Dec. 8, 1964 S. FÜRST 3,160,358

AUTOMATIC YARN-COIL WINDING MACHINE

Filed Sept. 28, 1962 4 Sheets-Sheet 1

FIG. 1

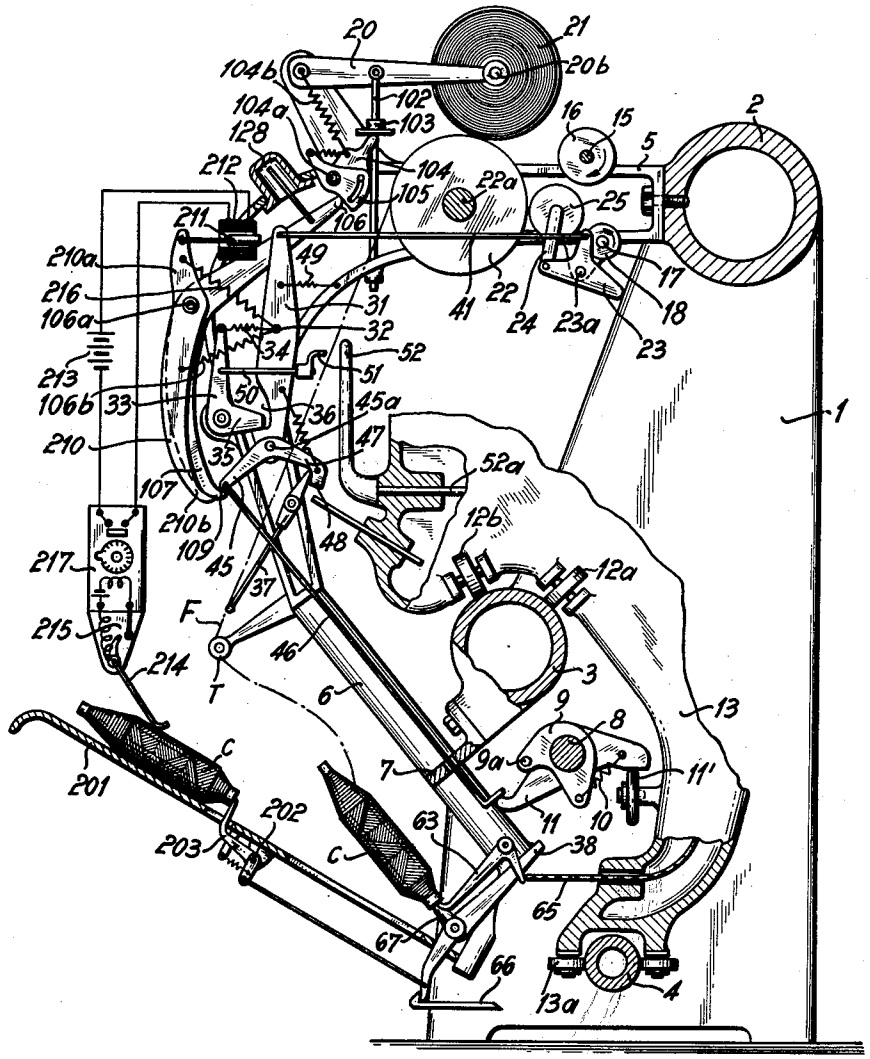

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FIG. 2

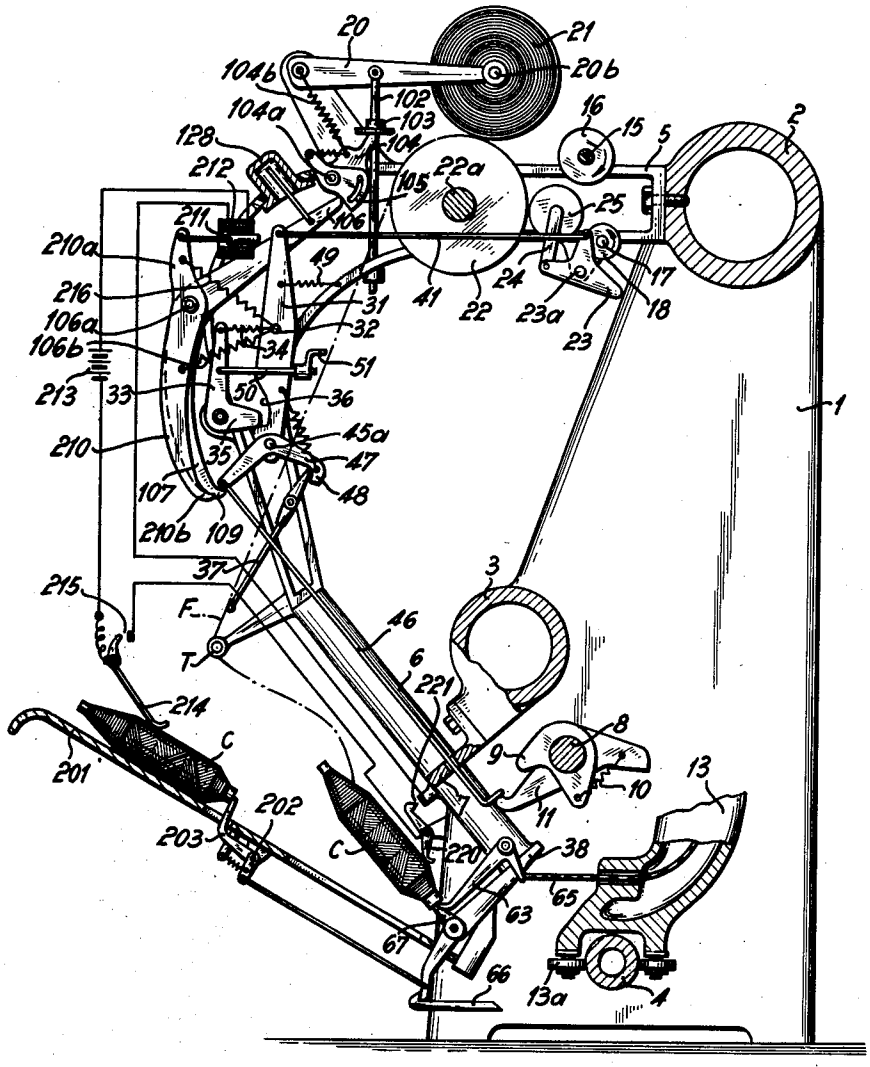

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FIG. 3

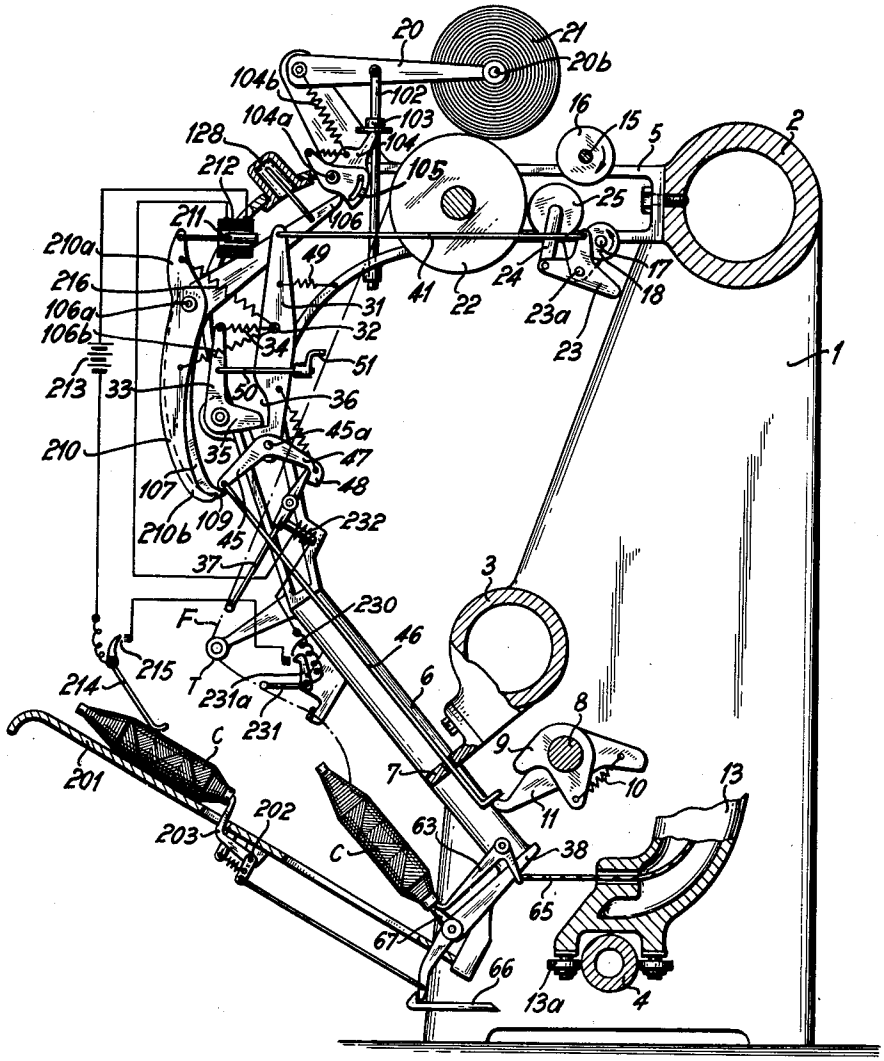

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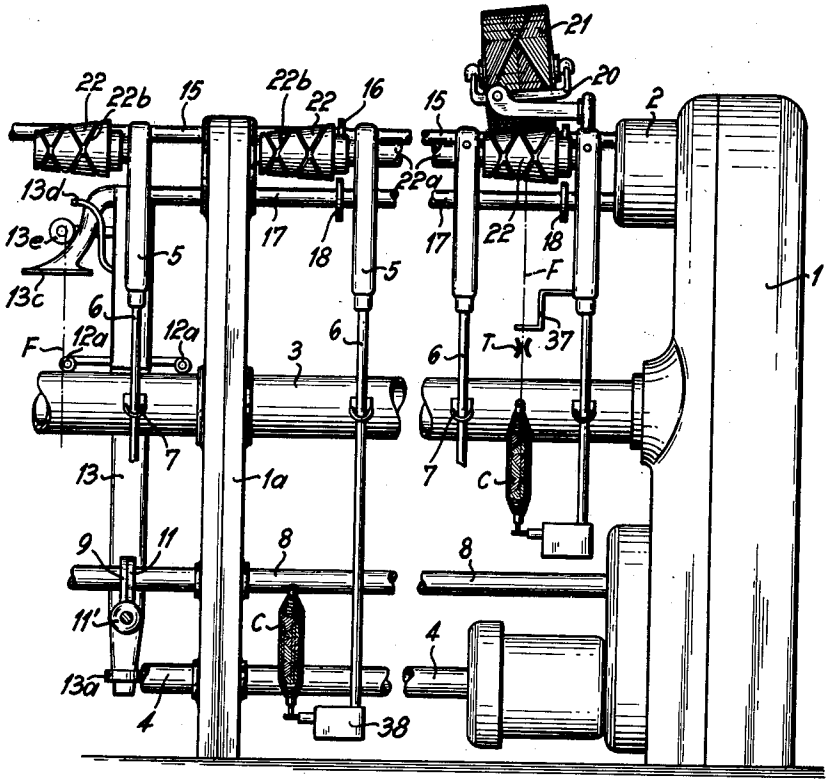
FIG. 4



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Stefan Fürst

United States Patent Office 3,160,358 Patented Dec. 8, 1964

3,160,358

AUTOMATIC YARN-COIL WINDING MACHINE

Stefan Fürst, Monchen-Gladbach, Germany, assignor to Walter Reiners, Monchen-Gladbach, Germany

Filed Sept. 28, 1962, Ser. No. 227,687
Claims priority, application Germany Sept. 30, 1961
3 Claims. (Cl. 242—35.5)

My invention relates to automatic machines for rewinding bobbins, cops and other relatively small yarn coils into larger packages of a desired type and size such as crosswound coils also called "cones" and "cheeses." In a more particular aspect my invention relates to multi-station winding machines in which a multiplicity of individually operable winding units are provided with a mobile servicing unit or "tender" whicht travels along a row or group of such stations and automatically performs any needed servicing operation, such as knotting the broken yarn ends from the supply coil and the take-up spool together, in order to place a fault-responsively stopped station back to normal operation.

