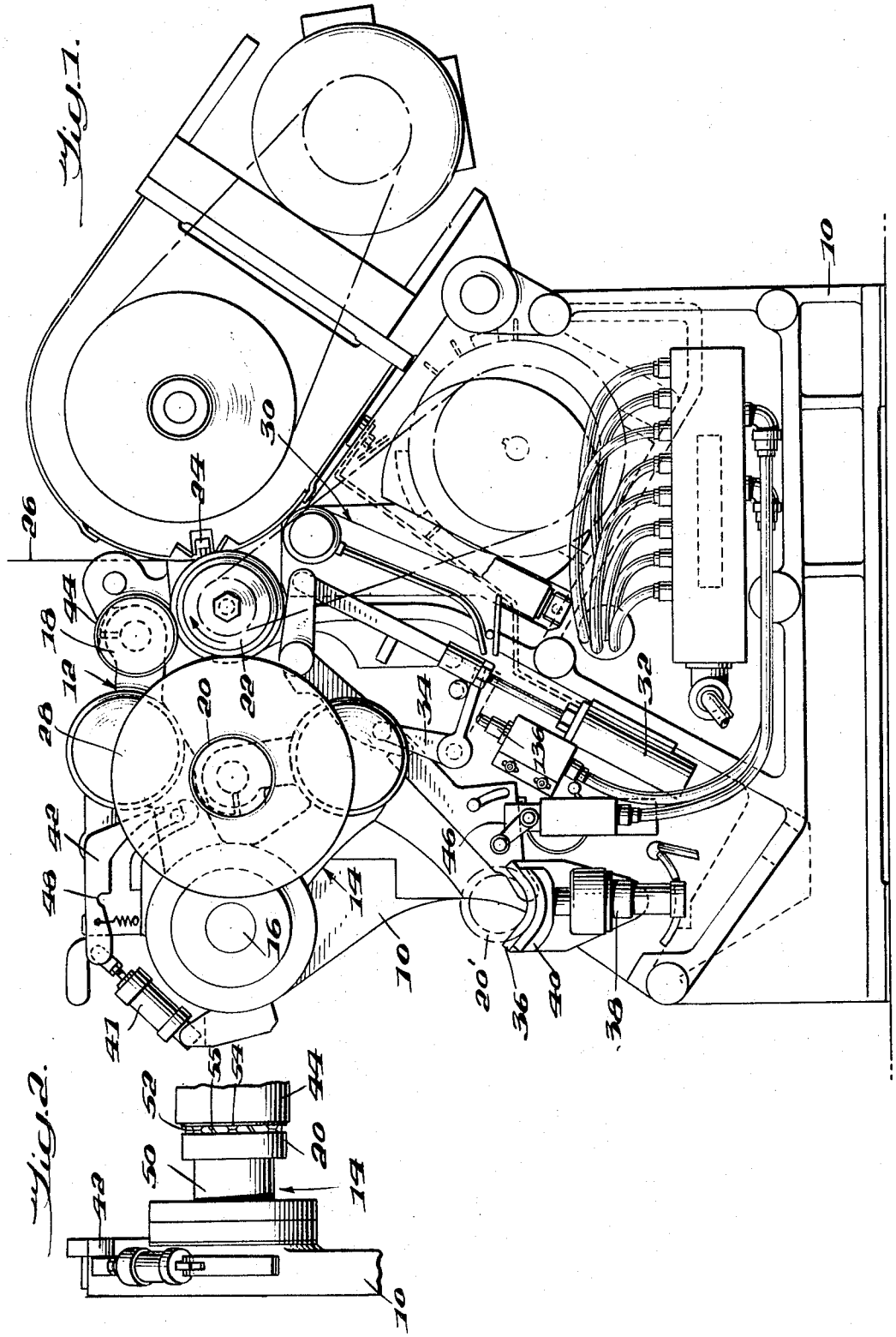
March 21, 1967 M. B. EMERY 3,310,247

CONTINUOUS YARN WINDUP MECHANISM

Filed Oct. 26, 1964 5 Sheets-Sheet 1



March 21, 1967 M. B. EMERY 3,310,247

