

- [54] **APPARATUS FOR WINDING YARN**
[75] Inventors: **James Edward McErlane**, Wilmington, Del.; **Russell Neal Palmer**, Kingston, N.C.
[73] Assignee: **E. I. du Pont de Nemours and Co.**, Wilmington, Del.
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[51] Int. Cl. **B65h 54/02**
[58] Field of Search **242/18 A, 18 PW**

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Primary Examiner—Stanley N. Gilreath
Assistant Examiner—Milton S. Gerstein
Attorney—Howard P. West, Jr.

[57] **ABSTRACT**

A winding apparatus of the type that includes a plurality of arms rotatably mounted in a frame for moving rotatable chucks mounted to the arms successively through winding and doffing positions includes a yarn transfer mechanism for transferring yarn from a full package to an empty package support carried by the chucks. The transfer mechanism is carried by a linkage mechanism which is actuated by a motive means that is operated by a cam and follower arrangement coupled between the windup frame and the rotatable arms. The cam includes a separable portion carried by the linkage which when engaged by a follower carried by the rotatable arms triggers operation of the linkage. The cam and follower arrangement serves both as a guide for the movement of the arms and as a means for initiating operation of the transfer mechanism.

6 Claims, 6 Drawing Figures

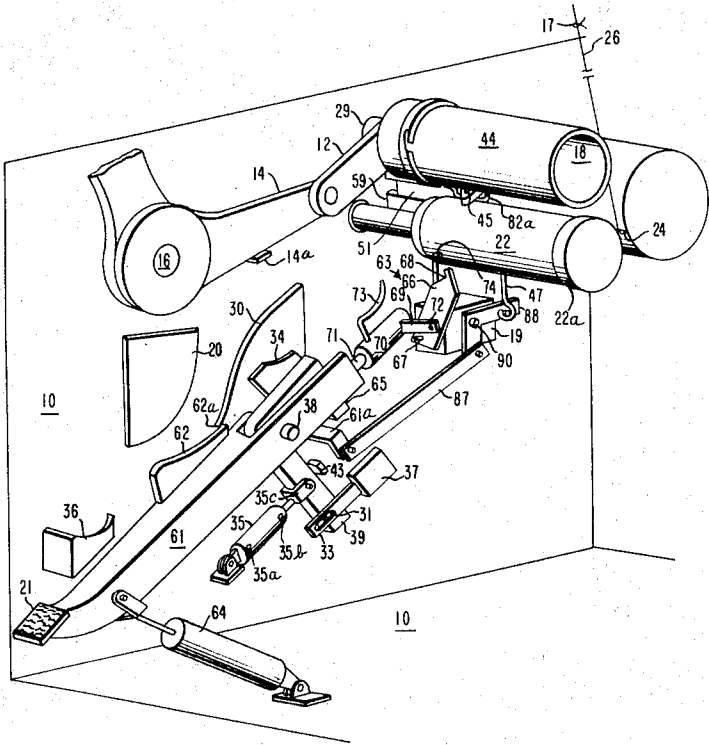


FIG. 1

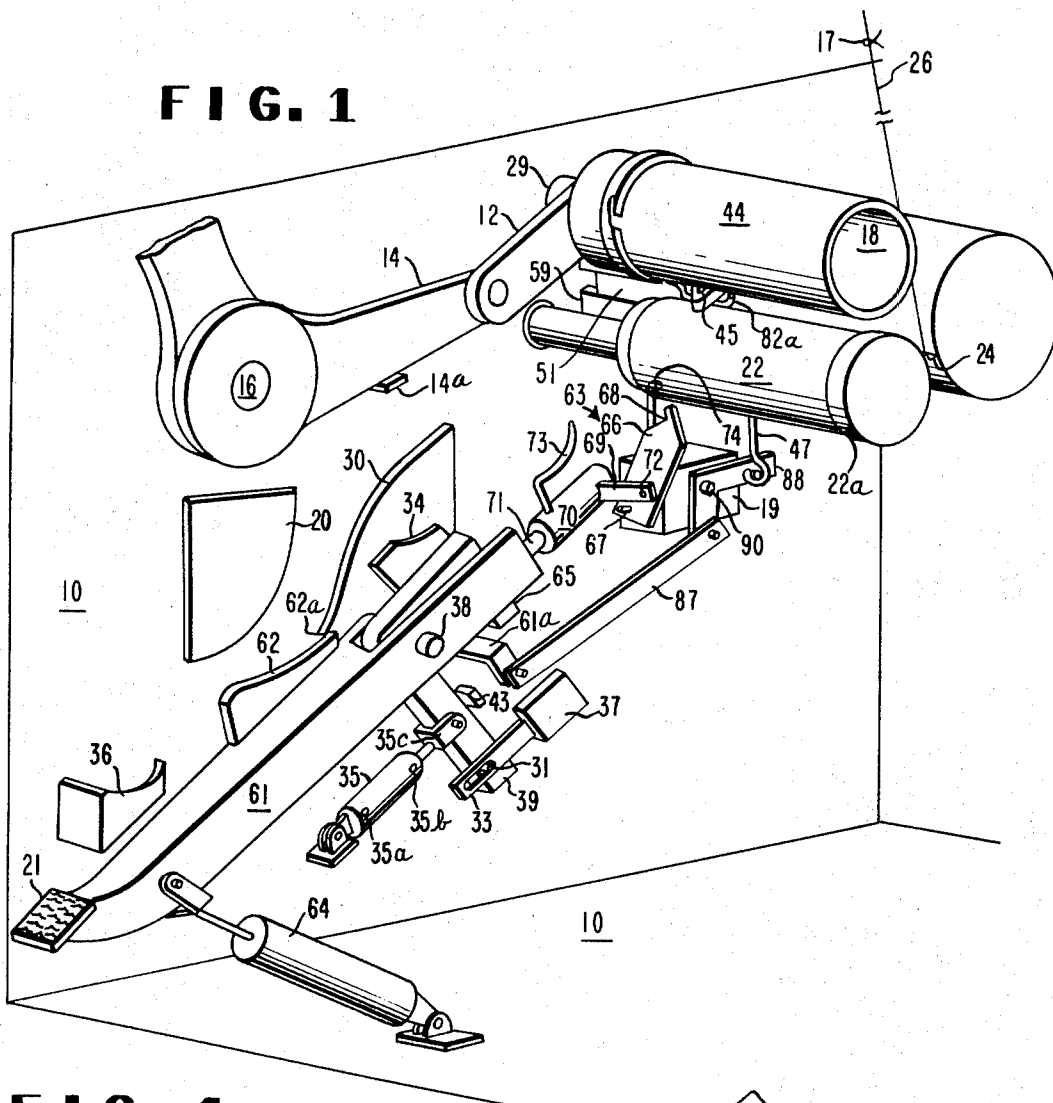


FIG. 4

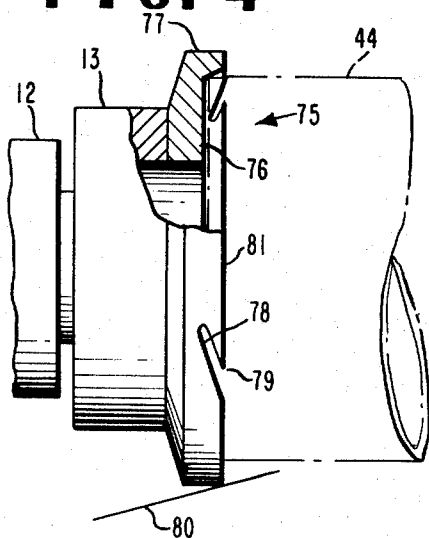
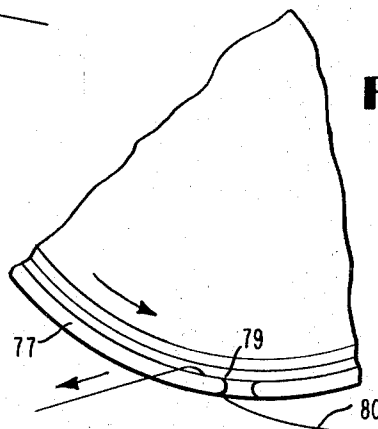


