

June 4, 1963

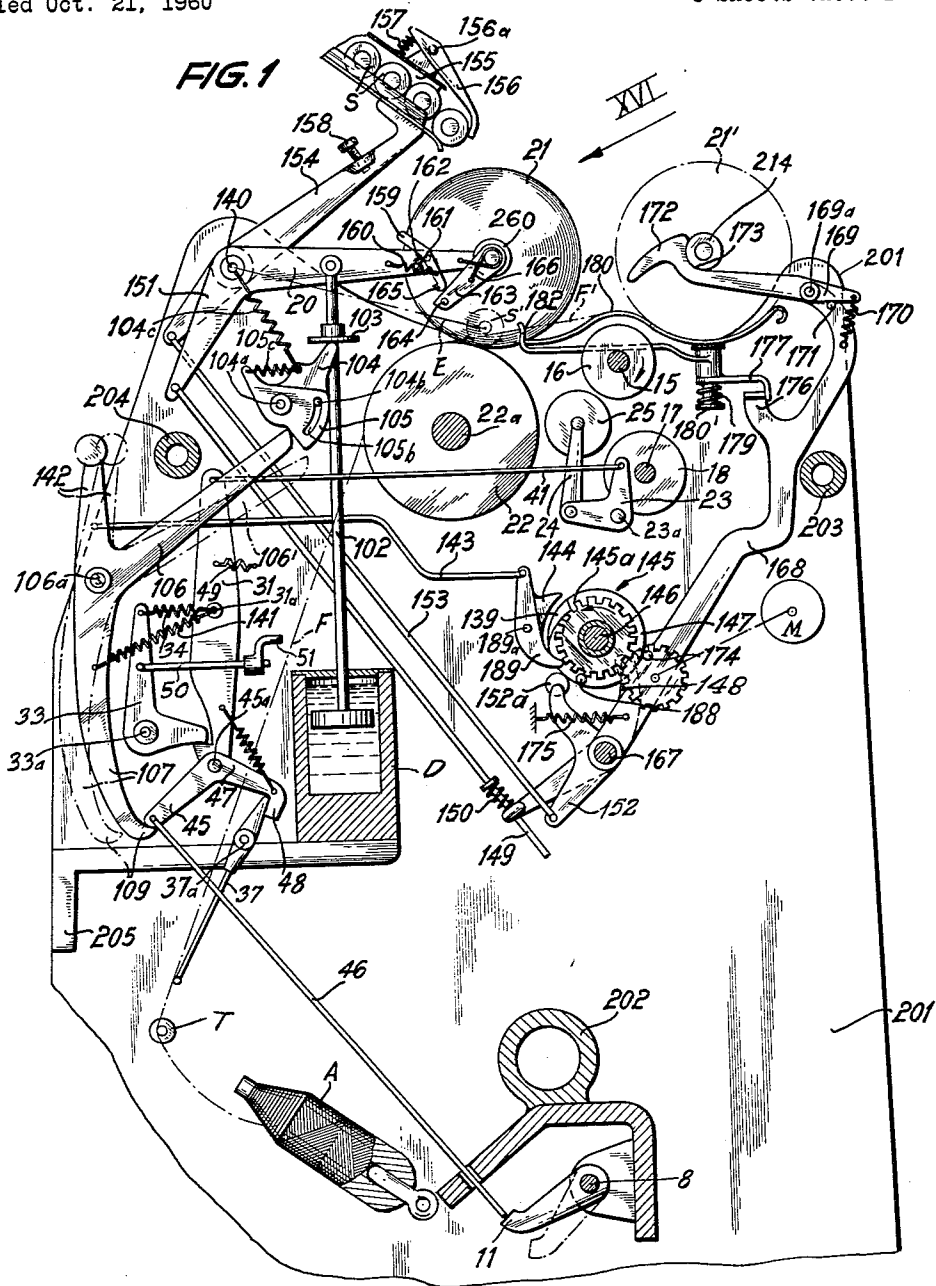
S. FÜRST

3,092,340

YARN-PACKAGE WINDING MACHINE

Filed Oct. 21, 1960

6 Sheets-Sheet 1



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YARN-PACKAGE WINDING MACHINE

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FIG. 2

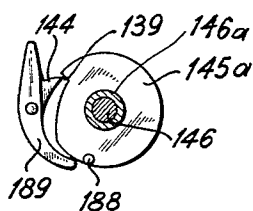


FIG. 3

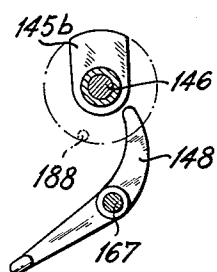


FIG. 4

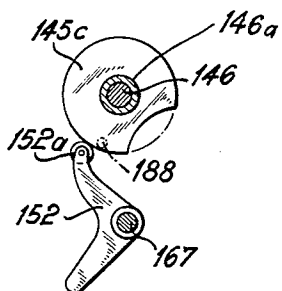
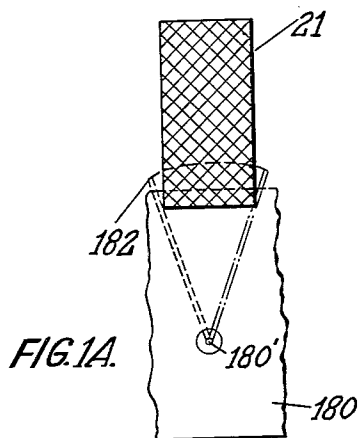
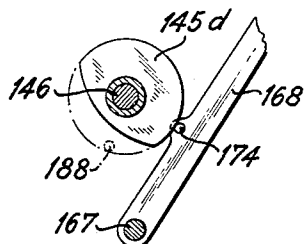


FIG. 5



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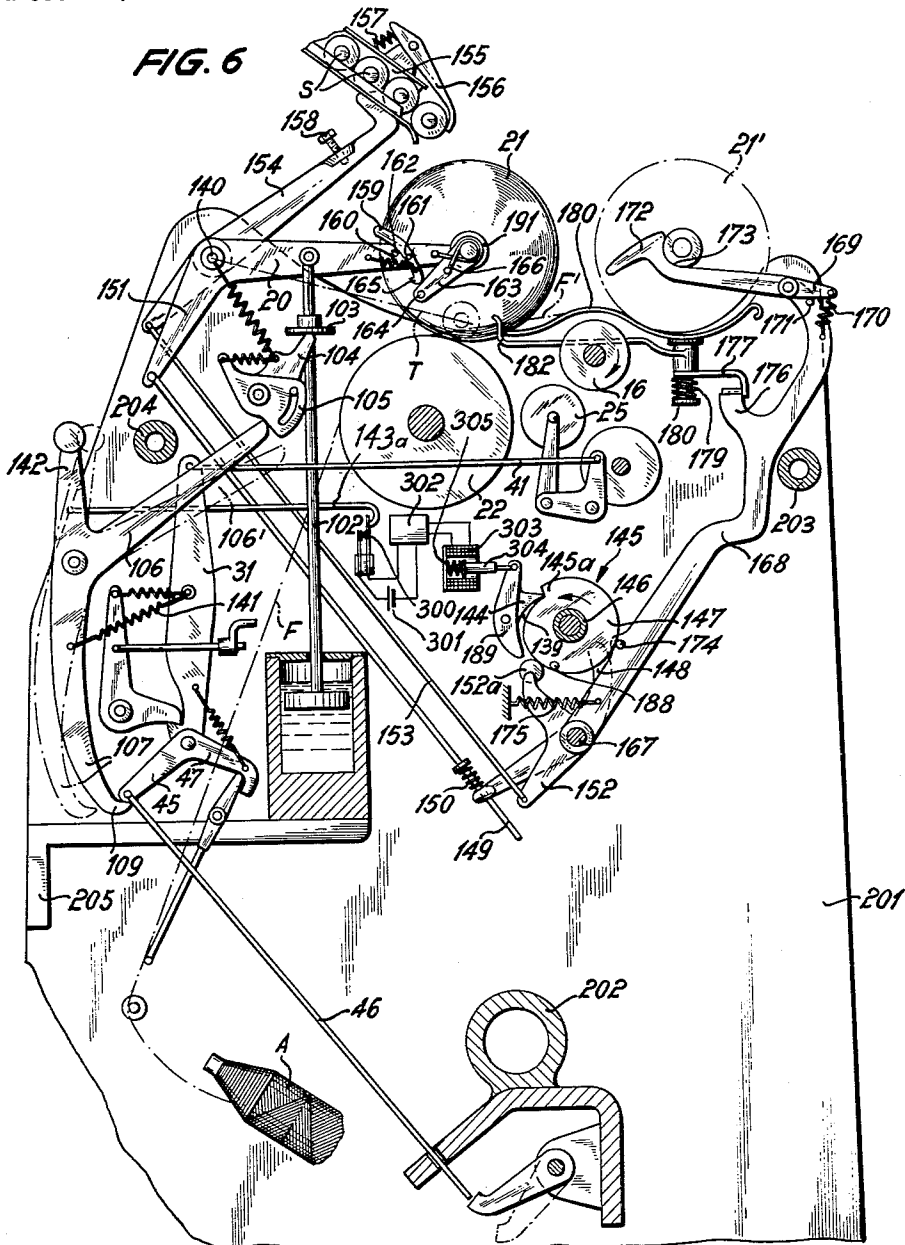
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YARN-PACKAGE WINDING MACHINE