CONTINUOUS YARN WINDUP MECHANISM

Filed Oct. 26, 1964 5 Sheets-Sheet 2

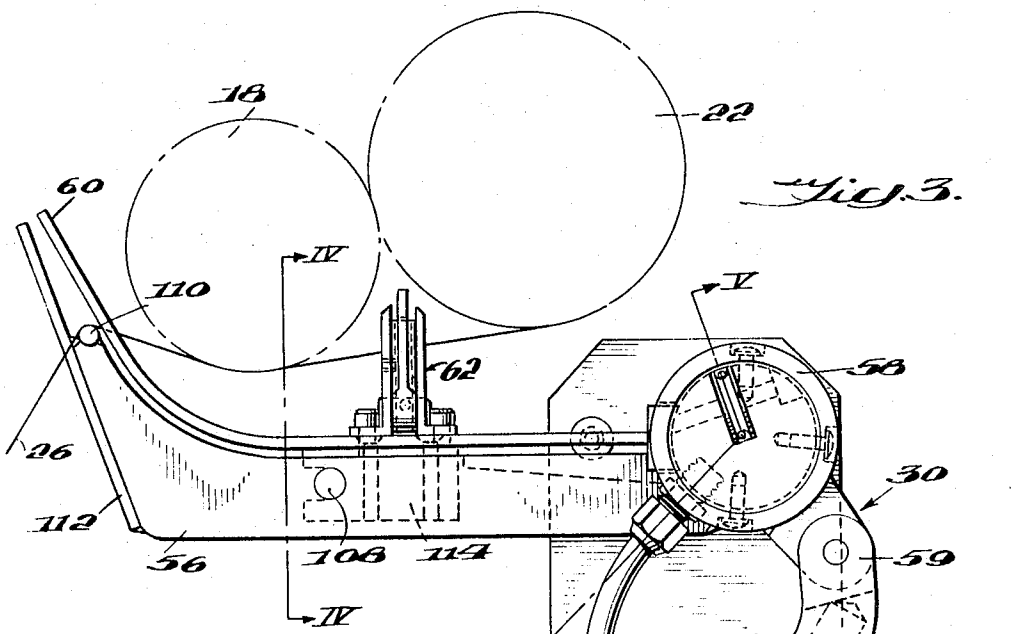
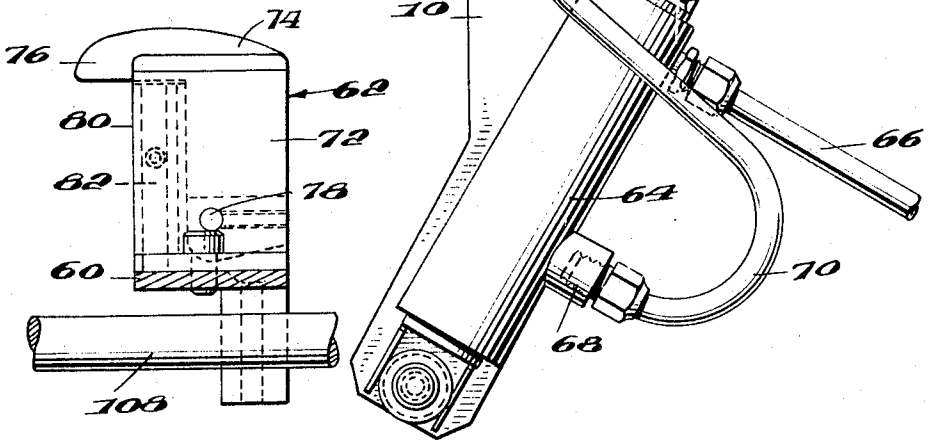


Fig. 3.

Fig. 4.