FIG. 5

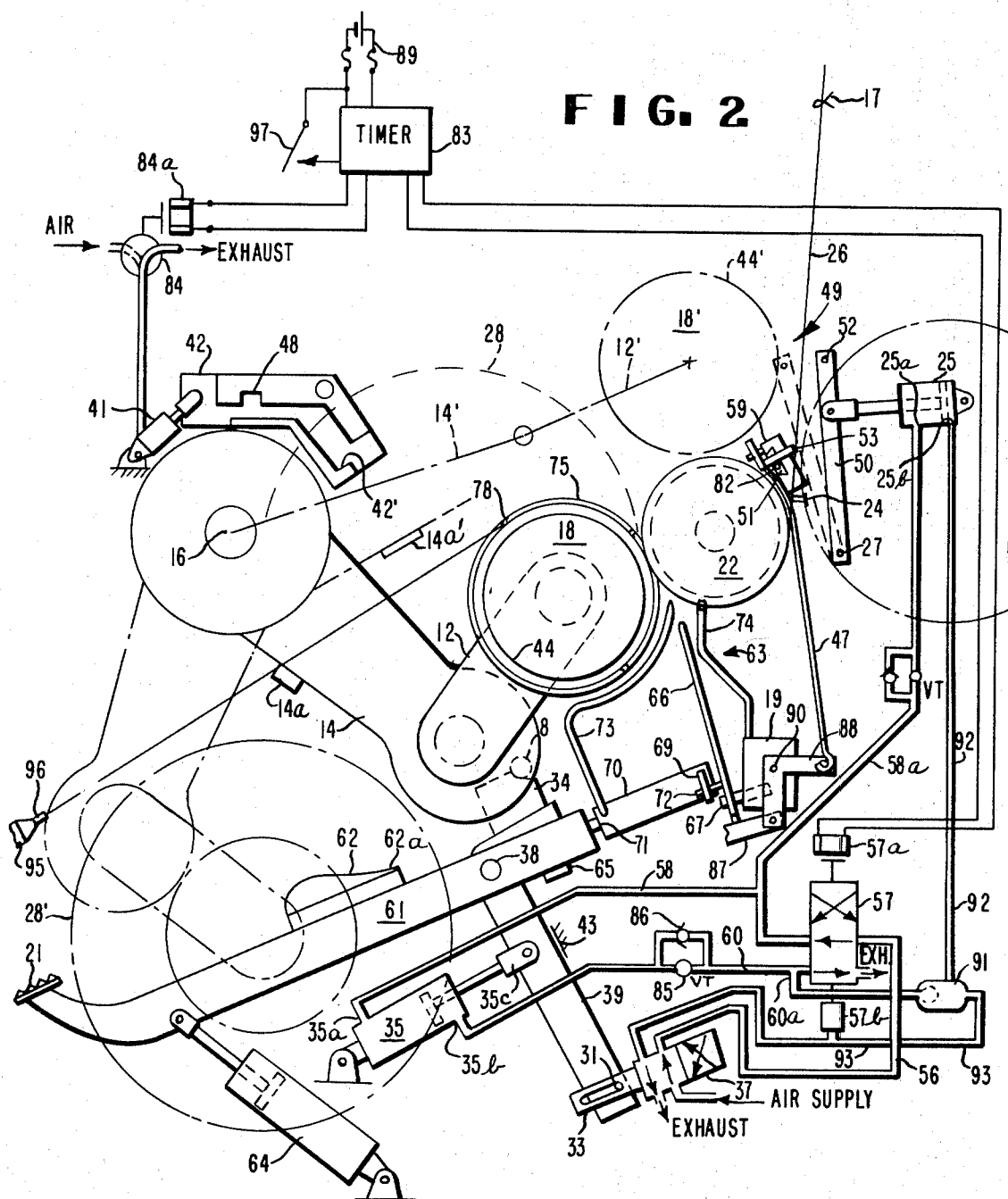


INVENTORS

JAMES EDWARD MCERLANE
RUSSELL NEAL PALMER

BY

Howard P. West Jr.
ATTORNEY



INVENTORS

JAMES EDWARD MCERLANE
RUSSELL NEAL PALMER

BY