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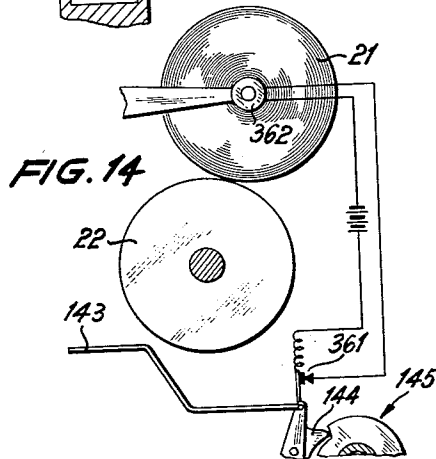
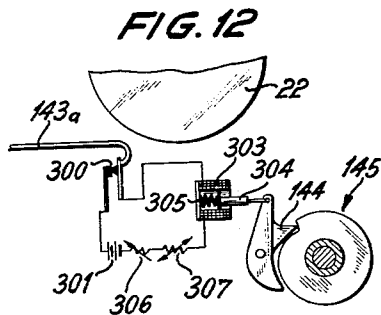
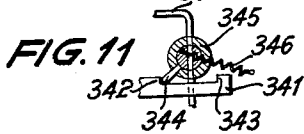
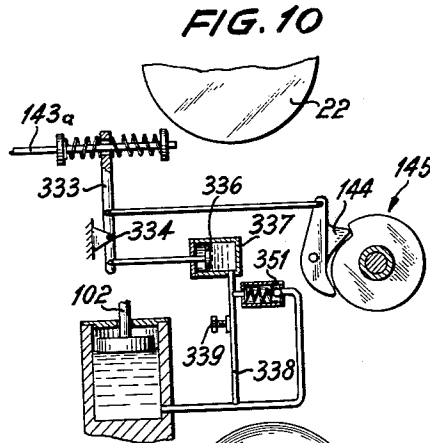
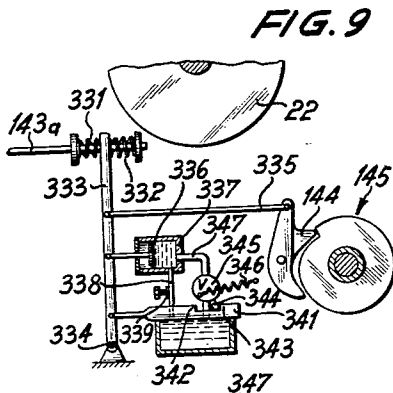
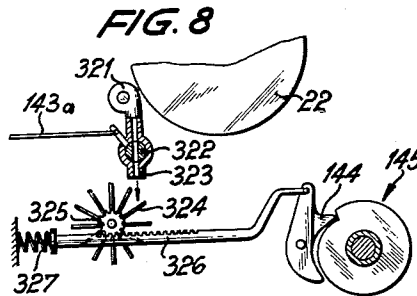
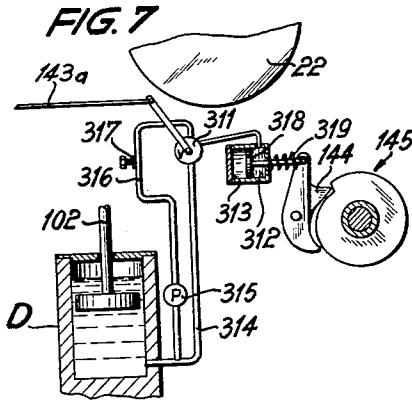
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YARN-PACKAGE WINDING MACHINE

Filed Oct. 21, 1960

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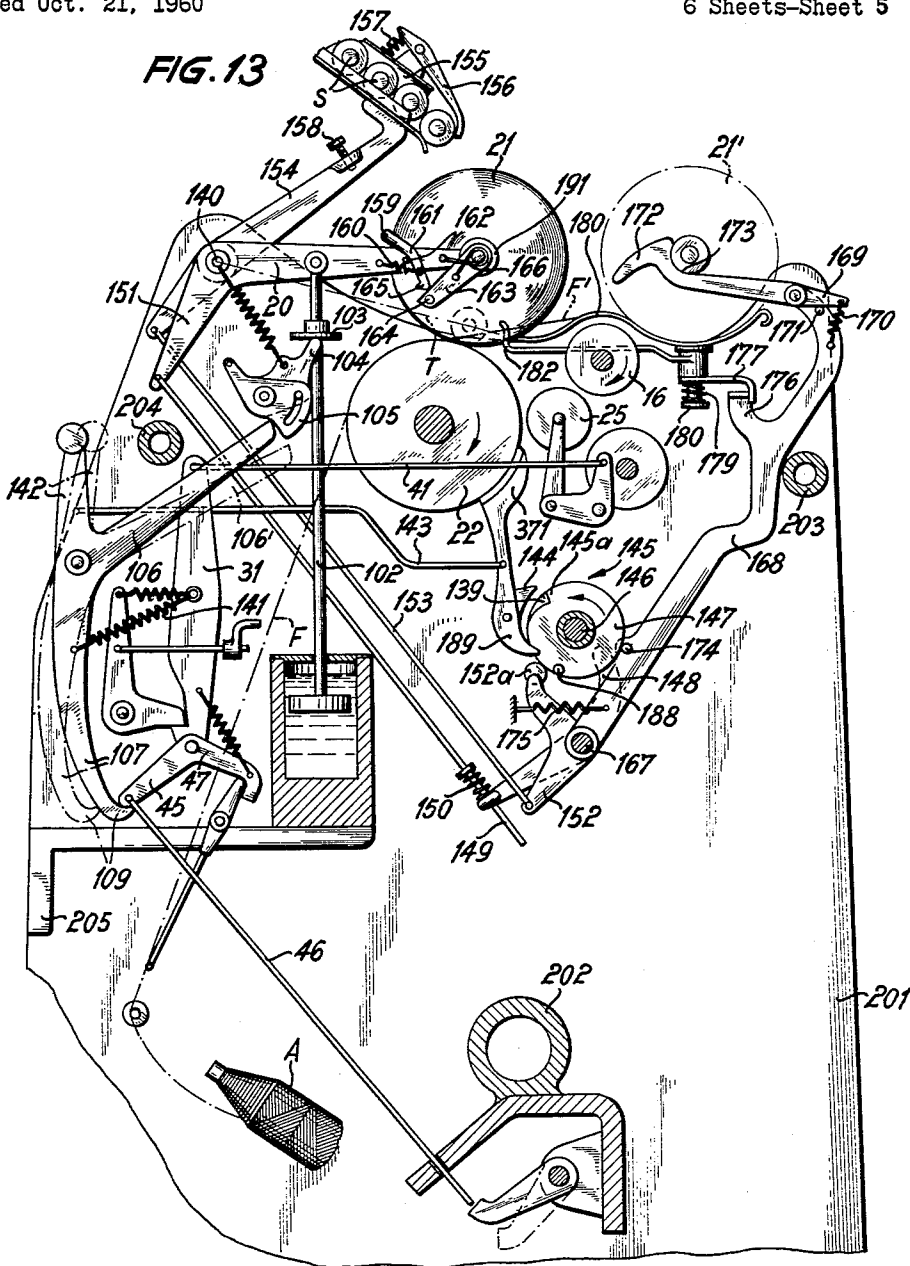
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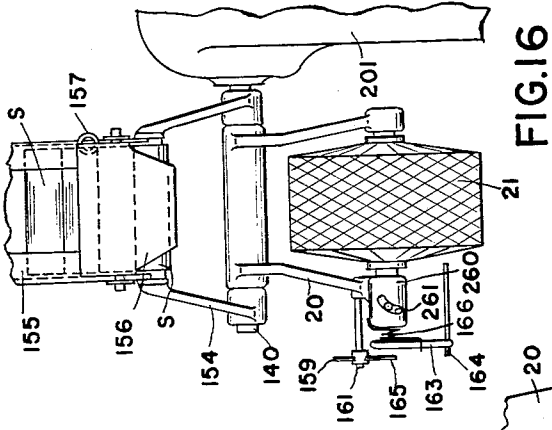