March 21, 1967 M. B. EMERY 3,310,247

CONTINUOUS YARN WINDUP MECHANISM

Filed Oct. 26, 1964 5 Sheets-Sheet 3

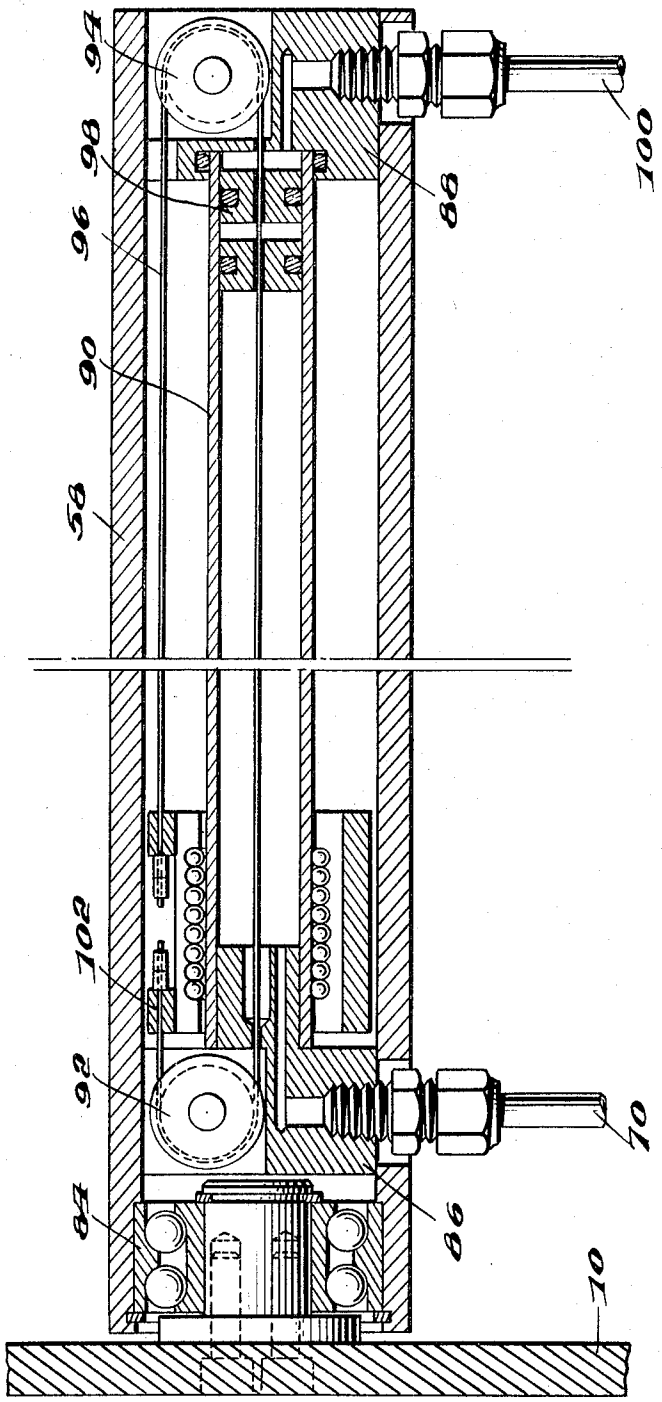


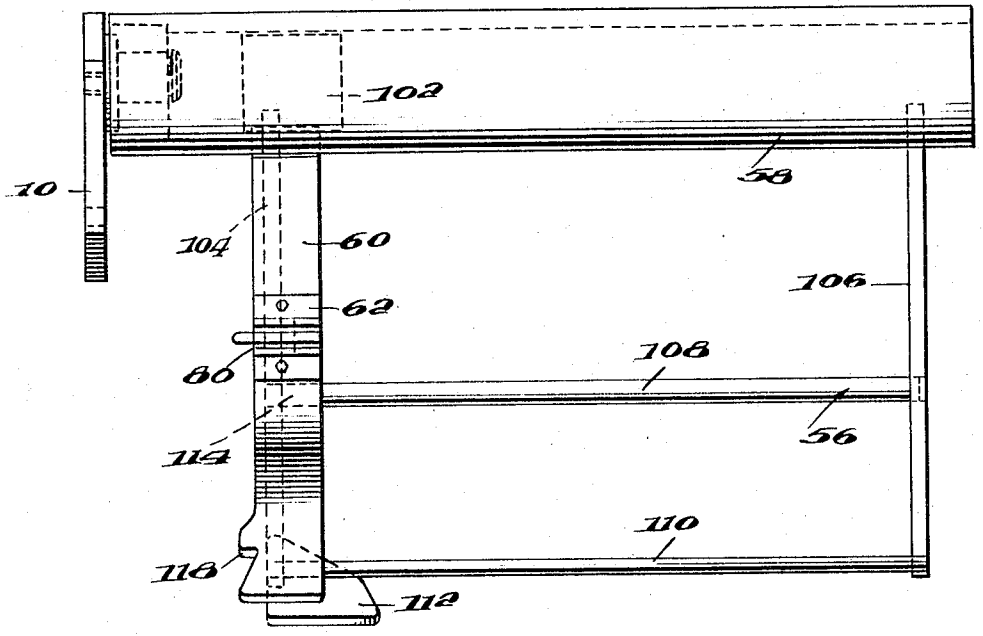
Fig. 5.

March 21, 1967 M. B. EMERY 3,310,247

CONTINUOUS YARN WINDUP MECHANISM

Filed Oct. 26, 1964 5 Sheets-Sheet 4

Fig. 6.