Howard P. Went Jr
ATTORNEY

FIG. 3

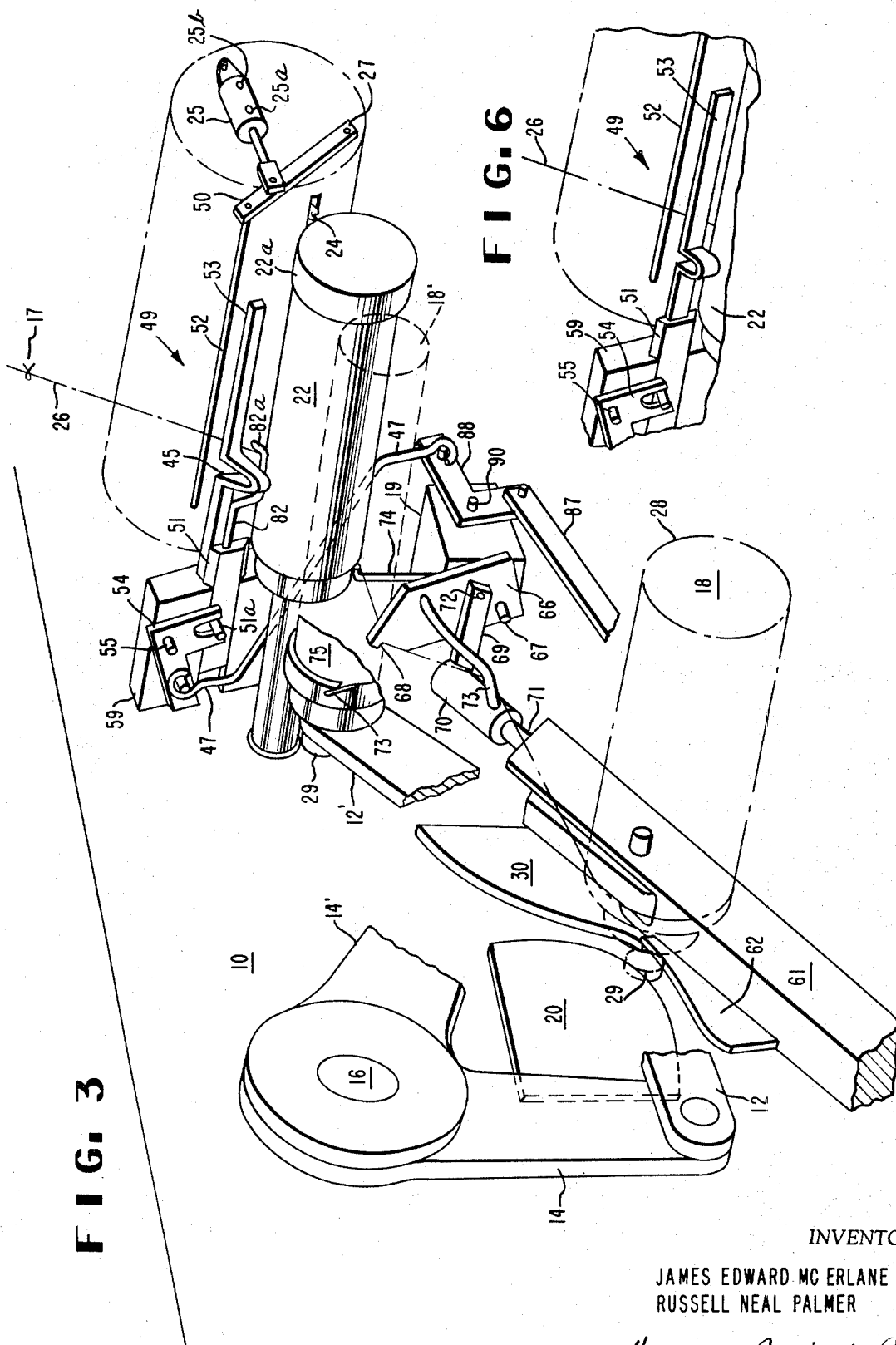
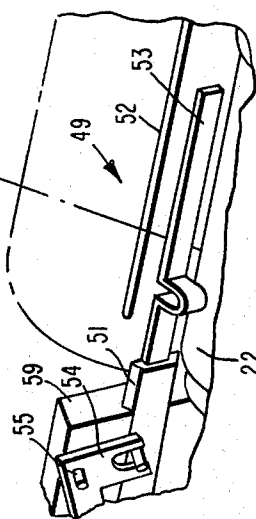


FIG. 6



INVENTORS

JAMES EDWARD MC ERLANE
RUSSELL NEAL PALMER

BY

Howard P. Whit Jr.