FIG. 16

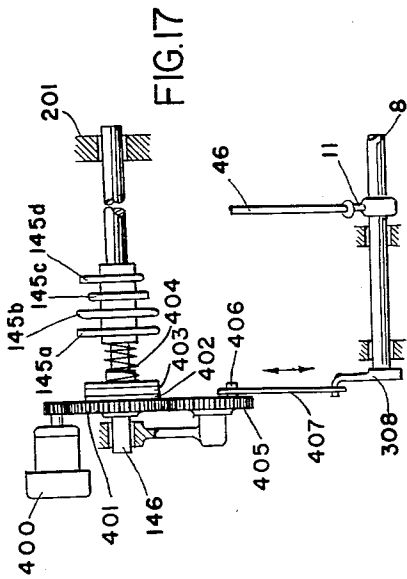


FIG. 17

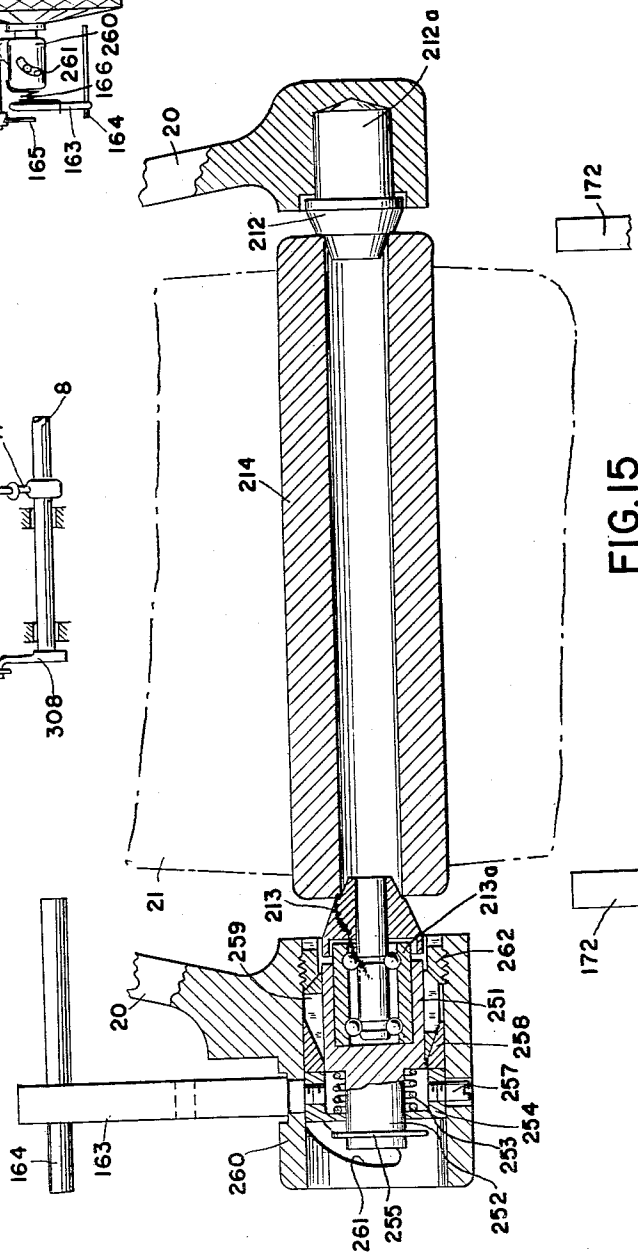


FIG. 15

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YARN-PACKAGE WINDING MACHINE

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Walter Reiners, Monchen-Gladbach, Germany
Filed Oct. 21, 1960, Ser. No. 64,197
Claims priority, application Germany Oct. 24, 1959
15 Claims. (Cl. 242—35.5)

My invention relates to a machine for winding yarn packages, particularly cross-wound packages such as cheeses or cones, of a desired shape and size from a number of relatively small bobbins, cops, and the like yarn-supply coils.

In modern high-speed winding machines of this kind, particularly multi-station machines in which a number of individual winding units operate simultaneously, the supply of yarn coils to be re-wound, as well as the joining of these supply coils with the end of the yarn on the take-up spool, is effected automatically. The take-up spool thus becomes rapidly filled, and the winding operation then stops automatically until the completed yarn package is removed and the winding station supplied with an empty spool core.

It is an object of my invention to prove such yarn-package winding machines toward a more rapid and more reliable removal of a filled take-up spool and the insertion of an empty spool core without requiring attention or manipulation by attending personnel, and to place the filled yarn packages at a location outside of the winding devices proper, from which location the finished spools can be removed at a convenient time corresponding to the general operating program of the plant.

To this end, and in accordance with a feature of my invention, I provide the yarn-package winding machine with (1) a spool-core conveying device for supplying an empty core to the spool holder in which the take-up spool is to be removably journaled, (2) a feeler member which is movable in response to the filling of a core with yarn on the holder, (3) a yarn deflector member located near the take-up spool in normally inactive position which, when moved out of that position, deflects the arriving yarn from its normal path to a position of lateral deflection in which an empty spool core can be placed onto the holder and the yarn end from the previously completed package can be clamped fast when the winding of the next yarn package commences. I further provide the machine with (4) a doffer mechanism which is normally spaced from the spool-core location of the holder and is movable into engagement with the core for withdrawing a filled spool from the holder. The above-mentioned conveying device, deflector member and doffer mechanism are all connected with and controlled by (5) a common control mechanism which is normally inactive and is triggered by response of the feeler member to perform a cycle of operation in which it causes the doffer mechanism to vacate a filled core from the holder while causing the deflector member to deflect the yarn, and to then cause the conveying device to supply an empty core to the vacant holder.

During the operation of such a machine according to the invention, one or more other events may occur simultaneously. For example, while the take-up spool is being removed from the holder, an exchange of a yarn-supply coil (bobbin or cop) may likewise be necessary, or the removal of the full take-up spool may cause the arriving yarn to decrease its tension so that the yarn guard, located in the yarn path and normally responsive to yarn breakage, will respond and will thus initiate the operation of the knotting or supply-coil exchanging devices of the machine despite the fact that no such operation is called for. It is therefore another object of my invention to securely eliminate such faulty operations.

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To this end, the above-described control mechanism for initiating and governing the exchange of a full take-up spool is also connected with those control means of the machine that are normally active under control by the yarn guard in response to yarn breakage, so as to render these other control means inactive while the exchange of a filled take-up spool is in progress.

According to another feature of my invention, the above-mentioned doffer mechanism for the take-up spool is provided with an arm structure which is normally in inactive position and, when the doffer mechanism is actuated by the control mechanism, passes a bifurcated portion beneath and against the respective two ends of the spool core while simultaneously opening a core clamping device of the spool holder for thus releasing the core before shifting it away from the holder.

According to still another feature, a tray or sheet member is located beneath the just-mentioned arm structure in order to receive the doffed yarn package therefrom. The receiving tray is preferably so designed that it forms a bump or ridge approximately parallel to the axis of the take-up spool, so as to prevent the doffed package from rolling back toward the winding location.

It is further preferable to devise the take-up spool holder in such a manner that it is opened for reception of an empty core in response to a signal issuing from the doffer mechanism, and is closed to secure the inserted core in proper winding position upon issuance of a signal from the empty core conveying device.

The above-mentioned and other objects, advantages and features of my invention will be apparent from, and will be mentioned in, the following with reference to the embodiments of the invention illustrated by way of example in the accompanying drawings in which:

FIG. 1 is a lateral view of a winding station shown partially in section.

FIG. 1A is a fragmentary top view of FIG. 1, showing a detail of the take-up spool, thread guide and supporting sheet.

FIGS. 2, 3, 4 and 5 separately illustrate four different control cams and appertaining cam followers in the machine according to FIG. 1.

FIG. 6 is a lateral and partly sectional view of another machine according to the invention, similar to that of FIGS. 1 to 5 but provided with electrically operating time-delay means.

FIG. 7 shows a modified portion in a machine otherwise according to FIG. 6, the modification relating to a hydraulically operating time delaying device.

FIG. 8 shows another modification including a pneumatic delaying mechanism.

FIGS. 9 and 10 relate to machine designs equipped with hydraulic damping cylinders, and FIG. 11 shows a detail of FIG. 9.

FIG. 12 is a modified electric circuit diagram applicable for a machine otherwise corresponding to FIG. 6.

FIG. 13 is a lateral and partly sectional view similar to those of FIGS. 1 and 6 but relating to a winding machine equipped with a brake acting upon the yarn-guiding drum.

FIG. 14 shows a modification in a machine as illustrated in FIG. 6 but equipped with an electromagnetic brake acting upon the take-up spool.

FIG. 15 is a sectional view of the spool holder in a machine according to the preceding illustrations.

FIG. 16 is a top view of part of the machine according to FIG. 1 or 6, the view being taken in the direction of the arrow XVI indicated in FIG. 1.

FIG. 17 is a schematic illustration of a cam-shaft and rocker-dog drive which forms part of the machines according to the preceding illustrations.

The same reference numerals are used in the various

illustrations to denote corresponding elements respectively.

Referring to FIG. 1, the yarn F to be wound into a yarn package of the desired shape and size, passes from a supply coil A through a yarn tensioner T and past a yarn guard 37 to a yarn-guiding drum 22 and thence onto the core of a takeup spool 21. The mandrel or pin for accommodating the supply coil A in proper position, as well as the tensioner T, the yarn guard 37 and the bearings for the shaft 22a of the guiding drum 22 are mounted on the rigid frame and supporting structure of the machine composed of mounting plates, such as the one denoted by 201, and interconnecting tubular beam structures 202, 203 and 204. The takeup spool 21 is rotatably and removably mounted on a spool holder 20 which constitutes a journalling frame (FIGS. 15, 16) and has a pivot shaft 140 (FIGS. 1, 16) secured to the frame structure 201 of the machine. The amount of yarn wound up on the takeup spool 21 rests upon the cylindrical periphery of the guiding drum 22 (FIG. 1). Consequently when the drum 22 is being driven at constant angular speed, it entrains the takeup spool 21 by frictional engagement so that the yarn F is wound up on the spool 21 at a constant linear travelling speed corresponding to the peripheral speed of the guiding drum 22. The drum 22 is provided on its peripheral surface with the conventional guiding groove which forms a helical loop closed upon itself, so as to cause the arriving yarn F to reciprocate axially along the takeup spool 21 while being wound, thus producing the desired cross-wound yarn package.

The yarn-guiding drum 22 is driven from a friction roller 16 on a shaft 15 which is kept in continuous rotation at constant speed as long as the machine is in operative condition. Driving force is transmitted from friction wheel 16 to drum 22 by means of an intermediate friction roller 25 which is journaled on an arm 24 linked to a bell-crank lever 23 pivoted at 23a to the frame structure of the machine. The lever 23 is actuated by a control rod 41 to place the intermediate roller 25 into and out of coupling engagement between the driving roller 16 and the drum 22. As will be further explained below, the friction roller 25 is in active engagement with roller 16 and drum 22 during normal winding operation but is removed therefrom, under control by the rod 41, in the event the yarn F is absent at the location of the yarn guard 37, which absence may be due to yarn breakage or to depletion of the supply coil A. Such events, therefore, cause the drum 22 and hence the takeup spool 21 to be stopped until the yarn breakage is mended by knotting the broken ends together, or by first exchanging a full coil for the depleted coil A and thereafter knotting its yarn end together with the end coming from the takeup spool 21. As will also be further explained, the drum 22 is also stopped by disengagement of roller 25 during exchange of the takeup spool.