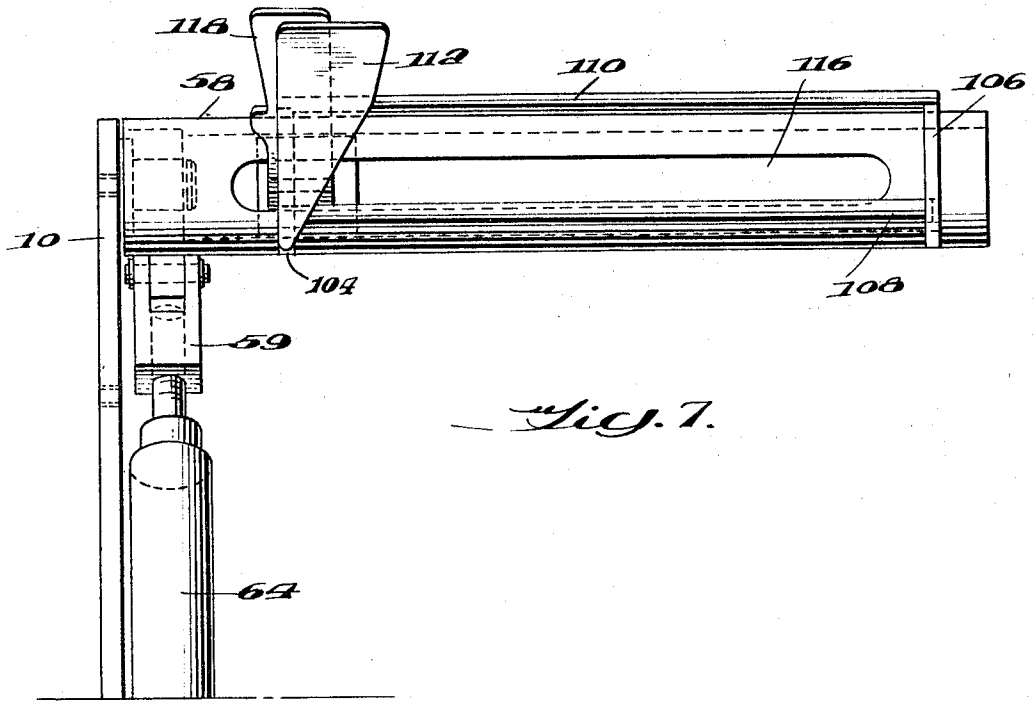


Fig. 7.