There are automatic winding machines of this type in which the individual winding stations are automatically fed with yarn-supply coils, such as cops, whenever a new supply coil is needed, particularly when the previously operative supply coil becomes exhaused. Generally, such automatic feeding operation at the individual stations of the machine is effected from a magazine or through a conveyer belt. Difficulties of proper timing are involved in cases where the supply coils are fed to the individual stations of the machine by means of a conveyor belt that receives its supply from a different fabricating location, for example at a spinning machine from which the completed spinning cops are taken in order to be rewound into larger yarn packages at the winding stations of the winding machine. With such a combination of a winding machine with a spinning machine, the working capacity of the winding machine must be greater than that of the spinning machine in order to reliably prevent clogging on the conveyer which feeds the coils to the winding machine. Consequently, when such winding machines cooperate with a given number of spinning spindles, it is inevitable that one or the other winding station from time to time is not temporarily provided with supply coils because the spinning machine does not produce a sufficient number of such coils. This has the consequence that the automatic mechanisms in the winding machine that respond to the absence of yarn in the winding stations are repeatedly raised into futile operation. In multi-station machines equipped with a servicing tender that travels along the row of winding stations, such temporary lack of coil supply at individual winding stations may have the result that the tender is time and again arrested in front of a winding station to perform a servicing operation which is useless in the absence of the yarn supply, so that the tender during the same period of time is prevented from servicing other winding stations that may still be provided with a sufficient yarn supply.

It is an object of my invention to minimize or eliminate the above-mentioned disadvantages and to provide an automatic winding machine in which the entire performance of each individual winding station is stopped if no yarn-supply coil is furnished from the feeder means of the machine.

Another, more specific object is to prevent, in a multi-station winding machine with a mobile tender, the imposition of any control action upon the travelling tender by an individual winding station if the station has not been fed properly with a yarn-supply coil from the feeder means of the machine.

Another object of my invention, implied in those aforementioned, is to reduce the wear imposed upon the automatic servicing equipment of coil winding machines by avoiding inherently futile knotting attempts and the like servicing operation; and it is also an object, with respect to mobile-tender multi-station winding machines, to increase the efficiency and working capacity of the tender by eliminating the possibility of having the tender called upon to stop and attempt a knotting operation at an individual station not properly provided with a yarn-supply coil from the feeder means of the machine.

To achieve these objects, and in accordance with a feature of my invention, in a yarn-package winding machine comprising a multiplicity of winding stations with individual take-up spool drive means and having yarn-supply coil feeder means for the stations, each of the winding stations is equipped with a control device whose sensing component is responsive to coil depletion of the feeder means in the station. The control device is in controlling connection with the spool drive means so as to individually control the speed of the winding operation to the rate or frequency of the coil supply from the feeder means.

It is particularly advantageous, however, to design the above-mentioned control device as a switching apparatus which automatically stops the winder drive of the winding station in response to absence of a yarn-supply coil at the feeding location of the station, and which apparatus automatically starts the drive upon resumption of the coil supply from the feeder means of the machine to the station.

According to another, preferred feature of my invention, the same control device is also provided with means for blocking and releasing the other working devices of the winding station that serve to eliminate yarn faults and resulting stoppage as may be due to yarn breakage or depletion of a yarn-supply coil. As a result, the control or switching device that responds to depletion of coil supply from the feeder means at the individual winding station not only stops and re-starts the winder drive in the station but simultaneously prevents the operation of the auxiliary automatic knotting and related servicing devices at the time the winder drive is stopped, while again releasing such servicing devices for operation when the winder drive is re-started, without affecting the corresponding automatic operations in any of the other winding stations.

The above-mentioned and more specific objects, advantages and features of my invention, said features being set forth with particularity in the claims annexed hereto, will be apparent from the following in conjunction with the embodiments of winding machines according to the invention illustrated by way of example on the accompanying drawings in which:

FIG. 1 is a cross-sectional side view of a multi-station winding machine, the appertaining mobile tender, being known as such and not modified by the invention proper, being represented only by a fragmentary and partly sectional view.

FIGS. 2 and 3 are similar cross-sectional side views of respectively different machines, modified in comparison with that of FIG. 1, and the mobile tender being omitted.

FIG. 4 is a schematic and fragmentary front view of the winding machine according to FIG. 1, the same view being also applicable to the machine according to FIG. 2 or FIG. 3.

The same reference characters are used in all illustrations for denoting respectively similar components.