Linked to the spool holder 20 is a damper rod 102 connected to a dash pot D. Mounted on rod 102 is a disc 103 which cooperates with a lever 104 pivoted at 104a and biased by a spring 104c so as to somewhat compensate the weight of the spool-holder assembly in order to prevent excessive pressure between spool 21 and drum 22. The lever 104 carries an entrainer pin 104b engaging an arcuate slot 105b in a segment 105. A spring 105c biases the segment 105 clockwise relative to the lever 104 so that normally the upper end of slot 105b abuts against the pin 104b, whereby the segment 105 is normally entrained by lever 104 when the latter turns counterclockwise as the rod 102 and the disc 103 move upwardly together with the spool holder 20 while the package of yarn being wound onto the spool 21 increases its diameter. The segment 105 is engageable by a cam-control lever 106 which occupies the dot-and-dash position 106' during normal winding operation. The

lever 106 is pivoted to the frame structure of the machine at 106a and is biased by a spring 141 for counterclockwise rotation. Normally, however, the upper end of lever 106 abuts against the peripheral cam portion of the segment 105 so that the lever 106 remains in the position 106'. When the takeup spool 21 is filled and hence the disc 103 on rod 102 raised to the illustrated position, the spring 141 snaps the lever 106 to the illustrated full-line position. During such motion, an arm 107 of lever 106 places its hook-shaped end 109 beneath a lever 45, thus arresting the lever 45 from continuing an oscillating motion normally imparted thereto by means of a linking rod 46. The lever 45 is pivoted at 45a to a drive-control lever 31 which in turn is pivoted at 31a to the stationary frame structure of the machine and whose upper end is linked by the above-mentioned control rod 41 to the bell-crank lever 23. The linking rod 46 is acted upon by a dog member 11 which, during operation of the machine, is kept reciprocating on its shaft 8 (FIGS. 1, 17) for the purpose of imparting to the lever 45 an oscillating motion serving to test the operating condition of the winding station and, as the case may be, to effect stoppage of the winding operation in the station upon occurrence of yarn breakage or supply-coil depletion or completion of a yarn package on the takeup spool.

When the yarn package on takeup spool 21 is filled, with the result that the lever 106 turns to the illustrated full-line position and thereby arrests the lever 45 at 109, the drive-control lever 31 is likewise prevented from oscillating under the action of the reciprocating dog 11 and is stopped in a position in which the rod 41 shifts the intermediate drive roller 25 away from roller 16 and drum 22. Consequently, the winding operation is now stopped and the takeup spool 21 can now be removed from the holder 20 and substituted by an empty spool core to be filled with yarn during the next winding operation.

It will be noted that during the stopped condition brought about by deflection of cam-control lever 106 to the illustrated full-line position, the yarn guard 37 is likewise held arrested by the lever 45 and cannot turn clockwise about its pivot 37a. Normally, the yarn guard 37 is biased by gravity or by a spring (not shown) to turn clockwise about its pivot, such clockwise motion being stopped by the yarn F as long as the yarn extends under proper tension along its normal path between the tensioner T and the guiding drum 22. When due to yarn breakage or depletion of the supply coil A the yarn F is absent at the location of the yarn-guard tip, the yarn guard 37 will deflect counterclockwise from the illustrated position.

Machines of this kind are preferably equipped with automatic yarn-knotting and supply-coil exchanging devices, for example such as those described and illustrated in my U.S. Patent 2,733,870 or in my copending applications Serial No. 728,139, filed April 14, 1958, or No. 795,151, filed February 24, 1959, or No. 798,406, now Patent No. 3,033,478, filed March 10, 1959, or Serial No. 845,259, filed October 8, 1959 all of them assigned to the assignee of the present invention. While the design and operation of the knotting and coil-exchanging devices is not essential to the invention proper, it is significant to the present invention that the operation of these devices is released by the deflection of the yarn guard from the normal position occupied when the yarn is under proper tension at the location of the guard tip. Consequently by locking the guard 37 in response to filling-up of the takeup spool 21, the guard 37 cannot respond to any simultaneous occurrence of yarn breakage or supply-coil depletion and cannot put the auxiliary knotting and coil-exchanging devices into operation even though the yarn may slacken at the guard location during the period in which the completed yarn package is being removed and substituted by an empty core. At the time the next winding operation is commenced, the yarn F is

again under proper tension so that the yarn guard 37, when released by the oscillating lever 45, can again initiate a knotting or supply-coil exchanging operation in consequence of yarn breakage or depletion of coil A.

The cam-control lever 106 has another arm 142 which is linked by a connecting rod 143 with a trigger member equipped with a detent 144 and a nose 189. The detent 144 cooperates with a cam disc 145a (FIG. 2) which forms part of a cam set comprising three additional cams 145b, 145c, 145d (FIGS. 3, 4, 5). This set of coaxial cams has a sleeve 146a (FIG. 2) with which all individual cams are rigidly joined, and which is rotatably seated on a cam shaft 146 (FIGS. 1 to 5). The shaft 146 is continuously driven at constant speed from a motor 400 by a gear 401 (FIG. 17), and tends to rotate the cam set counterclockwise (FIG. 1) through slip clutch which permits continued rotation of shaft 146 when the cam set is kept arrested by engagement of the detent 144 with a cam notch 139 in cam disc 145a. The clutch comprises friction discs 402, 403, forced against each other by a spring 404 (FIG. 17).

In the view shown in FIG. 1 the cam disc 145 is located in front, i.e. closest to the observer. The disc 145 carries a dog pin 188 for cooperation with the nose 189 of the trigger member so as to turn this member clockwise about its pivot 189a when the pin 188, during the last portion of the rotary travel of cam 145, is engaged by the nose 189. The cam disc 145b (FIG. 3) is located next behind the cam disc 145a relative to the view shown in FIG. 1. Disc 145b cooperates with a follower 148 which is biased by a spring 175 (FIG. 1) into engagement with the cam and acts upon a control rod 149 through a helical compression spring 150 whose one end rests against the follower 148 while the other end abuts against a shoulder ring rigidly fastened to the rod 149. Located behind the disc 145b is the cam disc 145c (FIG. 4). It cooperates with a roller 152a journaled on a bell-crank lever 152 rotatable about the same pivot shaft 167 as the cam follower 148 for cam disc 145b. Located behind the cam disc 145c (relative to FIG. 1) is the cam disc 145d (FIG. 5). It cooperates with the follower pin 174 of a swing arm 168 which is likewise mounted for pivotal motion about the shaft 167.

The control rod 149 has its upper end linked to an arm 151 (FIG. 1) of the spool-holder frame 20. The bell-crank lever 152 is connected by a linking rod 153 with a double-armed lever 154 which turns about the pivot shaft 140 of the spool-holder frame 20 and carries at its upper end a spool-core magazine 155. The outlet opening of the magazine is normally closed partially by a flap member 156 pivoted at 156a and biased to closing position by a spring 157. The closing flap 156 can be opened in opposition to the force of springs 157 to such an extent that one empty core S at a time can be removed from the magazine. For this purpose, the magazine 155 is laterally open near its lower end at the respective axial ends of the cores. The upper arm of lever 154 carries an adjustable set screw 158. Screw 158, during clockwise motion of lever 154 engages a latch 159 which is pivoted at 161 to the spool holder 20 and biased by a spring 160. A stop pin 162 mounted on holder 20 limits the counterclockwise motion of latch 159 imposed upon it by the downwardly travelling set screw 158. The latch 159 forms a hook 165 engageable with a latch pin 164 on an arm 163. This arm is the actuating member of a core clamping and releasing device that forms part of the spool-holder structure. When the arm 163 is latched by the latch member 159, the spool-core journalling means of the holder are in open position to permit removal of a filled spool and insertion of an empty core from the magazine 155. When the arm 163 is released by the latch member 159 under control by the set screw 158 on lever 154, the arm 163 can turn clockwise (FIG. 1) to a position in which a newly inserted, empty spool core is clamped in proper journalling position.

This will be more fully explained with reference to the example of a suitable core clamping and releasing device illustrated in FIGS. 15 and 16. It should be noted, however, that the particular design of the clamping and releasing means is not essential to the present invention proper. The particular device shown is in accordance with one of those illustrated and described in the co-pending application Serial No. 27,403, filed May 6, 1960, for Spool-Holding Device for Textile Machines, Particularly Winding Machines, assigned to the assignee of the present invention.

As shown in FIG. 15, the spool holder 20 is designed as a spool-journalling frame of generally U-shaped configuration. The ends of its two legs carry respective dowel members 212 and 213 which are coaxially aligned and enter into the respective ends of a tubular spool core 214 to permit winding a yarn package upon the core. As explained, the yarn wound upon the spool core is being guided back and forth along the core by the yarn-guiding drum which peripherally engages the yarn package as the package is being built up on the core, thus producing a cross-wound package.

This operation requires that when the core is properly clamped, it must remain readily rotatable about its axis while being securely held in the frame.

The dowel member 212 is mounted in a ball bearing 212a fixed in the frame 20. The dowel member 213 is displaceable axially and is biased by spring pressure against the core.