March 21, 1967 M. B. EMERY 3,310,247

CONTINUOUS YARN WINDUP MECHANISM

Filed Oct. 26, 1964 5 Sheets-Sheet 5

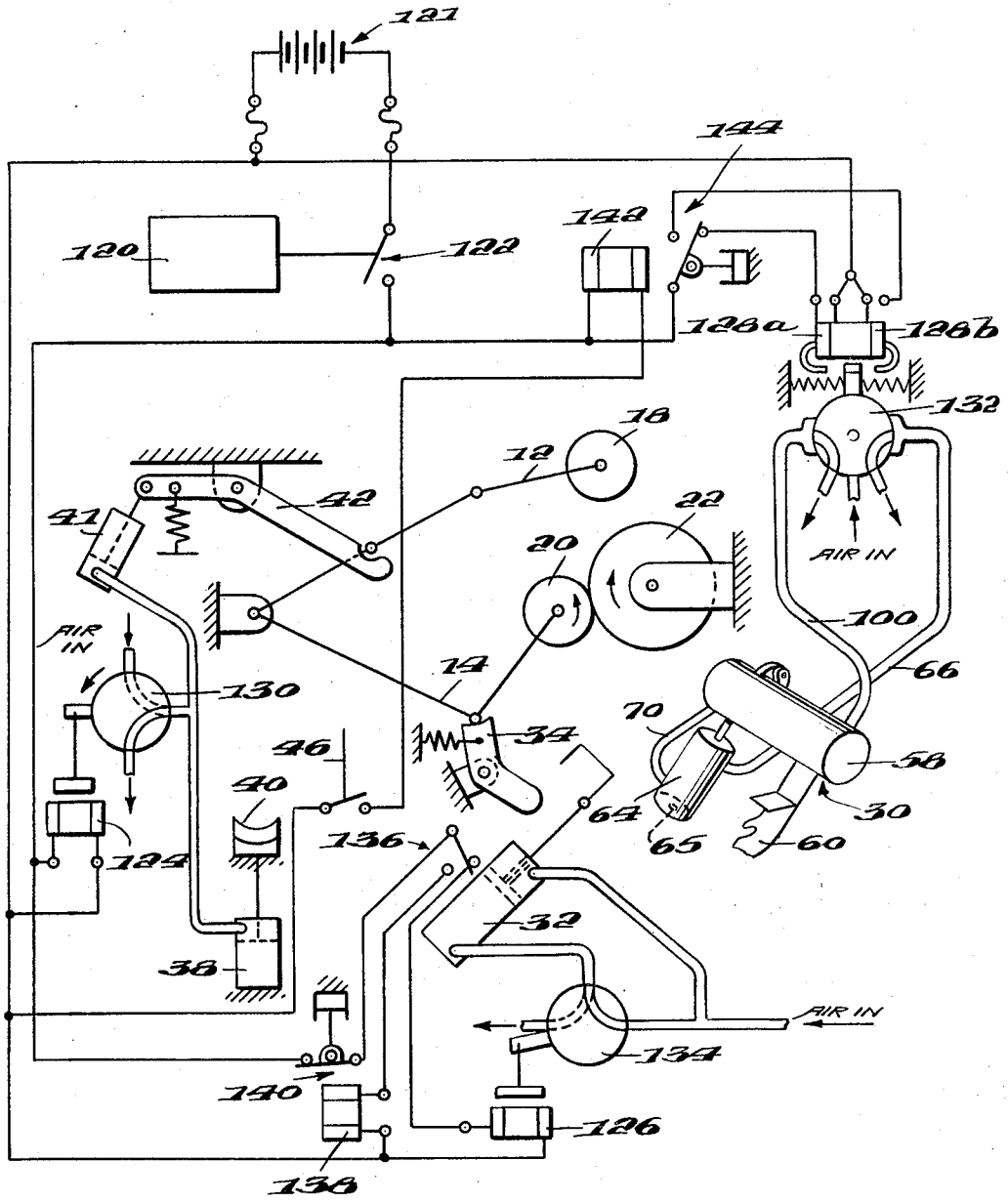


Fig. 8.

United States Patent Office 3,310,247 Patented Mar. 21, 1967

3,310,247

CONTINUOUS YARN WINDUP MECHANISM

Michael Burgin Emery, Seaford, Del., assignor to E. I. du Pont de Nemours and Company, Wilmington, Del., a corporation of Delaware

Filed Oct. 26, 1964, Ser. No. 406,522
6 Claims. Cl. 242—18)

This invention relates generally to the packaging of synthetic yarns and, more particularly, to the equipment with which yarn advancing continuously from a source is wound on successive packages.

Windups which include a print or drive roll to which yarn advances from a reciprocating traverse guide and from which the yarn is deposited on a surface driven package are in wide use. To avoid waste during a doffing cycle, such windups have been modified by the provision of two rotatable package supports alternately movable into surface driven engagement with the drive roll and of auxiliary equipment for accomplishing transfer of the yarn from a full package to a driven empty support.

The present invention is directed to such a windup and has as its principal objective the provision of further improvements and modifications with which the transfer of yarn to an empty package support is not only accomplished automatically but also in a more uniform and reliable fashion. It is a particular objective of the invention to provide for positive control of the yarn during a transfer cycle. A corollary object is to provide for the direct transfer of yarn from a full package to an empty support with a minimum of waste.

These and other objects are achieved in a windup which includes a drive roll, a pair of rotatable chucks alternately movable into surface engagement with the drive roll, a reciprocating traverse guide through which yarn normally advances over the drive roll to a package support on the driven chuck and an automatic mechanism for transferring the yarn from a full package to an empty package support. The transfer mechanism includes an elongated deflector bar which has a guide at one end and which is pivotally mounted at its other end for swinging movement to a position adjacent an empty support on the driven chuck. When in position, the bar is slidable to a location of alignment with severing elements on the driven chuck. After the yarn has been deflected and severed, a transfer tail is wound and a new package is initiated on the empty support.

In the accompanying drawings,

FIGURE 1 is a side view of a windup into which the transfer mechanism of the present invention has been incorporated;

FIG. 2 is a fragmentary front view of the windup;

FIG. 3 is a side view of the transfer mechanism shown in FIG. 1;

FIG. 4 is a sectional view taken on line IV—IV in FIG. 3;

FIG. 5 is a longitudinal sectional view taken on irregular line V—V in FIG. 3;

FIGS. 6 and 7 are top and front views, respectively, of the transfer mechanism; and

FIG. 8 is a schematic illustration of the windup.