In the drawings, the invention is shown applied to a multi-station winding machine of the type and fundamental design known, for example, from my United States Patent No. 3,033,478, assigned to the assignee of the present invention. Design details of such machines, including those of the appertaining mobile tender, are also known from the machines available under the trade-

mark "Autoconer" from the American Schlafhorst Corporation, Charlotte, North Carolina, described in the book entitled "Autoconer Manual" published in 1962, of which a copy is available in the Patent Office library. However, the design and operation of such a machine will be described below to the extent necessary or helpful in understanding the invention proper.

The illustrated machine comprises lateral frame structures **1** (FIGS. 1, 2), which are rigidly joined with a tubular carrier beam **2** extending along the top of the machine, another tubular beam **3** which forms a runway for the mobile servicing unit described below and a likewise tubular rail **4**. The tubular structures **2**, **3** and **4** extend horizontally parallel to each other along all individual coil winding stations of the machine. Fastened to the tubular top beam **2** at each individual winding station is a rigid arm **5** of arcuate shape which extends from beam **2** forward and downward. The lower end of the arm structure **5** carries a tubular sleeve **6** which is joined with the beam **3** by a bracket **7**.

A control shaft **8**, which during operation of the machine continuously turns a given angle forward and back, extends parallel to the top beam **2** between the lateral frame structures of the machine. Aside from being journalled at its ends, the oscillating shaft **8** may also be supported in bearings between the individual winding stations, such as at **1***a* (FIG. 2), depending upon the length of the shaft. Firmly mounted on shaft **8** in each winding station is an entrainer **9** which is joined by a spring **10** with a swing arm **11** rotatably seated on the shaft **8** and normally held by a spring **10** against a stop **9***a* of the entrainer **9**. During oscillatory movement of the shaft **8** and entrainer **9**, the arm **11** is normally free to be carried along for the actuation of testing means described below.

The machine is provided with a mobile tender **13** (FIGS. 1, 2) which has two pairs of running wheels **12***a*, **12***b* seated upon the track formed by the tubular beam **5**. Journalled on the lower bifurcated end of the tender **13** are guide rollers **13***a* and **13***b* which rest against opposite sides of the guide rail **4** thus maintaining the tender in proper position during its travel. During operation of the machine, the tender **13** travels along the individual winding stations and is temporarily arrested in front of any one winding station that may require servicing at the time. The means for driving the tender **13** along the track beam are not illustrated and described herein because they are not essential to the present invention proper and may be identical with those illustrated and described in the co-pending application of S. Fürst and M. Rühl, Serial No. 796,049, filed February 27, 1959, now Patent No. 3,061,216.

The travel of the tender **13** is automatically stopped in the proper servicing position relative to a winding station where the yarn-end seizing devices of the tender **13**, preferably consisting of air suction nozzles as shown at **13***c* and **13***d* in FIG. 2, can operate to suctionally entrain the yarn end of the take-up spool and the yarn end of the supply coil and to place both into the action range of a knotting device **13***e* which ties both ends together. For further details of the tender and its operation, not essential to the present invention and known as such, reference may be had to my United States Patent No. 3,033,478 assigned to the assignee of the present invention.

A winder drive shaft **15** (FIGS. 1, 2), continuously rotating during operation of the machine, extends above arm structure **5** in parallel relation to the axis of the top beam **2** and carries a friction roller **16** in each individual winding station. Located beneath the arm **5** is another drive shaft **17** which likewise rotates continuously during operation of the machine, but in a direction opposed to that of the shaft **15**. The shaft **17** carries a friction roller **18** in each winding station. The two shafts **15** and **17** are journalled in the lateral frame structures of the machine independently of the carrier arms **5**. If necessary, the shafts **15** and **17** may also be supported by bearings on other locations, for example at **1***a* between two winding stations.

A frame **20** is pivotally mounted at **20***a* on the arm **5** and forms a journal at **20***b* for the take-up spool **21** of the winding station. Also journalled on the arm **5** is a yarn guiding drum **22** with a drum shaft **22***a*. A three-armed lever **23** is pivoted at **23***a* to the carrier arm **5** and is connected by a link **24** with an intermediate friction roller **25**. When the lever **23** is turned clockwise from the position shown in FIG. 1, the intermediate roller **25** is lifted and then couples the friction roller **16** on the shaft **15** with the guiding drum **22**. The take-up spool **21**, gravity biased against the periphery of the drum **22**, is then entrained in the winding-up direction, and the guiding groove **22***b* (FIG. 2) extending about the periphery of the guiding drum and forming a loop closed upon itself, reciprocates the incoming yarn back and forth along the take-up spool, thus producing the desired cross-wound yarn package.