In the particular device shown in FIG. 15, the dowel member 213, journaled in a ball bearing 213a is seated in a cup 251 integral with a coaxial pin 252. The cup 251 is biased toward the spool core by a helical spring 253 surrounding the pin 252. The pin 252 is guided in a cup-shaped bearing 254 and carries a spring washer 255 on its exterior end. The bearing 254 glides in a cylindrical portion 260 of the frame structure 20. Fastened to the bearing 254 is the above-mentioned control arm 163 which coacts with a guide pin 257 screwed into the bearing 254. The arm 163 and the pin 257 pass through respective helical slots of the cylinder structure 260, one of these slots being visible at 261. (FIG. 16 shows a slightly modified design in which only the pin passes through such a slot.) When the arm 163 is being turned about the axis of the cylindrical structure 260, the bearing 254 (FIG. 15) is displaced axially. A conical ring 258 coaxially adjacent to one side of the cup-shaped bearing 254, cooperates with one conical face of a slotted double-conical ring 259 which has several longitudinal slots. The second conical face of ring 259 rests against a conical ring 262 which is in threaded engagement with the bore of the cylinder structure 260. The conical ring 259 can be turned for the purpose of adjusting its axial position in cylinder structure 260. In the illustrated position, the double-conical ring 259 is radially compressed due to the axial forces exerted upon it by the conical rings 258 and 260. The ring 259 widens its bore when it is relieved of the axial force. In the compressed and narrowed condition, the slotted ring 259 clamps the cup 251 fast in the adjusted position, whereas the cup 251 is released for motion when the ring 259 is widened.

When operating the device, the arm 163 is turned to shift the cup-shaped bearing 254 toward the left. This axial displacement of bearing 254 releases the previously clamped conical rings 258 and 259. The ring 259 then releases the cup 251 for axial displacement. The bottom of the cup-shaped bearing 254 is forced against the stop washer 255 and pulls the cup 251 with the dowel member 213 toward the left until the arm 163 is stopped by the end of the guiding slot 261. Now the dowel member 213 is in the inactive end position remote from the spool core 214 and the spool 215 can be taken out of the holding frame. When a new and empty core is clamped into the frame structure, the handle 163 is

turned back and the cup 251 is released due to the fact that the cup-shaped bearing 254 is lifted off the stop washer 255. The spring 253 now forces the dowel member 213 toward the right. At the end of the turning motion imparted to the arm 163 the cup-shaped bearing 254 presses toward the right against the conical ring 258 which in turn forces the ring 259 to narrow its opening thus firmly arresting the cup 251 with the clamping member 253.

A spring 166 (FIGS. 1, 16) is joined with the actuator arm 163 and tends to turn it counterclockwise (FIG. 1) to the position in which the spool core is securely clamped in the spool-holder frame as described above. When the arm 163 is forced to turn clockwise in opposition to spring 166, it reaches the coil-releasing position when the pin 164 is caught by the latch member 159. The arm 163 is released from this latched position and snaps back to the clamping position only after an empty core has been supplied from the downwardly moving magazine 155.

The above-described swing lever 168 (FIG. 1) pivotally movable on shaft 167 under control by cam 145d acting upon the follower pin 174, carries at its upper end a bifurcated entrainer arm 169 which is pivoted at 169a to the lever 168 and biased clockwise by a spring 170. When the entrainer arm 169 is in the illustrated position it abuts against a stop pin 171 mounted on lever 168. The two limbs of the bifurcated arm 169 are spaced from each other a distance somewhat greater than the axial length of the package to be wound, and each of the limbs has its end shaped as a horn 172 whose right-hand edge forms a groove 173 for engaging the periphery of a spool core. The just-mentioned mutual spacing between the limbs of entrainer 169 and its respective horn portions 172 is apparent from FIG. 15 where the horns 172 are schematically indicated with respect to their positioning relative to the axis of the spool core 214 during operation of the entrainer.

As mentioned, the follower pin 174 of swing lever 168 is kept in engagement with cam 145d by the spring 175. When the arm 168 is permitted by cam 145d to swing counterclockwise (FIG. 1) under the action of spring 175, the two horns 172 of the entrainer 169 move toward the left and snap under the ends of the core 214 (FIG. 15) upon which the completed yarn package is wound. In the left-hand end position of the swing arm 168 (FIG. 1), the lower end of one of the horns 172 engages the pin 164 on the actuator arm 163 and turns the arm 163 counterclockwise (toward the left) until the hook 165 of latch member 159 catches behind the pin 164. In this position, the clamping device for journalling the take-up spool is open so that the completed spool drops into a supporting sheet 180 and, during the next following return stroke of the entrainer 169 toward the right, is taken along to the dot-and-dash position 21'.

The swing arm 168 is provided with a lug 176 for co-operation with a yarn-deflector 177 which has an arm provided with a yarn-guiding portion 182. The deflector 177 is rotatable on a vertical pivot pin 180' which is secured to plate 180 attached to the stationary frame structure of the machine. A spring 179 mounted on pin 180' biases the deflector 177 to turn the yarn-guiding portion 182 to the rear (i.e. in the direction away from the observer in FIG. 1) when the swing arm 168 turns counterclockwise. When thereafter the swing arm 168 returns clockwise to the end position illustrated in FIG. 1, the yarn-guiding end 182 returns to its illustrated forward position and then entrains the yarn from the normal path to a position laterally of the completed yarn package (FIG. 1A) so that the yarn end is placed out of the way and cannot interfere with the insertion of an empty core from the magazine 155.

The supporting tray or sheet member 180 (FIG. 1), has a concave portion to receive the take-up spool when the latter, during the above-described offing operation, is released from the spool holder. When thereafter the

filled spool is conveyed by the entrainer 169 to the position 21', it again rests in a concave portion of sheet member 180, thus being prevented by the intermediate bulge or ridge from inadvertently rolling back to the range of the winding operation.

The above-described machine operates as follows.

When, during winding operation, the take-up spool 21 becomes increasingly filled with yarn, the diameter of the yarn package increases accordingly and causes the spool holder 20 to progressively turn counterclockwise (upward) about its pivot 140 (FIG. 1). The disc 103 on rod 102 participates in such upward motion. When the take-up spool is completely filled, the disc 103 has reached a position in which it causes the segment 105 to release the cam-control lever 106 which then drops away from the periphery of segment 105 and turns counterclockwise under the action of spring 141. The lever 106 then shifts the linking rod 143 to the left and releases the detent 144 from cam 145a. The cam set can now rotate together with the shaft 146 under the driving action of the slip clutch 302 (FIG. 17). During a single full revolution of the cam set, the swing arm 168 is turned counterclockwise (FIG. 1) by spring 175. The two horns 172 now enter beneath the core ends of the spool 21 so that these ends are placed into the curved portions 173 of the respective horns. The left end of one horn abuts against the pin 164 of the actuator arm 163 and entrains it for rotation about the core axis in opposition to the force of spring 166. When the arm 163 is thus turned clockwise to its uppermost position, the nose 165 of latch member 159 catches behind the pin 164 and thereafter temporarily retains the actuator arm 163 in the opening position of the core-clamping device. Now the filled spool is free for the doffing operation. During the next following swinging motion of lever 168 to the right, the horns 172 of entrainer 169 take the spool 21 along and place it into the concave portion at the right side of the supporting sheet 180. In this position, the completed yarn package can remain until it is removed by hand or suitable conveying means within the period of time during which the next yarn package is being wound.

During the return motion of swing arm 168 from the spool-releasing to the illustrated position, the yarn-guiding portion 182 of deflector lever 177 moves in the direction toward the observer of FIG. 1, due to the fact that the lug 176 of lever 168 abuts against the deflector 177. During this motion, the guide 182 seizes the yarn end F' of the completed take-up spool and shifts the end forwardly (toward the observer). Now this yarn end is located in the vicinity of the yarn-guiding drum 22 at a point where subsequently the new, empty core is located, so that the yarn end is clamped between the new core 214 (FIG. 15) and the adjacent dowel member 213, when the new core is being clamped between the two dowels as described above. While the yarn end is thus being placed in ready position for subsequent clamping, the cam-follower lever 148 is moved clockwise by cam disc 145b. This causes the spool-holder frame 20 to move downwardly to such an extent that the connecting line between the journalling axis of the spool holder and the pivot axis 140 reaches the lowermost position shown by a dash-and-dot line at E. At this time the laterally deflected yarn end from the completed spool 21' is located at a point where the next spool core will subsequently be clamped by the dowel member 213 (FIG. 15).

Now the cam 145c, acting through the follower lever 152 and the linking rod 153, moves the magazine lever 154 clockwise (FIG. 1) about its pivot 140 thus shifting the core magazine 155 downwardly, until the lowermost core in the magazine 155 reaches the position S' where the core touches the guiding drum 22. The set screw 158 on lever 154 hits against the upper end of the latch member 159 and thereby releases the pin 164 of the arm 163. The arm 163, acting under the force of spring 166, now causes the lowermost spool core S', still in the maga-

zine 155, to be seized and clamped by the dowel members of the clamping device which simultaneously clamp the yarn end as described above. During the subsequent upward motion of the magazine 155, the lowermost spool core, now clamped in the spool holder, passes out of the outlet opening of the magazine while temporarily forcing the flap 156 to the opening position. The flap 156 thereafter closes the magazine so that only the lowermost core is removed therefrom, and the magazine turns back to the stand-by position illustrated in FIG. 1.

After the spool exchange is thus completed, the winding station is ready to resume the next winding operation. The winder drive is switched on under control by the dog pin 188 on cam 145a which acts upon the nose 189 of the detent 144 and shifts the linking rod 143 toward the right. This returns the cam-control lever 106 to the normal operating position 106' shown by dot-and-dash lines. Due to the preceding downward motion of the spool holder 20, the weight-relieving lever 104 and the segment 105 have both turned counterclockwise about pivot 104a so that the upper end of lever 106 now rests against the peripheral contour portion of segment 105. Hence the force of spring 141 cannot turn the lever 106 to shift the rod 143, and a release of the detent member 144 is prevented.