Referring to FIG. 1, it will be seen that the windup chosen for purposes of illustration includes generally, as components thereof, an equipment frame 10, a pair of articulated swing arms 12, 14 mounted for relative rotation about a common pivot 16, rotatable chucks 18, 20 on stub shafts at the extremities of arms 12, 14, a drive roll 22, a reciprocating traverse guide 24 through which yarn 26 advances over drive roll 22 to a package 28 on chuck 20, and a transfer mechanism 30.

At the timed completion of package 28, a piston and cylinder assembly 32 and coupled linkages are actuated to release a pawl 34 and to prepare the illustrated cams for descent of arm 14 to a point where the stub shaft rests on a cradle 36. Simultaneously, a piston and cylinder assembly 38 is actuated to withdraw a brake shoe 40, against the bias of a spring (not shown) so that chuck 20 will continue to rotate and take up yarn when it reaches the position shown in phantom at 20'. A piston and cylinder assembly 41 is actuated to pivot a latch 42 clockwise, thereby releasing arm 12 from its "ready" position to one in which an empty support tube 44 on chuck 18 is in surface driven engagement with drive roll 22.

As described more fully hereinafter, the descent of package 28 trips a switch 46 to initiate pivotal movement of mechanism 30 to a level position (FIG. 3) beneath drive roll 22 and the then driven but empty package support on chuck 18. When yarn 26 has been transferred to and is winding on that support, mechanism 30 is returned to the position shown in FIG. 1 and brake shoe 38 rises into engagement with chuck 20'. This leaves package 28 ready for doffing, which is accomplished after arm 14 has been swung manually to a position where it is held in a notch 48 on latch 42. After replacement of the full package with an empty tube 44, arm 14 is unlatched at 48 and swung further to the "ready" position, i.e., to the position shown for arm 12 in FIG. 1. In the meantime, a package is being built on chuck 18.

In FIG. 2, the stub shaft on which chuck 20 is rotatably mounted has been shown at 50. It is the illustrated length of shaft 50 which engages cradle 36 when the chuck is at position 20'. Chuck 20 has a groove 52 cut in its surface adjacent the location of support tube 44. Chuck 18 is similarly equipped. Within each groove 52, there are several V-shaped snaring elements 54 and angularly disposed severing elements 55 which function to snare and sever yarn 26 at the initiation of a package. A transfer tail of one or more helical wraps is wound as yarn 26 is traversed to the package area on tube 44.

Yarn transfer mechanism 30 has been shown in detail in FIGS. 3–7 and schematically in FIG. 8. Referring to FIG. 3, mechanism 30 has a frame 56 fixedly attached to a tubular housing 58 which is rotatably mounted on equipment frame 10. On frame 56, there is a slidably mounted yarn deflector bar 60. Intermediate its ends, bar 60 carries a holder 62. Attached to housing 58, as shown at 59, there is a piston and cylinder assembly 64 which functions to swing frame 56 and bar 60 from the position shown in FIG. 1 to the operable position of FIG. 3 when air under pressure is supplied through conduit 66. The cylinder of assembly 64 has its lower end vented to the atmosphere, as shown at 65 in FIG. 8. When the piston therein has passed fitting 68, air from conduit 66 is delivered to housing 58 through a conduit 70, as described more fully in connection with FIGS. 5–8.

As shown in FIGS. 3 and 4, holder 62 has a pair of spaced upright plates 72 between which a latch 74 having a tooth 76 is pivotally mounted at 78. Latch 74 is biased to the position shown in FIG. 4, with tooth 76 projecting beyond edges 80 on plates 72, by a permanent magnet 82.

Within tubular housing 58, there is a ball bearing 84 (FIG. 5) which supports the swingable parts of transfer mechanism 30 rotatably on a short shaft projecting from equipment frame 10. A pair of plugs 86, 88 are secured to the housing interior adjacent its respective ends and have a concentric tube 90 extending therebetween. Beyond the ends of tube 90, there are cavities in which pulleys 92, 94 are rotatably mounted and so positioned

that the enclosed reach of an endless cable 96 is coaxial with tube 90. Attached to that reach of cable 96, there is a piston 98 which is driven back and forth in tube 90 by the admission of air through either of conduits 70, 100. On its exterior, tube 90 carries a sleeve 102 which is secured to the outer reach of cable 96 and to which is secured the deflector bar 60.