When the lever **23** is turned counterclockwise about its pivot **23***a* (FIG. 1), the intermediate roller **25** is placed in coupling engagement with the reversely driven roller **18** so that now the guiding drum **22** and the entrained take-up spool **21** rotate in the unwinding direction. This is done only temporarily whenever it is necessary to unwind a certain length of yarn from the take-up spool for the purpose of tying the yarn together with that coming from the supply coil.

The arm structure **5** further carries a main control lever **31** which is biased by a spring **49** for clockwise motion about a pivot **32**. Also mounted on the arm structure **5** is a pivoted latch member **33** biased by a spring **34** for engagement of its latch arm **35** with a catch recess **36** of the control level **31**.

Pivoted at **37***a* to the lower end of the arm structure **5** is a yarn guard **37** which is normally biased into feeling engagement with the yarn F coming from the supply coil C and passing over the guiding drum **22** onto the take-up spool **21**. In the event of yarn breakage or when the supply coil C is exhausted, the guard **37** responds to the absence of yarn by turning clockwise from the position shown in FIG. 1. As will be further explained below, such deflection of the yarn guard has the effect of stopping the winding operation of the winding station and, normally, causes the tender **13**, upon its next passage, to be arrested at the winding station for reestablishing proper winding conditions.

The tube **6** attached to the lower end of the arm structure **5**, carries at its bottom a holder **38** for accommodating the above-mentioned yarn-supply coil C, such as a spinning cop. The removal of a depleted coil C and the substitution of a full coil are effected automatically, for example, by control devices as described and illustrated in my co-pending applications, Serial No. 704,983, filed December 24, 1957 (now abandoned), and Serial No. 728,139, filed April 4, 1959, now Patent No. 3,077,311, both assigned to the assignee of the present invention.

A horizontal pusher rod **41** links one arm of the drive control member **23** with the main control lever **31**. Pivoted to the lower end of the main control lever **31** is a bell-crank lever **45** to which a reciprocating movement is imparted by a linking rod **46**. This reciprocating motion is transmitted from the oscillating control shaft **8** and the sensing arm **11** onto a lug at the lower end of the rod **46** and takes place whenever, and as long as, the swing arm **11** is free to participate in the oscillation of the entrainer **9**, this being the case when the tender **13** is not located at the winding station. The oscillatory motion of the swing arm **11**, rod **46** and bell-crank lever **45** ceases when a wheel **11'** on the approaching tender forces the swing lever **11** counterclockwise out of engagement with the entrainer stop **9***a*, this condition being shown in FIG. 1.

The right arm **47** of the bell-crank lever **45** forms at

its end a lug 48 which, when the yarn guard 37 is in position of normal operation, can catch behind the top of the yarn guard whenever, during the above-mentioned oscillating movement of the lever 45, the arm 47 is in lowermost position. However, when the yarn guard 37 is deflected clockwise due to breakage or absence of yarn, the lug 48, during its clockwise stroke will place itself upon the top 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 the lever arm 47 upon the lower end of the main control lever 31 with the effect of turning the control lever 31 counterclockwise in opposition to the biasing spring 49. This releases the latch member 33 from the catch recess 36 of the control lever 31. Consequently, the control lever 31 remains deflected in the counterclockwise direction until, at a later time, the control lever 31 is pushed back to the original position.

The just-mentioned counterclockwise motion of the main control lever 31 from the illustrated to the relieved position is imparted through the linking rod 41 to the drive control lever 23 which now moves the intermediate friction roller 25 away from the forward driving roller 16 to the position shown in FIG. 1 and the drum 22 now stops. During subsequent counterclockwise motion of the drive control lever 23, the coupling roller 25 is placed into engagement with the reversing roller 18. This causes the guiding drum 22 to rotate in the unwinding direction in order to expose a sufficient length of yarn from the take-up spool as required for the seizing and knotting of the yarn ends. The just-mentioned further motion of the lever 23, however, comes about by operation of the tender 13 as will be explained.