ATTORNEY

APPARATUS FOR WINDING YARN

BACKGROUND OF THE INVENTION

This relates to the winding of continuously advancing yarn on generally cylindrical, square-ended, surface driven packages in which yarn is wound to successive packages substantially without waste and relates particularly to mechanisms for effecting transfer of the yarn from a package to an empty support in a controlled fashion so as to form a transfer tail.

The present invention is directed to windups of the type which include a print or drive roll to which yarn advances from a reciprocating traverse guide and from which yarn is deposited on a surface driven package, such windups generally employ two rotatable package supports alternately movable into surface driven engagement with the drive roll and a mechanism for effecting yarn transfer from full package to empty support.

In the prior art windups, the full package is permitted to descend by gravity and the position of the descending parts is usually sensed by a limit switch to provide a signal based upon which a yarn transfer mechanism is triggered into action. In such an apparatus, there are inherent delays not all of which are predictable or consistent from time-to-time with the result that the transfer function is not attempted at the proper time or, geometrically, in proper relationship to windup components which are in motion with the result that yarn transfer is not effected some of the time.

A further problem arises from the basic nature of the windup; i.e., that a full package is withdrawn from driving engagement with a drive roll which means that reliance must be placed on continued coasting of the full package to maintain tension in the expanse of yarn from package to empty bobbin. Where low modulus or "stretchy" yarns are being handled, the prior art apparatus is generally satisfactory, but where a high modulus yarn is wound, the yarn quickly goes slack (due in part to decrease in speed of the coasting package) defeating attempts at transfer. In general, it is to these problems that the present invention is directed.

SUMMARY OF THE INVENTION

In a winding apparatus including a drive roll, wherein a plurality of chucks are advanced in succession from a winding position to a doffing position and including a plurality of arms rotatably mounted in a frame for moving the chucks through said positions, each chuck carrying a package support and having yarn snagging elements adjacent one end of the carried support and a traverse guide through which yarn normally advances around the drive roll to a support driven by the drive roll in the winding position, a yarn transfer mechanism comprising: a cam surface on said frame, said surface having a separable portion at one end, each arm having a cam follower fixed thereto for engaging said cam surface to guide said arm from said winding position toward said doffing position; guide means positioned adjacent said winding position for movement of said yarn below said drive roll across said snagging elements adjacent one end of an empty support and above said drive roll toward said one end; a linkage mechanism mounting said guide means for said movement, said linkage mechanism carrying said separable portion of said cam surface, said separable portion being dis-

placed by said cam follower during movement of said arms from said winding toward said doffing position to impart said sweeping movement to said linkage while yarn is still advancing to a full package moving toward said doffing position whereby to deflect, snare and sever said yarn thereby to initiate a new package on said empty support.

The windup includes a means for biasing said separable cam portion upwardly, said cam surface comprising spaced upper and lower, confronting surfaces, said separable portion being a part of the lower surface and converging toward said upper surface thereby yieldably obstructing the space between said confronting surfaces.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an isometric view of a windup of the present invention showing a yarn transfer mechanism.

FIG. 2 is a diagrammatic side elevational view of the windup of FIG. 1 showing controls and pneumatic devices.

FIG. 3 is a partial isometric view of the windup showing yarn in process of being transferred.

FIG. 4 is an elevational view partly in cross section of a yarn snagger.

FIG. 5 is a partial end elevational view of FIG. 4.

FIG. 6 is an alternate arrangement for the yarn deflector shown in FIG. 3.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. 1-3, the windup generally comprises a frame 10, two sets of articulated swing arms 12, 14 and 12', 14' mounted for rotation about a common pivot 16, rotatable chucks 18, 18' at the extremities of arms 12, 12', a drive roll 22, a reciprocating traverse guide 24 through which yarn 26 advances around drive roll 22 to a package 28 on support 44 on chuck 18, fixed guide cams 20, 30 and a pawl 34, pivotally mounted on fixed pin 38, for supporting one of the sets of swing arms 12, 14 (or 12', 14') when the chuck 18 (or 18') is in the winding position seen best in FIG. 2 where pin 8 on the far side of arm 14 is resting on pawl 34. At the end of each of the arms 12, 12' is a roller cam follower 29 which is guided between confronting surfaces of the fixed cams 20, 30 at such times as the arms 12, 14 are permitted to descend; e.g., when a package is to be doffed and a new package started.

In general, after a yarn transfer has been effected, the package 28 to be removed as well as its associated chuck and arms is supported by cradle 36 on frame 10. At some time after yarn transfer, the entire arm chuck-package assembly must be manually lifted clear of the cradle 36 and swung clockwise (CW) about pivot 16 to a position where a pin (not shown) on arm 14 engages the notch 48 on latch 42 thus temporarily securing the assembly above the pivot 16 where the package is doffed and an empty support substituted after which the latch 42 may be deflected, manually, to permit the arms 12, 14 (or 12', 14') to be lowered to the "ready" position, shown in FIG. 2., where the empty support 44' stands clear of the drive roll 22 (e.g., by 0.2 inch) the assembly now being supported by the hook 42' on the latch 42.

Directly above the path of the traverse guide 24 is a yarn deflector 49 (FIG. 3) generally comprising three parts: a pivoted arm 50 having a horizontal bar 52, a movable guide 82 and a fixed bayonet 53 which is mounted on the machine frame 10. A dovetail slide 51 in a fixed block 59 carries the guide 82 which has a hook 82a located slightly to the right of a U-shaped guide 45 in the bayonet 53. A pin 55 mounted on the block 59 carries a crank 54, the lower end of which is forked to engage a pin 51a on the dovetail slide 51 and the opposite end of which is pivotally connected to a link 47 the latter extending generally downward to be joined to a mechanism to be described. The bayonet 53 is bent near its left end to form a U-shaped guide 45 which is situated in the position shown in FIG. 3 aligned about 0.25 inch to the right of the edge of the package 28.