Frame 56 includes a pair of arms 104, 106 and a pair of rods 108, 110 (FIG. 6). Arms 104, 106 are fixed to and extend radially from housing 58 as cantilevers. Their outer ends curve upwardly so as to extend a short distance around the empty driven chuck (FIG. 3) and are interconnected by smooth rod 110. Arm 104 also carries a small fixed triangular plate 112, the right-hand edge of which cooperates with rod 110 as a yarn guide during the transfer cycle.

Rod 108 also interconnects arms 104, 106. As best shown in FIG. 3, it receives a bearing block 114 which is secured to bar 60 outwardly from the point at which the bar extends through a slot 116 in housing 58 (FIG. 7) to its point of attachment with sleeve 102 (FIG. 6). At its outer end, deflector bar 60 is formed to present a guide hook 118 which is in alignment with the edges 80 on plates 72 of holder 62 and with the groove 52 (FIG. 2) on the driven chuck when in the transfer position of FIGS. 6 and 7.

The condition of various related control components while a package is being wound on chuck 20 has been shown schematically in FIG. 8. Completion of the package is determined by a timer 120 which closes a switch 122 to connect solenoids 124, 126 and 128*a* to power source 121. With the energization of solenoid 124, a coupled valve plug 130 is rotated to admit air under pressure to assemblies 38, 41, thereby withdrawing brake shoe 40 and releasing arm 12 from its "ready" position. Energization of solenoid 128*a* pulls the spring biased actuator on coupled valve plug 132 to the left, thereby delivering air through conduit 100 to insure the initial location of deflector bar 60 adjacent the right end of slot 116 (FIG. 7). Energization of solenoid 126 rotates a coupled valve plug 134 to its second position in which the lower end of cylinder 32 is exhausted to atmosphere. Resulting movement of the associated linkages causes clockwise rotation of pawl 34, permitting descent of arm 14. In its movement, pawl 34 also reverses the position of switch 136, thereby de-energizing solenoid 126 and energizing a solenoid 138. De-energization of solenoid 126 permits the clockwise return of valve plug 134. With both ends of cylinder 32 again pressurized, the piston therein returns relatively slowly to its initial position. Responsive to the action of a spring, pawl 34 also returns to its initial position where it can block descent of arm 12. In the meantime, momentary energization of solenoid 138 has opened switch 140 which then closes against the action of an attached dashpot, thereby insuring that solenoid 126 will not be energized a second time during the doffing cycle.

As indicated previously, the descent of a full package trips and closes switch 46, closing the circuit to a solenoid 142 which reverses the position of a switch 144. The latter action energizes solenoid 128*b* which pulls in the actuator on valve plug 132 to pressurize assembly 64 through conduit 66, thereby swinging frame 56 to the operable position shown in FIG. 3. As the piston in assembly 64 passes the fitting 68 for conduit 70, air under pressure drives piston 98 from left to right in tube 90 (FIG. 5), thereby sliding deflector bar 60 from right to left (FIGS. 6 and 7).

At the time bar 60 is driven from right to left, yarn 26 is advancing through traverse guide 24, in contact with drive roll 22 and an empty support tube 44 on the driven chuck, over guide rod 110 (FIG. 3) to the full package which still has enough rotational inertia to take up the yarn. As bar 60 moves to the left, the yarn is engaged and travels outwardly into guide hook 118 which, with edges 80 on plates 72 (FIG. 4), holds the yarn in alignment with the groove 52 (FIG. 2) on driven chuck 18. From hook 118, the yarn advances around the guide edge of plate 112 which is aligned with a point in the length of package 28. Except for guide plate 112, the yarn would be deflected from package 28 to the rotating chuck and would not then be advanced at a rate sufficient to insure effective snaring and severing. When snared, severed and advancing to the driven chuck, the yarn passes under tooth 76 on latch 74 until there is sufficient tension to pivot the latch against the bias of magnet 82. Then yarn 26 rides free of edges 80 on holder 62 and moves laterally in a transfer tail of one or more helical wraps to a package area defined by the stroke of traverse guide 24. Thus, yarn 26 is under positive control during the automatic transfer from package 28 to an empty package support 44.

A dashpot attached to the arm of switch 144 prevents its return to the position shown in FIG. 8 until the yarn has been transferred and is advancing directly to a support tube 44 on the driven chuck. Then solenoid 128*a* is re-energized to direct air once again to tube 90 through conduit 100. In this manner, deflector bar 60 is returned to its "ready" position, i.e., to the right end of slot 116 (FIG. 7). Simultaneously, the cylinder of assembly 64 is vented to the atmosphere through conduit 66, permitting frame 56 of transfer mechanism 30 to swing gravitationally back to the position shown in FIG. 1.