The tender 13, when passing by an individual winding station, must check whether the winding operation in that station is still in good order. For the purpose of such checking, a horizontal tappet 50 (FIG. 1) is linked to the latch member 33 and cams an extension 51. If, due to breakage or absence of yarn in the winding station, the latch member 33 is turned clockwise about its pivot 33*a* in the manner described above, the tappet 50 moves toward the right and enters into the travelling range of a switch arm 52 which is pivotally mounted on the housing structure of the tender 13 and is normally in the illustrated upright position. When the tender 13 approaches a winding station in which the tappet 50 has previously shifted to the right, the switch arm 52 is engaged by the protruding end of the tappet and is turned in one or the other direction depending upon whether the tender 13 arrives from the left or right (relating to FIG. 2). The deflecting motion of the switch arm 52 is transmitted by a shaft 52*a* to the internal mechanisms (not shown) of the tender 13 which cause it to stop and to operate its yarn-end seeking and knotting devices. During such operation, a tappet (not shown) protruding out of the tender 13 pushes against the drive control lever 23 and thereby engages the coupling roller 25 with the reverse driving roller 18 for a short interval of time. During that interval the yarn guiding drum 22 is turned in the unwinding direction so that a certain length of yarn is available to be seized by the yarn seeking and knotting devices 13*c*, 13*d*, 13*e* (FIG. 2) which form part of the tender and are not further described herein because they may correspond to those illustrated and described in my above-mentioned co-pending applications, Serial No. 704,983, filed December 24, 1957 (now abandoned), and Serial No. 728,139, filed April 14, 1958, both assigned to the assignee of the present invention.

While in the event of yarn breakage the lever 47 entrains the main control lever 31 over a relatively large range of turning motion, the entrainment is only short when the yarn is present because then the arm of lever 47 rather than its end 48 abuts upon the top of the yarn guard 37. This short entrainment, however, suffices in order to temporarily eliminate the driving connection between the intermediate roller 25 with the driving roller 15 and the yarn guiding drum 22.

When, during winding operation, the yarn package on the take-up spool 21 has reached a predetermined diameter, and the journalling frame 20 is lifted a corresponding distance, a rod 102 is likewise lifted. A shoulder disc 103 on the rod 102 then permits a lever 104, pivoted at 104*a*, to turn counterclockwise under the biasing force of a spring 104*b* to a position in which a segment 105, likewise pivoted at 104*a*, is entrained to follow the pivotal movement in the clockwise direction. The segment 105 is connected with the lever 104 by a biasing spring and has a slot traversed by a stop pin of lever 104. A lever 106 pivoted at 106*a* to the arm structure 5 and biased by a spring 106*b* for counterclockwise motion, normally rests against the circular periphery of the segment 105. However, when the segment 105 is entrained by the lever 104 and reaches the position illustrated in FIG. 1, the lever 106 is released and snaps counterclockwise to the illustrated position of FIG. 1. This causes a push button 128 to protrude out of the arm structure 5, thus signalling to the attendant that the yarn package on the take-up spool 21 is completed.

When, due to lifting of the journalling frame 20, the lever 106 snaps to the illustrated position of FIG. 1, a lug 109 formed by an extension 107 of the lever 106 catches behind the bell-crank lever 45 and locks it in position. Now the lug 48 of the lever arm 47 is held arrested so that the connecting rod 46 is kept in lifted position and no longer continues to follow the reciprocating motion of the swing lever 11. This stops the reciprocating motion of the horizontal connecting rod 41 and of the drive control lever 23. The intermediate coupling roller 24 is thus kept in the inactive position shown in FIG. 1. Consequently, the winder drive in the winding station is stopped. In this position of the rod 46, the control lever 31 also remains in the illustrated position. That is, the arm 35 of the latch member 33 is not released and consequently the tappet 50 is retained in the illustrated position. Hence, although the winding station is stopped, the servicing tender 13 is not called upon to operate because the tappet 50 with its projection 51 has not been shifted into the path of the switching arm 52 on the tender 13.

After the full take-up spool 21 is replaced by an empty spool core, the attendant depresses the push button 128. This returns the lever 106 into engagement with the periphery of segment 105 so that the above-described stopping and locking actions are terminated. The lug 109 is thus withdrawn from the bell-crank lever 45. The rod 102 drops together with the journalling frame 20, and the winding operation is resumed.