Due to the just-mentioned motion of the cam-control lever 106 to the dot-and-dash position, the oscillatable lever 45 is released from the latch hook 109 and can resume its oscillatory motion. This has the consequence that the drive-control lever 31, during its subsequent oscillating motion about the pivot 31a, acts through the control rod 41 to place the intermediate roller 25 into frictional engagement with the driving roller 16 and the guiding drum 22, so that the winding operation is again commenced. When the yarn begins to be wound up upon the new core, the yarn end F' is torn, thus separating the yarn of the new spool from the spool previously completed. To aid in severing the yarn, a sharp edge may be provided at the yarn-guiding portion 182 of the deflector lever 177, so that the pull exerted by the winding operation upon the yarn causes it to be forced against the edge.

A machine according to the invention, as described above, requires a relatively simple design as well as relatively little space for those machine components that effect automatic doffing of a completed takeup spool, depositing it away from the spool holder, and inserting a new spool core with such a rapid performance as to afford shorter stoppage intervals and hence a more economic utilization of the machine.

As explained above, the control apparatus according to the invention acts not only upon the means for exchanging the takeup spool but also arrests the yarn guard 37 (FIG. 1) to prevent it from putting the knotting or supply-coil exchanging devices of the machine into operation in response to any slackening of the yarn as may occur during the doffing and spool-exchanging interval. The particular design of the knotting and supply-coil exchanging devices are not essential to the present invention, any suitable known design being applicable as long as its operation is controlled or initiated by the deflection of the yarn guard 37. Preferably, however, the knotting and coil exchanging devices are of the type in which these devices are combined to form a travelling servicing unit which sequentially passes by the winding stations of the multi-station machine and is caused to stop and operate at a particular winding station only if the yarn guard in that station has become deflected in response to trouble. Such travelling servicing units suitable for the machine according to my present invention are illustrated and described in my above-mentioned copending applications Serial No. 728,139, No. 795,151, No. 798,406 and No. 845,259.

For example, the above-described machine according to FIGS. 1 to 5 may be provided with a travelling servicing

ing unit identical with the one illustrated and described in Serial No. 798,406. It will be understood that, for use of such a travelling servicing unit, the components of the spool-exchanging apparatus according to the present invention must be arranged accordingly; but the coaction of the apparatus with the knoter operating mechanisms of the travelling unit will be readily apparent from the use of identical reference numerals in FIG. 1 of the present disclosure and in FIGS. 1, 2, 3 of Serial No. 798,406. This applies, inter alia, to all reference numerals between 20 and 51, the parts 50 and 51 in the present disclosure being understood to act upon the same part 52 of the servicing unit shown in FIG. 1 of Serial No. 798,406 as the parts 50, 51 in the latter application. How the servicing unit, including the knotting and coil-exchanging devices, is placed into action by deflection of the yarn guard 37 according to FIG. 1 of the present disclosure will be described presently.

During operation of the machine, the dog 11 on shaft 8 (FIGS. 1, 17) is continuously reciprocated by a crank pin 406 on the motor-driven gear 405, a pitman 407, and a crank arm 308 on shaft 8. As described, this oscillating motion is transmitted by rod 46 to the lever 45 (FIG. 1). The right arm 47 of lever 45 (FIG. 1) forms a lug 48 which, when the yarn guard 37 is in the illustrated position of normal operation, can catch behind the upper portion of the yarn guard whenever, during oscillating movement of lever 45 about pivot 45a, the arm 47 is in lowermost position. However, when due to breakage or absence of yarn the yarn guard 37 is deflected clockwise from the illustrated position, the lug 48, during its clockwise stroke, will place itself upon the tip of the yarn guard 37. This has the result that during the oscillating motion imparted to lever 45 by the rod 46, a pushing force is exerted by lever arm 47 upon the lower end of the drive-control lever 31 and turns lever 31 counterclockwise in opposition to the biasing spring 49. This releases the pawl arm of a latch member 33 from a catch recess of lever 31. Consequently, the lever 31 remains deflected counterclockwise until, at a later time, the control lever 31 is pushed back to the original position.

The just-mentioned counterclockwise motion of the drive-control lever 31 from the illustrated position is transmitted through the control rod 41 to the bell-crank lever 23 which now moves the intermediate friction roller 25 away from the driving roller 16 and the drum 22, thus stopping the winding operation. During subsequent counterclockwise motion of lever 23, the coupling roller 25 is placed into engagement with roller 22 and a reversing roller 18 whose shaft is continuously driven counterclockwise. This causes the guiding drum 22 to rotate in the unwinding direction in order to expose a sufficient length of yarn from the takeup spool as required for seizing and knotting of the yarn ends. This is more fully explained in the application Serial No. 798,406 and of no further interest with respect to the present invention proper.

A horizontal tappet 50 is linked to the latch member 33 and carries an extension 51. If, due to breakage or absence of yarn, the latch member 33 turns clockwise about its pivot 33a as described above, the tappet 50 moves toward the right. Its extension 51 thus enters into the travelling range of a switch arm mounted on the travelling servicing unit to release the knotting and servicing operation as more fully shown and described in Serial No. 798,406. Consequently, the present invention, by virtue of the retainment of the yarn guard 37 under the action of lever 45 during the take-up-spool exchange, prevents the knotting and supply-coil exchanging devices of the travelling servicing unit from entering into operation as long as the takeup-spool exchange is not completed.

It will be understood that to the extent necessary the disclosure in my copending applications Serial No.

798,406, Serial No. 728,139 and Serial No. 845,259 (FIGS. 1, 2) is to be considered part of the disclosure in the present application with respect to features that may be associated with, but do not constitute features of, the present invention proper. It should further be understood that the present invention is also applicable in conjunction with winding machines other than those comprising a travelling servicing unit in accordance with the principles embodied in the machines of said copending applications.

According to another feature of my invention I provide the machine with auxiliary control means for the purpose of reliably putting the spool doffing and exchanging components in operation only after the takeup spool has decelerated down to complete, or nearly complete standstill. It has been found that, particularly with large yarn packages, the coasting-down time may be relatively long so that the spool exchanging operation might commence at a moment when the takeup spool is still in motion. To prevent this, as well as the resulting operating trouble, I preferably provide the machines with time-delay means for retarding the initiation of the spool exchanging operation or with braking means for reducing the coasting-down time of the takeup spool or with time-delay and braking means combined for simultaneous performance.

According to a more specific feature, I provide between the member that responds to the completion of the yarn package, on the one hand, and the doffer control mechanism on the other hand, a time-delay member which transmits the starting signal to the doffer mechanisms after elapse of a given interval of time. The delaying member may comprise an electrical, preferably electronic, switching device. Also applicable for this purpose are hydraulic and pneumatic transmission or damping means. In the case of a hydraulic device, the line or duct for supplying the damping fluid is preferably given a flow resistance different from that of the duct for the return flow of the fluid, for example by using a check valve which closes only partially and whose flow resistance therefore changes in dependence upon the flow direction. If desired, however, separate supply and outlet ducts may be provided for the fluid medium of which one is provided with a completely closing check valve whereas an adjustable choke member is inserted into the other duct. According to another feature, the supply of fluid to the damping cylinder may be effected through a valve of relatively small flow resistance, whereas the fluid escaping from the cylinder is passed through a duct of high flow resistance.

When thus providing for delay between the response of the feeler member and the release of the control mechanism, it is preferable to operate with a delay interval of about one to about eight seconds and to make this delay adjustable. Depending upon the size of the yarn packages, the mass and weight of the yarn in the package, and the winding speed, it may be desirable to extend the delaying time up to about fifteen seconds.

As mentioned, a premature operation of the control mechanism can also be prevented by braking the completed yarn package in order to shorten the coasting-down time. Suitable for this purpose is a brake acting upon the yarn-guiding drum. According to another feature, however, a brake can be used that acts upon the completed yarn package or its spool core. By combining both above-mentioned principles of preventing premature control operation, that is by using a brake for reducing the coasting time and also employing a retarding device for delayed initiation of the control performance, the loss of time between the moment when the completion of a takeup spool is sensed and the doffing operation is commenced can be reduced to a particularly great extent.

The above-mentioned delayed-action and braking features will be further described with reference to FIGS. 6

to 14. The machine shown in FIG. 6 differs from that of FIG. 1 only in being provided with an electrical time delay member. The machine is shown during operation at a moment when the takeup spool is just filled and the signal for initiating a spool exchange has just issued.

While according to FIG. 1 the linking rod 143 directly connects the arm 142 of cam-control lever 106 with the detent member 144, the corresponding rod 143a in the machine of FIG. 6 connects the arm 142 with an electric switch 300. When the control lever 106 moves from the dot-and-dash position 106' to the full-line position 106, the rod 143 closes the switch 300 which then energizes a time delay unit 302 from a current source 301. The time delay unit 302 may consist of any commercially available time-delay relay or other electric timing device. After elapse of a given or selected interval of time, the delay unit 302 energizes a solenoid 303 whose core 304 is then pulled inward against the force of a spring 305. The core 304 is linked to the detent member 144 and entrains it counterclockwise thus causing the detent to move out of the catch recess 139 in cam disc 145, whereby the cam set is released to perform the spool-exchanging operation described above with reference to FIGS. 1 to 5. As mentioned, the time to be adjusted at the delay unit 302 depends upon the size and weight of the supply coil, the winding speed and other operating data.

In the somewhat modified circuit shown in FIG. 12 and applicable in a machine according to FIG. 6, the delay member is composed of an adjustable ohmic resistor 306 and a thermistor 307. A thermistor has high resistance when cold but reduces its resistance considerably when being heated to increasing temperatures due to current flowing through it. The thermistor 307 when cold conducts a small magnitude of current corresponding to the adjustment of the resistor 306. This initial current is not sufficient to cause the solenoid 303 to attract its core 304 in opposition to the force of spring 305. However, when the adjusted interval of time has elapsed, the increased current now passing through the thermistor 307 is strong enough to cause attraction of the core 304, thus moving the detent 144 into released position.