When doffing timer 120 opens switch 122, solenoid 124 is de-energized, valve plug 130 returns to the exhaust position and latch 42 returns to the "ready" position. Similarly, assembly 38 is exhausted, permitting brake shoe 40 to rise and engage chuck 20'. Solenoid 128*a* is de-energized, permitting the actuator on valve plug 132 to return to its center position in which conduits 66, 100 are exhausted. Subsequently, switch 140 closes, but without effect, since switch 122 is open. In an actual embodiment, all of the functional events described in connection with transfer mechanism 30 and its operation occur within a period of less than four seconds, i.e., timer 120 holds switch 122 closed for less than four seconds. Thus, yarn is not only transferred reliably and uniformly but also with what is believed to be a minimum of waste.

It is apparent that many changes and modifications of the disclosed windup may be made without departing from the spirit of the present invention which is accordingly intended to be limited only by the scope of the appended claims.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. In a yarn windup including a drive roll, a pair of rotatable chucks alternately movable into surface driven engagement with the drive roll and a traverse guide through which yarn normally advances over the drive roll to a package support on the driven chuck, a yarn transfer mechanism comprising: an elongated deflector bar provided with a guide adjacent one of its ends; means mounting the bar for swinging movement of said one end to a position adjacent said driven chuck and for sliding movement longitudinally thereof to a location beyond an empty support thereon, each chuck having yarn-snaring and -severing elements at said location; and separate motive means coupled to said bar for sequentially swinging it to said position and sliding it to said location while yarn is still advancing to a full package on the other chuck whereby to deflect, snare and sever said yarn, thereby initiating a new package on said empty support.

2. The windup of claim 1 wherein is provided a yarn-holding member affixed to said bar intermediate the ends thereof, said member having a guide edge substantially in alignment with said deflector guide and, when the bar is in said location, with said elements, said edge terminating in the space between said drive roll and the driven chuck whereby to block normal traverse motion of the yarn until it has been severed and is advancing to the driven chuck.

3. The windup of claim 2 wherein is provided a pivotally mounted latch having a tooth normally projecting

beyond said edge, said tooth being adapted for engagement by and movement out of the path of said yarn when the latter has been severed and is advancing to the driven chuck.

4. The windup of claim 3 wherein is provided means biasing said latch toward the normal position in which the tooth projects beyond said edge and against pivotal movement responsive to yarn tension.

5. In a yarn windup including a drive roll, a pair of rotatable chucks alternately movable into surface driven engagement with the drive roll and a traverse guide through which yarn normally advances over the drive roll to a package support on the driven chuck, a yarn transfer mechanism comprising: a frame; means mounting the frame for pivotal movement to and from a position adjacent the drive roll and an empty support on said driven chuck while yarn is still advancing to a full package on the other chuck, said frame including an elongated guide rod in spaced parallelism with said driven chuck, said rod being adapted for engagement by the yarn as it advances to said full package, each chuck having yarn-snaring and -severing elements adjacent the support thereon; an elongated deflector bar provided with a guide adjacent one of its ends; means mounting the bar on said frame, transversely of said guide rod, for sliding movement to and from a location in which the deflector guide is aligned with said elements; and motive means coupled to said bar for sliding it toward said location whereby to deflect, snare and sever said yarn, thereby initiating a new package on said empty support.

6. A mechanism for transferring continuously advancing yarn to an empty package support on a driven chuck provided with yarn-snaring and -severing elements adjacent the support, said mechanism comprising: an elongated deflector bar provided with a guide adjacent one of its ends; means mounting the bar for swinging movement of said one end to a position adjacent said support and for sliding movement longitudinally of the chuck to a location in which the deflector guide is aligned with said elements; and separate motive means coupled to said bar for sequentially swinging it to said position and sliding it to said location whereby to deflect, snare and sever said yarn, thereby initiating a new package on said empty support.

References Cited by the Examiner

UNITED STATES PATENTS

2,296,339	9/1942	Daniels	242—18
2,789,774	4/1957	Petersen et al.	242—18
2,957,635	10/1960	Bisbe	242—18
3,076,614	2/1963	Baer	242—18
3,149,795	9/1964	Rhein	242—18

FOREIGN PATENTS

761,689	11/1956	Great Britain.

STANLEY N. GILREATH, *Primary Examiner.*