Directly above the bayonet 53 is horizontal guide bar 52 which is cantilevered from arm 50 and extends parallel to the axis of drive roll 22 and to the plane swept out by the traversing yarn. The arm 50 is pivotally mounted on a pin 27 carried by the traverse mechanism housing which also supports pneumatic cylinder 25 the rod end of which is pinned to the arm 50. When pressurized air is applied to the port 25a, the arm 50 and bar 52 are held in their retracted position as shown in FIG. 2.

Pawl 34 is joined to a crank 39 which is pivotally mounted on a pin 38 fixed to frame 10. The lower portion of crank 39 is connected to a pneumatic cylinder 35 and a four-way valve 37. The body of the cylinder 35 is pivotally anchored to the machine frame 10 while the rod is connected to the crank 39 by means of a clevis 35c. Air pressure at the port 35a in the head end of the cylinder holds the piston against the end of the cylinder, thus holding the crank 39 (and pawl 34) in the position shown in FIGS. 1 and 2. Near its lower end, the crank 39 carries a pin 31 which (for the crank position shown) is situated in the upper end of a slot in a link 33 which is connected to the four-way valve 37. In the position shown in FIG. 2, the valve 37 is adapted to supply pressurized air via conduit 56, four-way solenoid valve 57 and conduit 58 to the head end port 35a of cylinder 35, thus maintaining the status quo (pawl 34 supporting arms 12 and 14). Air is also supplied, via conduit 58a, to the rod end port 25a of cylinder 25 holding it and thus bar 52 as well in the retracted position.

Rotatably mounted on the fixed pivot pin 38 is a rocker 61 (FIG. 1) which carries a cam 62 near its lower end and portions of a yarn guiding means or presenting mechanism 63 (to be described) at its upper end. On the lower edge of the rocker 61, near the pivot 38, is a lug 65 which extends to the far side of the rocker 61 beneath the pawl crank 39 to serve as an abutment surface for the lower edge of the pawl and crank as will be described. The cam 62 is rigidly joined to the rocker 61 and the surface of cam 62 generally forms in effect a separable continuation of the surface of fixed cam 30 except that the lower portion of the cam 62 converges toward the surface of the cam 20, in effect obstructing the "track" by narrowing the distance between the confronting faces of the cams 20 and 30. At the foot of the rocker 61 is a foot pedal 21 and an adjustable shock absorber 64 or dash pot which

is connected to the machine frame at its lower end and is clevis mounted to the rocker 61 at the opposite end. This arrangement biases rocker 61 upwardly thereby yieldably obstructing the track.

At the time when a package descends with arms 12 and 14, the roller 29 on arm 12 enters the space between cams 20 and 30, continuing the descent in the path defined by the cams but otherwise falling without restraint to the point where the roller 29 encounters the leading edge of the cam 62 (e.g., at 62a) at which stage the rocker 61 is caused by the weight of the package to pivot counter-clockwise (CCW) on the pin 38 by about 12° moving the lug 65 upward toward the lower edge of the pawl crank 39 and driving the yarn presenting mechanism 63 which with yarn deflector 49 is part of the guide means adjacent the drive roll 22 for moving the yarn above and below the drive roll to a position outside the traverse zone to effect a yarn stringup on an empty support and form a transfer tail thereon.

The principal part of the presenting mechanism 63 is a yarn presenter 66 which is pivotally mounted on pin 67 which latter is fixed to the machine frame by means of a block 19. A plane normal to the axis of the drive roll 22 contains the axis of the pin 67. The axis of the pin 67 does not intersect the axis of the drive roll, thus it may be seen that the presenter 66 swings in a plane generally parallel to the drive roll axis being situated normally, however, in the "rest" position shown in FIG. 1, where the notch 68 in its upper end has not yet engaged the yarn. The upper end of the presenter 66 is slightly below the nip between the drive roll 22 and the support 44 on chuck 18 (FIG. 2).

The rocker 61 carries a shaft 71 and a rotatable sleeve 70 at its upper end. Joined to the sleeve 70 is an arm 69 which (for the rest position) is more or less horizontal and is connected to the presenter 66 by means of a pin 72 and ball joint, not detailed. Counter-clockwise motion of the rocker 61 lifts the shaft 71 and the sleeve 70, but since the latter is linked to the presenter 66, the sleeve 70 turns clockwise on the shaft 71 with concomitant counter-clockwise rotation of the presenter through an angle of about 30°. The sleeve 70 carries a yarn guide bar 73 which extends radially upward from the sleeve proximal to the chuck 18 where it is bent to conform to the outer periphery of the chuck, terminating close (e.g., 0.2 inch) to the surface of the drive roll 22 but clear of the plane swept by the presenter 66. Since the sleeve 70 is caused to turn clockwise, as noted above, the guide bar 73, of course, turns with it so that the curved portion of the bar 73 sweeps generally to the right along the undersurface of the support 44 while at the same time the notch 68 of the presenter 66 is sweeping to the left.

Directly behind the presenter 66 is a fixed guide 74 having a horizontal portion directly beneath the drive roll 22 and a nearly vertical portion the lower end of which is secured to the block 19; the horizontal portion is parallel to the axis of the drive roll and is spaced about 0.1 inch from its periphery. The vertical part of the guide 74 is located to the left of the end of the traverse stroke but to the right of the yarn snagger 75 in the chucks 18, 18'.