Upon completion of the spool-exchanging operation, the rod 143a (FIGS. 6, 12) opens the switch 300 due to movement of lever 106 to position 106'. This interrupts the circuit of solenoid 303 so that the detent 144 returns and enters into the catch recess 139 of the cam set. This terminates the actuation of the spool-exchanging mechanisms, and the normal winding operation is continued as described above. It will be understood that a thermal time relay or other delaying relay of known type may be used in lieu of the thermistor shown in FIG. 12.

In the modified embodiment according to FIG. 7, the transmission of the switching signal from the rod 143a to the detent 144 is effected by hydraulic means. The movable member of a valve 311 is linked to the end of arm 143a. During normal winding operation, the valve connects the interior space 312 of a hydraulic cylinder 313 through a line 314 with an accumulator D for hydraulic medium. The same valve 311, when in another position corresponding to the full-line position of lever 106 in FIG. 6, connects the same cylinder space 312 with a pump 315. The connecting line 316 between pump and valve comprises a throttle 317 whose flow cross section can be varied by adjustment of a screw. As soon as the rod 143a issues the signal for initiating the spool exchange, the hydraulic medium is passed through line 316 and through the throttle 317. The active cross section of throttle 317 is so small that, under the normally obtaining pressure of the hydraulic medium, some time will elapse until the cylinder space 312, being progressively filled with medium by the action of the pump, moves a piston 318 and hence the detent 144 a sufficient extent to release the cam set 145. As explained,

this release causes the spool-exchange mechanisms to commence operating. When the spool exchange is completed, a spring 319 acts upon the detent 144 as well as upon the piston 318 to pull the piston 318 back to the latching position of the detent, while the hydraulic medium is again forced out of the cylinder space 312 and returns to the accumulator D through the valve 311 which in the meantime has switched to the proper position. On this return path, virtually no resistance is offered to the hydraulic medium so that no time delay is encountered. If desired, the damping cylinder (D in FIG. 1) usually employed in the winding station, may also serve as a storage space or accumulator for the hydraulic medium of the timing device, or a common accumulator may be used for the damping cylinder D as well as for the hydraulic cylinder 313.

The modification according to FIG. 8 is provided with a time-delay device of pneumatic type. A blower 321, often employed in winding machines for producing suction or compressed air, is connected with a valve 322 which can be opened and closed by the control rod 143a. When the rod 143a is displaced thus issuing a signal for initiation of the spool exchange, the valve 322 is opened and the air current blows from the nozzle 323 of valve 322 upon a vane wheel 324. The wheel carries a coaxial pinion 325 meshing with a rack 326 for moving the rack toward the left in opposition to the force of a spring 327. The rack then releases the detent 144 from the cam set 145 thus initiating the spool-exchanging operation with the desired time delay. Upon completion of the spool exchange, the valve 322 is closed by the rod 143a, and the rack 326 with detent 144 are returned to the illustrated position by the action of the spring 327.

In the modifications according to FIGS. 9 and 10, hydraulic means are used for damping and time-delay. The rod 143a is connected by two springs 331, 332 with an arm 333 movable about a pivot 334. When the arm 333 turns toward the left, a connecting rod 335 shifts the detent 144 into released position so that the cam set 145 can rotate to perform a spool-exchanging operation. However, in both embodiments a damping member prevents an immediate release of the detent. To this end, the piston 336 of a damping cylinder 337 is linked to the arm 333. Liquid can only slowly enter into the damping cylinder because a throttle path 339 of adjustable flow cross section is inserted into the hydraulic line 338. To prevent damping action to occur during return motion after completion of the spool-exchanging operation, the hydraulic medium in the cylinder 337 returns to the accumulator through a second line of considerably greater cross section.

In the embodiment of FIG. 9, a slider 341 is connected with the arm 333. The slider has stops 342 and 343 acting upon the control arm 344 of a valve 345. This valve has a toggle spring 346 which retains the valve in one of its two limit positions until the slider 341 passes the valve into the other limit position. When the spool-exchanging operation is initiated by release of the detent 144, the valve 345 opens a line 347 of relatively large flow cross-section. FIG. 11 shows a cross section of the valve 345. The entrainment of the valve-actuating arm 344 is effected each time at the end of a working stroke of slider 342. When the arm 333 returns to the normal position occupied during winding operation, the valve opens a path for the rapid return flow of the hydraulic medium, thus minimizing the interval of time required for the arm to return to normal position. At the end of this movement the valve is again closed so that during the next following operation, occurring when the next signal for performance of a spool exchange is received, only the line 338 is available which, due to adjustment of the throttle 339, secures a slow operation of the damping piston 336 and hence a slow motion of the arm 333.

In the embodiment of FIG. 10, a check valve 351 is provided in lieu of the switching valve 345. During the

return motion of the piston 336 the check valve 351 passes a sufficient quantity of hydraulic medium without appreciable resistance. In contrast, the check valve does not permit a flow of medium in the other direction, so that hydraulic medium can enter into the damping cylinder only through the line 338, thus securing the desired time delay.

The machine illustrated in FIG. 13 is identical with the one described with reference to FIG. 1 except that it is additionally provided with a brake shoe 371 which is joined with the detent member 144 and acts upon the yarn-guiding drum 22 with considerable force as soon as the feeler assembly 103, 104, 105 issues a signal for spool exchange. As a result, the cross-wound yarn package to be exchanged is rapidly deprived of its momentum due to the stoppage of the yarn-guiding drum 22. The braking action can readily be made sufficiently rapid to reliably stop the takeup spool before the spool-exchanging operation can commence.

The modification shown in FIG. 14 comprises an electromagnetic brake which directly acts upon the core of the takeup spool 21 rather than upon the yarn-guiding drum 22. The detent member 144 in this embodiment carries an electric contact 361 which closes the circuit of the electromagnetic brake 362 to open the latter. When the takeup spool is filled, the rod 143 is pulled toward the left and thereby the circuit for the magnetic brake is interrupted; the brake becomes placed in known manner under spring force against the corresponding rotating parts of the takeup spool 21 and thus rapidly retards the coasting travel of the takeup spool.

It will be understood that the braking devices according to FIGS. 13 and 14 can be used conjointly so that the takeup spool is subjected to braking by the brake 362 shown in FIG. 14 while simultaneously the yarn-guiding drum 22 is subjected to braking by the means illustrated in FIG. 13. If desired, when using one or two brakes as described above, a time-delay member may be additionally provided in the transmission between the arm 142 and the arm 144. Such simultaneous use of several means, all cooperating in shortening the time elapsing between filling of the yarn package and performing the spool-exchanging operation, affords reducing this period of time to a negligible value.

In machines according to the invention as described above, the initiation of the control operation resulting in exchange of the takeup spool can be so adjusted that no dead interval is encountered. However, the braking and time-delaying devices may also be so adjusted that the operation of the control devices already commences at a moment where the takeup spool has not entirely reached standstill but has been retarded to such a low speed that it will reliably reach standstill before the spool is acted upon by the doffing devices.

It will be obvious to those skilled in the art, upon studying this disclosure, that my invention affords a great variety of modifications, including embodiments other than particularly illustrated and described herein, without departing from the essential features of my invention and within the scope of the claims annexed hereto.

I claim:

1. A yarn-package winding machine comprising winding means having a holder for a takeup spool core upon which the package is to be wound and yarn guiding means defining a yarn path to said holder; a spool-core conveying device for supplying an empty core to said holder; said spool holder having a releasable clamping device for journalling the empty core upon which the package is to be wound and for clamping the starting yarn end to the empty core; a feeler member movable in response to filling of the core with yarn on said holder; a doffer mechanism normally spaced from the core location of said holder and movable into engagement with the core on said holder for withdrawing a filled core therefrom; a yarn deflector member mounted beyond said yarn path at a

location along the core-engaging travel path of said doffer mechanism for engaging the yarn extending to the withdrawn core; said deflector member being engageable with the yarn extending between said guiding means and the withdrawn core and being movable from a normally inactive position in a direction generally parallel to the core axis of said holder for laterally deflecting the yarn to a position near one axial end of the core location of said holder for placing the yarn end in position to be clamped by said clamping means together with the empty core so as to automatically fix the yarn thereto; a normally inactive control mechanism connected with said core-conveying device and said deflector member and said doffer mechanism for causing them to conjointly operate upon release of said control mechanism; linking means connecting said deflector member with said control mechanism for operating said deflector together with said doffer mechanism, whereby the yarn coming from the supply coil is automatically fixed to the empty new core for automatically starting the winding operation; and trigger means connecting said feeler member with said control mechanism to release the latter for operation in response to completion of a yarn package on said holder.

2. A yarn-package winding machine comprising winding means having a rotatable yarn-guiding drum, drive means for rotating said drum during winding operation, and a holder for rotatably holding a takeup spool core upon which the packages are to be wound, said holder being movable toward and away from said drum and defining a core axis parallel to the drum axis for peripheral entrainment of the package by said drum; a spool-core conveying device for supplying an empty core to said holder; a feeler member movable together with said holder in response to filling of the core with yarn on said holder and connected to said drive means for stopping said drum in response to completion of the yarn package; a takeup-spool exchanging apparatus having a doffer mechanism spaced from said drum and said holder, said doffer mechanism being movable into engagement with the core on said holder for withdrawing a filled core therefrom; a yarn deflector member mounted along the core-engaging travel path of said doffer mechanism for engaging the yarn extending to the withdrawn core, said deflector member being normally inactive and movable in a direction generally parallel to the core axis of said holder for laterally deflecting the yarn to a position near one axial end of said holder; a normally inactive control mechanism connected with said core-conveying device and said deflector member and said doffer mechanism for causing them to conjointly operate upon release of said control mechanism; and trigger means connecting said feeler member with said control mechanism to release the latter for operation when said drive means is being stopped in response to completion of a yarn package.

