONTINUOUS YARN WINDUP APPARATUS

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4 Claims. (Cl. 242—18)

ABSTRACT OF THE DISCLOSURE

Yarn windup apparatus which permits doffing without interrupting operation. Two chucks, each carrying yarn packages, are mounted on a pivot arm. During winding, packages on first chuck contact a drive roll until full. In doffing, pivot arm is rotated so empty packages on second chuck contact drive roll; yarns break, and leading ends engage empty packages. Entanglement of trailing ends is prevented by shield between drive roll and full packages. Shield retracts during winding and during first part of doffing, but swings back to shielding position during latter part of doffing.

Background of the invention

This invention relates to a continuous yarn windup apparatus, and particularly to apparatus for winding yarn on a plurality of packages supported on a common windup chuck.

In high-speed yarn winding operations, it is essential that a full running speed be maintained without a lapse in yarn tension, particularly at the time the yarn end is transferred from a completed package to a new package. This has been accomplished by using improved apparatus such as that disclosed in U.S. Patents 3,001,732 and 3,092,339. Even with these advances, considerable difficulty has been encountered in the doffing operations, particularly in winding spandex yarn on multiple yarn packages. Difficulty has been encountered due to free trailing yarn ends on the completed package becoming entangled with the running ends on the package drive roll. Breaking of the threadline and interruption of winding has resulted. Such difficulty may be avoided by the use of a shield extending along the region of the nip between drive roll and bobbins.

A fixed shield would be in the way of a growing package during part of the winding operation. In U.S. Patent 3,165,274, De Priest provides a flexible, roll-up sheet, which effectively prevents entangling of trailing yarn ends from completed packages. However, the De Priest shield requires space-consuming contrivances for extending and withdrawing it. Accordingly, with the De Priest apparatus it is impossible to obtain a tandem arrangement in which one windup assembly is placed above another, as would be desirable for winding a large number of threadlines from a single spinning cell.

Summary of the invention

This invention provides an improved apparatus for continuously winding yarn which permits transfer of yarn ends from completed packages to empty packages without interruption of the winding operation and essentially without yarn waste during the doffing operation. This invention also provides a yarn winding apparatus having a movable shield in which the movement of the shield is essentially automatic requiring no operator attention whatever, no source of power external to the windup and no switches, valves, or the like.

The yarn winding apparatus of this invention comprises a pair of windup chucks for rotatably supporting yarn packages, a drive roll for rotating a yarn package on one

of the chucks, the drive roll being positioned to form a nip with the package, and means for continuously feeding yarn to the nip and thence to the package. The chucks are secured to opposite ends of a pivot arm which is rotatably mounted for rotating one chuck from a winding position in which the peripheral surface of a completed package thereon is in contact with the drive roll to a position remote from the drive roll for doffing the completed package while simultaneously rotating the other chuck into winding position in which the peripheral surface of an incomplete package thereon contacts the drive roll.

The apparatus also includes a shield assembly composed of a shield secured to one end of a shield arm. The shield is generally parallel to and coextensive with the drive roll and the chucks. The shield arm is rotatably mounted at a point remote from the point where the pivot arm is mounted. The shield assembly is biased toward a shielding position with the shield between the drive roll and the completed package on the chuck in doffing position. Thus rotation of the shield arm against the urging of the bias will rotate the shield outside the path traveled by the chucks upon rotation of the pivot arm during movement of the completed package from the winding position to the doffing position, but the shield assembly will automatically return to the shielding position upon release of the force causing the rotation because of the urging of the bias.

Preferably, the mounting of the shield arm and pivot arm are arranged so that rotation of the latter during movement of the completed package from the winding position to the doffing position causes rotation of the former against the urging of the bias. In one embodiment, the end of the shield arm which carries the shield is located in the path of rotation of the pivot arm. Rotation of the pivot arm thus causes rotation of the shield arm in the opposite direction, against the urging of the bias, thereby progressively and continuously retracting the shield from the path traveled by the chucks.

In the preferred embodiment, the pivot arm and shield arm are eccentrically mounted on a plate which is in turn rotatably mounted on a frame. During winding, the plate rotates to accommodate the growing package. The end of the shield arm opposite the end carrying the shield extends past the edge of the plate and, as the plate rotates, engages a fixed pin mounted on the frame. This engagement causes the shield arm to be rotated, against the urging of the bias, in a direction opposite the direction of rotation of the plate and out of the path of the growing package during winding.

Drawings

The invention will now be discussed in detail with reference to the accompanying drawings in which

FIGURE 1 is an end-elevational view of the apparatus of this invention;

FIGURE 2 is an elevational view of a chuck partly in cross-section;

FIGURES 3, 4, and 5 are diagrammatic representations showing the relative positions during the doffing operation of the drive roll, the windup chucks bearing full (completed) and empty packages, and the shield and shield arm;

FIGURE 6 is a perspective view of a yarn winding apparatus of the invention;

FIGURE 7 is a perspective view of a plurality of apparatuses of the invention arranged compactly on a single frame for winding a large number of threadlines.