The dovetail slide 51 and the guide 82 are reciprocated by means of an integral arm 61a (FIG. 1) situated on rocker 61 on its underside, a link 87 pinned

to the extremity of the arm 61a and a crank 88 which is coupled to the lower end of the link 47. The latter, as described previously, drives the dovetail slide by means of crank 54 (FIG. 3). The crank 88 is pivotally mounted on a pin 90 which is supported by fixed block 19. From this it will be seen that CCW motion of rocker 61 will move link 87 to the right resulting in CCW motion of crank 88 and CW motion of crank 54. This causes dovetail slide 51 and guide 82 to be moved to the left. The yarn snagger 75 (FIGS. 4, 5) is part of the rotatable portion of each of the chucks 18 and comprises a disk 76 which is encircled by an integral band 77 having plural angled radial slots 78 which pass entirely through the band 77, each forming a point 79. All of the points are aimed in the direction of rotation of the chuck and are thus adapted to snag or catch yarn 80 which is in grazing contact across the outer edge of the band 77, the outside diameter of which is larger than the diameter of a support 44. Upon installation on a chuck 18, the end of the support 44 is thrust into the cavity in the snagger, engaging the conical surface inside the band 77 so that the peripheral surface of the support underlies the root of each of the slots 78, providing yarn pinch regions therebetween.

The windup is controlled by means of a timer 83 (FIG. 2) which, after permitting winding to proceed for a preselected time interval, produces two signals, in sequence, to electrically energize solenoid 84a of valve 84 and solenoid 57a of valve 57, respectively, from electrical source 89. The valve 84 admits pressurized air to the head of cylinder 41 activating latch 42 while solenoid 57a, energized a finite time later, usually about 15 seconds, serves generally to release the just completed package 28 from the winding position and to initiate yarn transfer. Between valve 57 and cylinder 35 in conduit 60 is a throttling valve 85 which serves to restrict air flow from valve to rod end port 35b of the cylinder while a check valve 86 permits free flow in the opposite direction. The timer 83 energizes each of the solenoids 84a and 57a for a short period (e.g., a second or two) after which valve 84 is restored to its original position (FIG. 2) by a spring (not shown) while valve 57 remains in its shifted position until later when pressurized air is supplied to the pilot cylinder 57b. When valve 37 is shifted to a position opposite that shown in FIG. 2 (by means of crank 39), it supplies air to the pilot cylinder 57b but cuts off air to the remainder of valve 57 or, in effect, cuts off air supplied to pneumatic cylinder 35. Both ends of cylinder 35 are thus at atmospheric pressure, and the crank 39 is therefore free to be moved by other agencies, such as, by the action of lug 65 against crank 39.

At the start of a doffing cycle, the windup components are situated generally as shown in FIGS. 1 and 2 (swing arms and other components in solid line positions) with the exception that yarn has been wound on the support 44 occupying the lower (or normal winding) position and the arm 12 has receded from the drive roll 22 so that, for example, the yarn package 28 (shown in broken lines) is being wound and is to be doffed. The arm 14 is supported by pin 8 which is resting on pawl 34 while the upper arms 12', 14' are in rest position being supported by latch 42. The timer 83 has been "running" since the yarn package was started. The following events occur in sequence::

1. Timer 83 reaches the end of a preselected time interval and energizes solenoid 84a; valve 84 then admits air to cylinder 41, actuating latch 42 and releasing arm 14'.

2. Arms 14', 12' and support 44' drop until support 44' makes contact with enlarged section 22a on drive roll 22, being accelerated, and until lug 14a' on underside of arm 14' abuts upper side of arm 14.

3. Approximately 15 seconds after event 1, above, timer 83 energizes solenoid 57a shifting valve 57 with two effects:

a. Conduits 58 and 58a are opened to the exhaust port of valve 57, permitting air to escape.

b. Air is admitted simultaneously to conduits 60a and 60 and via the latter to throttling valve 85 and thence to port 35b of cylinder 35 thus starting to move crank 39 CW. Air admitted to conduit 60a flows via shuttle valve 91 to conduit 92 and thence to the head end of cylinder 25, driving the piston to the left and moving arm 50 and horizontal bar 52 to the left. The latter sweeps the traversing yarn against the fixed bayonet 53 until the yarn, moving leftward, is urged into the U-shaped guide 45 and, in consequence, becomes free of the traversing guide 24.

4. Crank 39 moves CW with two effects:

a. Pawl 34 releases pin 8, allowing arms 12, 14 and package 28 to start to descend, the latter losing contact with drive roll 22 (arms 12', 14' and empty support 44' following attempting to maintain contact of lug 14a' with arm 14). Yarn continues to advance via U-shaped guide 45 to the coasting package 28.

b. Pin 31 on crank 39 starts to move downward along the slot in link 33 (but does not actuate valve 37 as yet).

5. Arms and package continue descent while roller cam 29 on arm 12 enters cam track 20-30.

6. Substantially simultaneously with 5, above pin 31 actuates valve 37, reversing it and applying air pressure to conduit 93 and to pilot 57b, thereby restoring valve 57 to the position shown in FIG. 2. In effect, this releases air from port 35b to the atmosphere and permits substantially unrestrained movement of the piston and rod of pneumatic cylinder 35; however, since there is no force available to urge the crank 39 in either direction, the valve 37 remains in the reversed position temporarily; therefore, no pressurized air is supplied to conduit 56, as yet, and no air can be supplied to conduits 58 and 58a at this time. Admission of air to conduit 93 results in the reversal of the ball check in the shuttle valve 91, having the effect of continuing to maintain pressure in conduit 92 and holding arm 50 and bar 52 to the left.