3. A yarn-package winding machine according to claim 2, comprising a brake engageable with said guiding drum, and brake actuating means in controlled connection with said movable control member for decelerating the spool upon stopping of said drive means due to completion of a yarn package, whereby said control mechanism commences operating after the spool is substantially at standstill.

4. A yarn-package winding machine comprising winding means having a holder for a takeup spool core upon which the package is to be wound and yarn guiding means defining a yarn path to said holder; a spool-core conveying device for supplying an empty core to said holder; a feeler member movable in response to filling of the core with yarn on said holder; a doffer mechanism normally spaced from the core location of said holder and movable into engagement with the core on said holder for withdrawing a filled core therefrom; a yarn deflector member mounted beyond said yarn path at a location along the core-engaging travel path of said doffer mechanism for engaging the yarn extending to the withdrawn core,

said deflector member being normally inactive and movable in a direction generally parallel to the core axis of said holder for laterally deflecting the yarn to a position near one axial end of said holder; a normally inactive control mechanism connected with said core-conveying device and said deflector member and said doffer mechanism for causing them to conjointly operate upon release of said control mechanism; and trigger means connecting said feeler member with said control mechanism to release the latter for operation in response to completion of a yarn package on said holder; yarn-knotter control means having a sensing member responsive to absence of yarn in said yarn path, and interlock means linking said control mechanism with said knotter control means for inactivating the latter during operation of said control mechanism.

5. A yarn-package winding machine comprising winding means having a holder for a takeup spool core upon which the package is to be wound, a rotatable yarn guiding drum having an axis of rotation parallel to the core axis of said holder, and a yarn tensioner spaced from said drum and defining together therewith a yarn path to said holder, said holder being movable toward and away from said drum for peripheral entrainment of the yarn package on said holder; a spool-core conveying device movable toward and away from said holder for supplying an empty spool core to said holder; a doffer mechanism normally spaced from the core location of said holder and movable into engagement with the core on said holder for withdrawing a filled core therefrom; a yarn deflector member mounted beyond said yarn path at a location along the core-engaging travel path of said doffer mechanism for engaging the yarn extending to the withdrawn core, said deflector member being normally inactive and movable in a direction generally parallel to the core axis of said holder for laterally deflecting the yarn to a position near one axial end of said holder; a normally inactive control mechanism connected with said core-conveying device and said deflector member and said doffer mechanism for causing them to conjointly operate upon release of said control mechanism, said control mechanism having releasing means linked to said holder so as to be released in response to completion of a yarn package on said holder; knotter control means having a yarn guard engageable with the yarn in said path and movable in response to absence of yarn in said path; and interlock means linked to said control mechanism and engageable with said yarn guard for locking it during operation of said control mechanism.

6. A yarn-package winding machine according to claim 4, further comprising a spool-supporting tray member extending in a generally horizontal direction beneath the travel path of said doffer mechanism for receiving the doffed yarn package.

7. A yarn-package winding machine according to claim 4, further comprising a spool-supporting tray member extending in a generally horizontal direction beneath and along the travel path of said doffer mechanism and having two concave top-surface portions of which one is located beneath said holder and the other beneath the fully withdrawn filled core, said tray member having a ridge between said concave portion to prevent rolling back of the doffed yarn package.

8. A yarn-package winding machine comprising winding means having a spool holder with releasable clamping means for journalling a takeup spool core upon which a yarn package is to be wound, said clamping means having an actuator movable between core-clamping and core-releasing positions and spring-biased toward said clamping position, and yarn guiding means defining a yarn path to said holder; a spool-core supply device having a conveying member normally remote from said holder and movable toward said holder for supplying an empty core to said holder; a feeler member movable in response to filling of the core with yarn on said holder; a doffer mech-

anism having an arm structure normally spaced from the core location of said holder and movable to a position of engagement with the core on said holder for withdrawing it therefrom when filled with a yarn package, said doffer mechanism being also engageable with said actuator for moving it to said core-releasing position when said arm structure moves to core-engaging position; latch means mounted on said holder and latchingly engageable with said actuator when the latter is in said core-releasing position, whereby said clamping means are held ready to receive an empty core from said conveying member; said conveying member, when moved toward said holder, being engageable with said latch means to release said actuator for motion to said core-clamping position; and a normally inactive control mechanism connected with said core supply means and said doffer mechanism for causing them to conjointly operate upon release of said control mechanism; and trigger means connecting said feeler members with said control mechanism to release the latter for operation when said drive means is being stopped in response to completion of a yarn package on said holder.

9. A yarn-package winding machine according to claim 8, comprising a yarn deflector mounted beyond said yarn path at a location along the core-engaging travel path of said doffer mechanism, said deflector being engageable with the yarn extending between said guiding means and the withdrawn core and being movable from a normally inactive position toward one axial end of the core location of said holder for placing the yarn end in position to be clamped by said clamping means together with a new core, and linking means connecting said deflector with said control mechanism for operating said deflector together with said doffer mechanism.

10. In a yarn-package winding machine according to claim 1, said clamping device having clamp-opening means responsive to core-engaging motion of said doffer mechanism, and having clamp-closing means responsive to core-supplying motion of said conveying device.

11. A yarn-package winding machine according to claim 1, comprising a winder drive for the takeup spool, said drive having drive control means connected to said feeler member to stop driving the takeup spool in response to completion of the yarn package being wound; said control mechanism being timed to commence operating after the spool has reached standstill.

12. A yarn-package winding machine according to claim 1, comprising a winder drive for the takeup spool, said drive having drive control means connected to said feeler member to stop driving the takeup spool in response to completion of the yarn package being wound; and time-delay means interposed between said feeler member and said trigger means, whereby said control mechanism is released for operation after the spool has substantially reached standstill.

13. A yarn-package winding machine comprising winding means having a holder for a takeup spool core upon which the package is to be wound and yarn guiding means defining a yarn path to said holder; a spool-core conveying device for supplying an empty core to said holder; a feeler member movable in response to filling of the core with yarn on said holder; a doffer mechanism normally spaced from the core location of said holder and movable into engagement with the core on said holder for withdrawing a filled core therefrom; a yarn deflector member mounted beyond said yarn path at a location along the core-engaging travel path of said doffer mechanism for engaging the yarn extending to the withdrawn core, said deflector member being normally inactive and movable in a direction generally parallel to the core axis of said holder for laterally deflecting the yarn to a position near one axial end of said holder; a normally inactive control mechanism connected with said core-conveying device and said deflector member and said doffer

mechanism for causing them to conjointly operate upon release of said control mechanism; and trigger means connecting said feeler member with said control mechanism to release the latter for operation in response to completion of a yarn package on said holder; a winder drive for the takeup spool, said drive having drive control means connected to said feeler member to stop driving the takeup spool in response to completion of the yarn package being wound; said trigger means comprising an electromagnetic trigger device having an electric energizing circuit connected with said feeler member to be controlled thereby; and electric time-delay means connected in said circuit for releasing said control mechanism after the spool has substantially reached standstill.

14. A yarn-package winding machine comprising winding means having a holder for a takeup spool core upon which the package is to be wound and yarn guiding means defining a yarn path to said holder; a spool-core conveying device for supplying an empty core to said holder; a feeler member movable in response to filling of the core with yarn on said holder; a doffer mechanism normally spaced from the core location of said holder and movable into engagement with the core on said holder for withdrawing a filled core therefrom; a yarn deflector member mounted beyond said yarn path at a location along the core-engaging travel path of said doffer mechanism for engaging the yarn extending to the withdrawn core, said deflector member being normally inactive and movable in a direction generally parallel to the core axis of said holder for laterally deflecting the yarn to a position near one axial end of said holder; a normally inactive control mechanism connected with said core-conveying device and said deflector member and said doffer mechanism for causing them to conjointly operate upon release of said control mechanism; and trigger means connecting said feeler member with said control mechanism to release the latter for operation in response to completion of a yarn package on said holder; a winder drive for the takeup spool, said drive having drive control means connected to said feeler member to discontinue driving the takeup spool in response to completion of the yarn package being wound; and fluid damping means interposed between said feeler member and said trigger means for delayed release of said control mechanism, whereby said control mechanism starts operating after the spool has substantially reached standstill.

15. A yarn-package winding machine comprising winding means having a holder for a takeup spool core upon which the package is to be wound and yarn guiding means defining a yarn path to said holder; a spool-core conveying device for supplying an empty core to said holder; a feeler member movable in response to filling of the core with yarn on said holder; a doffer mechanism normally spaced from the core location of said holder and movable into engagement with the core on said holder for withdrawing a filled core therefrom; a yarn deflector member mounted beyond said yarn path at a location along the core-engaging travel path of said doffer mechanism for engaging the yarn extending to the withdrawn core, said deflector member being normally inactive and movable in a direction generally parallel to the core axis of said holder for laterally deflecting the yarn to a position near one axial end of said holder; a normally inactive control mechanism connected with said core-conveying device and said deflector member and said doffer mechanism for causing them to conjointly operate upon release of said control mechanism; and trigger means connecting said feeler member with said control mechanism to release the latter for operation in response to completion of a yarn package on said holder; a winder drive for the takeup spool, said drive having drive control means connected to said feeler member to stop driving the takeup spool in response to completion of the yarn package being wound; normally inactive brake means for reducing the coasting time of the spool; and linking means connecting said brake

means with said feeler member for releasing the braking
operation in response to completion of the yarn package.

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