Description

The yarn-winding apparatus chosen for purposes of illustration includes a frame 8 upon which is mounted a rotatable cylindrical plate 32, a power-driven drive roll

18, and a mechanism 9 which drives a yarn-traversing guide 11 in close proximity to the drive roll 18. Situated in the upper left-hand quadrant of the plate 32 is a shaft 30 upon which is journalled a pivot arm 16, which extends symmetrically on opposite sides of the shaft 30 and carries chucks 12 and 14 respectively, at its ends.

The chucks 12 and 14 are of conventional design and generally comprise a fixed shaft 15 (FIGURE 2) upon which is mounted a pair of ball bearings 21 supporting a rotatable sleeve 23. Sleeve 23 is adapted to support a plurality of bobbins 24, 26, 28 (on chuck 12) and 34, 36, 38 (on chuck 14). One end of each fixed shaft 15 is secured to the respective extremities of the pivot arm 16 while the free ends of the shafts 15 carry axially slidable handles 17 and 19, respectively. The handles are keyed to the shafts 15 to avoid relative rotation and, at their inner ends, are provided with a brake-band material (not shown) which is adapted to frictionally engage a tapered seat in the outer end of each of the sleeves 23 when the handles are manually pushed toward the pivot arm 16.

One detent (not shown) at each end of the pivot arm 16 adapted to engage a single recess (not shown) in the face of the cylindrical plate 32, thus locking arm 16 and plate 32 together temporarily in the position shown in FIGURE 1. During part of the doffing process, the frictional restraint of the detent is overcome by the operator, and the arm 16 is moved relative to the plate 32. During most of the winding process, however, the arm 16 and the plate 32 act together. Rearward of the plate 32, are an arm and a counter-weight (not shown), which urge the plate 32 and parts mounted thereon in a counter-clockwise direction. This effect is enhanced by the weight of the arm 16, the chuck 12, the bobbins 24, 26, 28 and the yarn thereon.

Fixed to the right-hand portion of the plate 32, is a pin 25 which is located below and generally to the right of the pivot arm 16. Mounted rotatably on the pin 25 is a shield arm 27. The arm 27 is free to rotate with respect to the plate 32 and is heavier on its right-hand end, so that it tends to turn clockwise. As shown in FIGURE 1, the upper left-hand edge of the shield arm 27 abuts the lower edge of the pivot arm 16 when there is no yarn on the bobbins 24, 26, and 28.

The peripheral surface of the shield arm 27, at the left is arcuate. Secured to this surface is a thin, sheet-metal shield 29, arcuate in cross-section. The shield 29 is cantilevered from the arm 27 and is generally parallel to the drive roll 18, extending substantially the full length of the drive roll. When it is in the position shown in FIGURE 1, with little or no yarn on bobbins 24, 26, and 28, the shield 29 is positioned generally between the drive roll 18 and the empty bobbins 34, 36, and 38. The right-hand end of the arm 27 bends generally downward to form a hook. Projecting from the frame 8 is a pin 31, which in the position shown stands clear of the inner surface of the hook.

In operation, yarn 22 travels vertically downward, through traversing guide 11, counter-clockwise around the drive roll 18 and is wound on the bobbins 24, 26 and 28 to form packages 13. In the early part of the winding cycle, i.e., while a thin layer of yarn is being wound on the bobbins, the pivot arm 16, the plate 32, and the shield arm 27 rotate as a unit about the central axis of the plate 32 until hook on the shield arm 27 engages the pin 31, after which the shield arm is caused to rotate counter-clockwise with respect to the plate 32. This relative rotation causes a progressive and continuous withdrawal of shield 29, so that its upper edge is incapable of interfering with the periphery of the growing packages 13.

After a predetermined amount of yarn is wound onto packages 13, the operator grasps the handle 17 and 19 on windup chucks 12 and 14 and rotates pivot arm 16 clockwise, forcing it out of its detented position on circular plate 32 while continuing to rotate the chuck 14 and the empty bobbins down and into driving engagement with the drive roll 18 and at the same time maintaining contact between the full packages 13 and the drive roll, thus reaching the position shown in FIGURE 3. During this part of the cycle, the edge of the pivot arm 16 engages to top edge of shield arm 27, swinging the shield 29 farther in a counter-clockwise direction to a fully retracted position completely out of the path of the bobbins.

After the empty bobbins 34, 36 and 38 are brought up to speed, the operator proceeds to rotate pivot arm 16 still farther clockwise. During this part of the cycle, the empty bobbins 34, 36, and 38 maintain contact with the drive roll 18, but move generally upward, while the packages 13 are moved away from the drive roll to the doffing position as shown in FIGURE 4, where one of the detents in the end of arm 16 once again engages the recess in the plate 32, thereby locking the arm 16 in respect to the plate. As the bobbins 34, 36, and 38 climb up and over the drive roll 18, shield arm 27 follows, due to its counter-weight, thus resuming the position it occupied in FIGURE 1.