7. As roller 29 reaches the bottom of track between cams 30 and 20, it encounters cam 62 which tends to slow the descent slightly while causing rocker 61 to start to pivot CCW about pin 38 against the resistance of shock absorber 64. 8. As the rocker 61 turns CCW on pin 38 (as in event 7, above), it reaches a position at which the rising lug 65 abuts the lower edge of the crank 39, in effect lifting pawl 34 into position to receive the pin 8' on descending arm 12' and to stop it in normal winding position. CCW motion of rocker 61 also sets dovetail slide 51 and guide 82 in motion to the

left; the first increment of motion of the guide 82 has no effect on the yarn, however, since hook 82a on the end of the guide is about 0.2 inch to the right of the fixed U-shaped guide 45.

9. While arms 12, 14 continue to descend, roller 29 continues to drive cam 62 and consequently rocker 61 CCW causing yarn presenter 66 to sweep leftward or CCW while at the same time causing guide bar 73 to sweep to the right; the latter keeps the yarn from falling off the left end of the still-rotating package 28 while the notch 68 of the presenter 66 moves to the left of the snagger 75 on the chuck 18' carrying empty support 44', thus sweeping the advancing yarn up toward the nip between the support 44' and the drive roll 22. Yarn immediately upstream of the presenter 66 engages fixed guide 74 which prevents the yarn from falling off the left-hand end of the drive roll.

10. As the rocker 61 continues CCW to its position of maximum displacement, five events occur:

- a. The reach of yarn between the notch 68 and the guide bar 73 attains grazing contact with the underside of the periphery of the band 77 of the yarn snagger 75 (FIGS. 4 and 5) where it is caught up by one of the points 79 and slots 78. The snagged yarn is pinched and secured between the inner conical surface of the snagger and the outer peripheral surface of the support 44' so that the yarn is caused to change direction very abruptly and, after taking up slack, to start to wrap about the empty support; at the same time the still-rotating package 28 imposes additional tension on the yarn downstream, causing it to be severed between the pinch region and the just completed package 28.
- b. Simultaneously, the yarn advancing toward the newly strung-up support 44', is guided momentarily by the U-shaped guide 45 until the hook 82a engages the yarn and moves it about 0.3 inch to the left, its point of maximum displacement leftward.
- c. The pin 31 on crank 39 reaches the right end of the slot in link 33 restoring valve 37 to the original position shown in FIG. 2; this has the effect of venting pressurized air in cylinder 25 and conduit 92 and 93 to the atmosphere and admitting air to conduits 56 and 58 (via valve 57) and thence to port 35a causing cylinder 35 to exert a "holding" action on crank 39 (against stop 43).
- d. As roller 29 nears the end of its travel along cam 62, the cam profile becomes lower (FIG. 2) thus the rocker 61 is able to start moving CW under the urging of a spring (not shown in shock absorber 64). As rocker 61 starts to move CW the hook 82a, which is coupled to it, starts to move to the right carrying the yarn to the right and substantially completing the over-wrap of yarn on the transfer tail.
- e. As valve 37 is restored (c, above) air is also admitted to conduit 58a and then to port 25a in the rod end of cylinder 25 thereby withdrawing arm 50 and horizontal bar 52, in effect permitting the yarn to escape from U-shaped guide 45 and hook 82a and to sweep to the right because of yarn tension and the centered position of the fanning guide 17, located above. The initial position of the yarn relative to the support 44' at the time of snagging had

been outside the normal limits of traversing (by about 0.3 inch), thus, as motion of the hook followed by release from guide 45 and hook 82a is effected, approximately two to three wraps are formed on the support 44' by the time the yarn moves to the right far enough to cross over the (left) line at which normal traversing would ordinarily terminate. As soon as the yarn 26 enters the normal traverse zone, it is "captured" by the traversing guide 24 and thereafter is traversed in a normal fashion. The two or three exposed wraps on support 44', of course, form a transfer tail with an over-wrap and are prevented from contacting the drive roll by virtue of a reduced diameter at the left-hand end of the drive roll.

11. Arms 12 and 14 and package 28 continue to descend so that as the roller 29 breaks engagement with the lower end of the cam 62 the spring inside shock absorber 64 continues to urge rocker 61 CW and restores rocker 61 and all its appurtenances to their starting or rest positions.

12. The timer 83 is reset to zero time (by a means not shown) and starts running while the newly strungup package 28' is being wound.

13. The completed package, the chuck of which is now resting in cradle 36 is moved to the doffing position manually and the cycle of events is repeated.

On occasion, there is a need for winding packages without transfer tails and this apparatus can be adapted for such use by simply removing guide 82 and or link 87. The operation then becomes one of sweeping the yarn across the snagger 75 below the drive roll 22 as previously described while maintaining the yarn in U-shaped guide 45 of fixed bayonet 53. Then when bar 52 is withdrawn the yarn escapes from guide 45 and less than one wrap is formed on the support 44' by the time the yarn moves into the traverse zone.

While the foregoing describes a yarn transfer from a full package to an empty support, it should be realized that initial stringup of the winding apparatus may be accomplished automatically. Initial stringup is stringup of yarn to an empty support on a windup that is running but is not then receiving or taking up yarn. The method of stringup requires the use of a portable waste take-up device to temporarily receive running yarn. The waste take-up may comprise an air aspirated device, known to the art, as a sucker gun, which is capable of taking yarn at high velocities and high tensions.

Referring to FIG. 2, both swing arms of the windup are provided with empty supports 44 one of which is drivingly engaged with the windup drive roll and the other of which is in the standby position above the drive roll, the running yarn is deflected into the guide of the waste take-up after which the waste take-up 95 is manually manipulated to carry the guide 96 and the yarn clockwise around the drive roll 22 for about 180° to direct the yarn to the drive roll-support nip, then counterclockwise for approximately 90° around the empty support 44 after which the waste take-up 95 is placed in front of the windup while continuing to receive yarn and to maintain about a 90° wrap on the support 44. The waste take-up 95 is positioned in a plane near the swing arms to as to cause the running yarn to depart from the empty bobbin 44 in a plane approximately 0.5 to 1.0 inch from the face of the snagger

75. At this stage, the operator depresses pushbutton 97, in effect, bypassing the timer 83 and feeding a pulse of electrical current to the output circuits of the timer to energize solenoid 84a and solenoid 57a, respectively, in the manner previously described. This has the effect of causing a yarn transfer to be effected not from a package but from the waste take-up 95 to the upper one of the empty supports 44 thereby initiating winding thereon. It will be understood that this preferably includes the winding of a transfer tail.