At this stage the operator pushes handle 17 inward, thereby braking the still rotating packages 13 and chuck 12 and causing the yarn running across and around bobbins 34, 36, and 38 and thence to packages 13, to go slack as shown in FIGURE 5. As the slack portion becomes progressively larger, the yarn clings to the bobbins 34, 36, and 38, being caught eventually in the nip between bobbins and drive roll 18 with the result that the yarn is broken and begins to wind on bobbins 34, 36, and 38. The free end protruding from the packages 13 extends outward from the package but strikes the shield 29 and thus cannot be caught in the bobbin-drive roll nip. When the chuck 12 has been braked to a stop, the completed packages 13 are removed from the chuck, and new bobbins are installed in preparation for the next cycle.

As pointed out hereinabove, the doffing shield of this invention is fully automatic in operation and requires no attention by the operator of the windup machine. Moreover, no piping of air or external equipment is required to actuate the shield. Although simple in design and low in cost, the shield of this invention is highly effective in preventing trapping of the loose yarn ends. The present invention may be used in winding one or more packages on the windup chuck. It is particularly useful in permitting a compact arrangement of several windup assemblies for winding a large number of threadlines, e.g. from 12 to 30 or more, obtained from a single spinning cell. A compact arrangement wherein two apparatuses of the invention are disposed vertically is illustrated in FIGURE 7. Obviously, any number of the apparatuses can be arranged compactly in vertical or horizontal relationship to handle any desired number of threadlines. For example, in FIGURE 7 two additional apparatuses could be mounted on the left side of the frame 8 to provide a compact unit which would handle 12 threadlines. Compact arrangement of the De Priest apparatus is not feasible, because of the relatively large amount of space required for installation of the flexible shield and associated parts.

It is apparent that the dimensions and placement of the component parts of the apparatus of this invention may be varied, depending on the type of yarn being wound, the number of bobbins to be placed on the windup chucks, as well as other features. It is further apparent that any compact mechanical arrangement controlled by the motion of pivot arm 16 during winding and doffing which retracts and returns shield 29 appropriately is intended to be included within the scope of this invention. It is necessary that pivot arm 16 be eccentrically positioned on plate 32 to permit rotation of the full packages from the winding position to the doffing position while simultaneously rotating the new packages into winding position. The tension during winding and

the size of the packages may be regulated as desired by those skilled in the art.

We claim:

1. An apparatus for continuously winding yarn which permits transfer of a yarn end from a completed package to an empty package without interrupting the winding operation, said apparatus comprising:

a pair of windup chucks (12, 14) for rotatably supporting yarn packages (24, 26, 28, 34, 36, 38),

a drive roll (18) for rotating a yarn package while supported on one of the chucks, the drive roll (18) forming a nip with the package,

means for continuously feeding a yarn (22) to the nip and thence onto the package,

a pivot arm (16) having one of the chucks secured to each end and being rotatably mounted for rotating one chuck from a winding position in which a completed package (13) thereon is in contact with the surface of the drive roll (18) to a position remote from the drive roll (18) for doffing the completed package (13) while simultaneously rotating the other chuck into winding position in contact with the drive roll (18) where an incomplete package thereon can be completed, and

a shield assembly composed of a shield (29) secured to one end of a shield arm (27), the shield (29) being generally parallel to and coextensive with the drive roll (18) and the chucks (12, 14), the shield arm (27) being rotatably mounted at a point remote from the point where the pivot arm (16) is mounted, whereby the shield (29) can be retracted from a shielding position between the drive roll (18) and the completed package (13) on the chuck in doffing position outside the path traveled by the chucks (12, 14) upon rotation of the pivot arm (16) during movement of the completed package (13) from the winding position to the doffing position, the shield assembly being biased toward the shielding position.

2. A yarn winding apparatus as defined in claim 1 wherein the end of the shield arm (27) which carried the shield (29) is located in the path of rotation of the pivot arm (16), whereby rotation of the latter causes the former to rotate in the opposite direction against the urging of the bias, thereby progressively and continuously retracting the shield (29) from the shielding position.

3. An apparatus as defined in claim 2 wherein the pivot arm (16) and the shield arm (27) are eccentrically mounted on a plate (32) which is in turn rotatably mounted on a frame (8), the plate being rotatable in order to accommodate a growing package during the winding operation.

4. An apparatus as defined in claim 3 wherein the shield (29) is mounted on one end of the shield arm (27) and the opposite end of the shield arm (27) extends outwardly beyond the edge of the plate (32), and wherein a pin (31) is mounted on the frame (8) in a fixed position in the path traveled by the outwardly extending end of the shield arm (27) as the plate (32) rotates, whereby the shield arm (27) engages the pin (31) and is caused to rotate against the urging of the bias in the direction opposite the direction of rotation of the plate (32) and out of the path of the growing package during the winding operation.

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