A contemplated modification to the arrangement of the yarn deflector 49 includes removing guide 82 and mounting bayonet 53 in its place on slide 51 as shown in FIG. 6. With this arrangement, the U-shaped guide 45 retains the yarn and moves it to its point of maximum displacement leftward to effect the winding of a transfer tail.

The particular embodiment disclosed utilizes a timer 83 for regulating package size according to a preselected time interval, however, it should be recognized that the actual size of the package being wound on a position could be used to trigger the operation of the transfer mechanism. For example, when a predetermined package size is reached, cam follower 29 could actuate a limit switch to operate solenoid 84a and admit air to cylinder 41 which will actuate latch 42 releasing arm 14' from a standby position.

From the foregoing, it will be seen that the angular travel of the rocker 61 under the influence of the descending arms and package is determinative of the relative timing of the entire yarn transfer function including release from the traverse mechanism, the coordinated motions of the yarn deflectors, the restoration of the parts to this starting condition and the resumption of normal winding and traversing. In addition, since the downward displacement of the rocker 61 occurs in a very short period of time, there is substantially no opportunity for yarn being handled to go slack; thus, yarn transfer is effected in a consistent manner from doff to doff.

What is claimed is:

1. In a winding apparatus including a drive roll, wherein a plurality of chucks are advanced in succession from a winding position to a doffing position and including a plurality of arms rotatably mounted in a frame for moving the chucks through said positions, each chuck carrying a package support and having yarn snagging elements adjacent one end of the carried support and a traverse guide through which yarn normally advances around the drive roll to a support driven by the drive roll in the winding position, a yarn transfer mechanism comprising: a cam surface on said frame, said surface having a separable portion at one end, each arm having a cam follower fixed thereto for engaging said cam surface to guide said arm from said winding position toward said doffing position; guide means positioned adjacent said winding position for movement of said yarn below said drive roll across said snagging elements adjacent one end of an empty support and above said drive roll toward said one end; a linkage mechanism mounting said guide means for said movement, said linkage mechanism carrying said separable portion of said cam surface, said separable portion being displaced by said cam follower during movement of one of said arms from said winding

toward said doffing position to impart said movement to said linkage while yarn is still advancing to a full package moving toward said doffing position whereby to deflect, snare and sever said yarn to initiate a new package on said empty support.

2. The apparatus as defined in claim 1, there being two chucks and two arms.

3. The apparatus as defined in claim 1, including a means for biasing said separable cam portion upwardly, said cam surface comprising spaced upper and lower, confronting surfaces, said separable portion being a part of the lower surface and converging toward said upper surface thereby yieldably obstructing the space between said confronting surfaces.

4. The apparatus as defined in claim 1, said guide means comprising: a horizontally movable bayonet positioned above said traverse guide ahead of said yarn, said bayonet having a U-shaped portion opening toward said yarn; a horizontal bar positioned above said traverse guide behind said yarn, said bar being supported for pivotal movement to and from a position moving said yarn out of the traverse guide into said U-shaped portion, said U-shaped portion being movable from a position within the path of traverse to a position outside the path of traverse adjacent said one end; and a yarn deflecting member positioned below said drive roll, said member being mounted for pivotal movement to and from a position engaging and sweeping the yarn across the snagging elements, said bayonet being coupled to said member for simultaneous movement therewith.

5. The apparatus as defined in claim 1, said guide means comprising a fixed bayonet positioned above said traverse guide ahead of said yarn, said bayonet having a U-shaped portion opening toward said yarn, said portion being within the path of traverse and adjacent the snagging elements; a horizontal bar positioned above said traverse guide behind said yarn, said bar being supported for pivotal movement to and from a position moving said yarn out of the traverse guide into the U-shaped portion; a horizontally movable hook positioned below said bayonet, said hook being movable from within the path of traverse past a yarn engaging position with yarn in said U-shaped portion to a position outside the path of traverse adjacent said one end; and a yarn deflecting member positioned below said drive roll, said member being mounted for pivotal movement to and from a position engaging and sweeping the yarn toward the snagging elements, said hook being coupled to said member for simultaneous movement therewith.

6. In a winding apparatus including a drive roll, wherein a plurality of chucks are advanced in succession from a winding position to a doffing position and including a plurality of arms rotatably mounted in a frame for moving the chucks through said positions, each chuck carrying a package support and having yarn snagging elements adjacent one end of the carried support and a traverse guide through which yarn normally advances around the drive roll to a support driven by the drive roll in the winding position, a device for initiating winding of said advancing yarn on a driven empty package support in said winding position comprising: a cam surface on said frame, said surface having a separable portion at one end, each arm having a

11

cam follower fixed thereto for engaging said cam surface to guide said arm from said winding position toward said doffing position; guide means positioned adjacent said one end of said empty support in said winding position for sweeping movement of said yarn across said snagging elements to snag and sever the yarn; a linkage mechanism mounting said guide means for said movement, said linkage mechanism carrying

12

said separable portion of said cam surface, said separable portion being displaced by said cam follower during movement of said arms from said winding toward said doffing position to impart said movement to said linkage whereby to deflect snag and sever said yarn thereby initiating a new package on said empty support.

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