The coil holder 38 fastened to the lower end of the tube 6 carries a peg 67 for receiving the supply coils C. The peg 67 is pivotally mounted so that the peg can be turned to the unwinding position shown in FIG. 1 or to a downward position in which it can receive a coil from the feeder means. Also mounted on the lower part of tube 6 is a doffer 63 for removing the empty coil cores. The doffer is actuated by a Bowden wire 65 whose active end protrudes from the tender 13. Details of the mechanism for the Bowden wire 65 and for another Bowden wire 66 shown only schematically in FIG. 1, are not relevant to the present invention and may be identical with those apparent from the above-mentioned copending application Serial No. 728,139, assigned to the assignee of the present invention. The Bowden wire 66 serves for turning the peg 67 counterclockwise when it is to receive a new supply coil that glides downward on a glideway 201. The glideway 201 forms part of the yarn-supply feeder means of the machine and has just enough space to store one spare coil which normally is held in position by a latch lever 203 rotatable about a pivot 202. The spare coil is held in ready position until the peg 67 has turned downwardly to the proper receiving position. Then the

Bowden wire 66 is active to operate the latch lever 203, whereupon the spare coil glides downwardly onto the peg 67, whereafter the peg 67 turns upward to the illustrated unwinding position. The supply of new coils to the glideway 201 can be effected in any desired manner, for example by means of a conveyor belt that passes along the row of winding stations in accordance with the machine illustrated and described in the copending application Serial No. 153,244 of Reiners et al., filed November 17, 1961, now Patent No. 3,111,280, assigned to the assignee of the present invention.

The devices and components of the multi-station machine described so far, have been explained for the purpose of conveying an understanding of the invention proper now to be described. With respect to the devices and components mentioned above, the three embodiments illustrated in FIGS. 1, 2 and 3 are identical.

Turning now to the invention proper, it is essential that the machine is provided in each individual winding station with a control or switching device which acts upon the winder drive in the station in response to the condition of the supply-coil feed means. The control device comprises a lever arm 210 (FIGS. 1, 2, 3) which can rotate about the same pivot 106*a* as the above-mentioned control lever 106 but is not connected with the lever 106. That is, the parts 106 and 210 can perform rotational motion independently of each other. Linked to the lever arm 210*a* is a drive control member which operates in response to the feed of supply coils and which in the illustrated embodiments consists of the armature 211 of an electromagnet or solenoid 212 energized from a current source 213. The energizing circuit of the magnet 212 is controlled by a feeler 214 which responds to presence and absence of a supply coil in the ready position on the glideway 201. When there is no supply coil in this ready position, so that the feed of yarn supply is interrupted, the feeler 214 closes a pair of electric contacts 215 which effect closing of the energizing circuit so that the magnet 212 is excited. The armature 211 is then pulled toward the left and turns the lever arm 210 counterclockwise. During such turning motion, a lug 210*b* of arm 210 is placed beneath the bell-crank lever 45 in the same manner as is described above for the lug 109 of the lever 107. Consequently, when the magnet 212 responds to absence of a supply coil in the feeder glideway, the winding operation of the station is likewise discontinued by disconnecting the transmission from the drive roller 16 through the intermediate roller 25 to the yarn-guiding drum 22, and a turning motion of the yarn guard 37 as well as a displacement of the tappet 50 are again prevented. Consequently, when a spare supply of yarn is missing in a winding station, the station is stopped but the otherwise occurring automatic servicing operations are not released and the servicing tender is not caused to stop at the station and to attempt putting it back into operative condition.

In order to prevent the magnet 212 from responding each time a depleted coil is substituted by a full yarn-supply coil, a time-delay member 217 is interposed between the feeler contacts 215 and the control circuit of the magnet. The timing period of the delay member 217 is adapted to the period of time required for completely unwinding a yarn-supply coil. For example, when the minimum time needed for depleting a supply coil is 4 minutes, the time-delay member 217 may be set for a timing period of 3 and one-half minutes. In this case the magnet 212 is energized only if 30 seconds prior to complete depletion of a supply coil no new coil has arrived in the ready position on the glideway 201 and has opened the contacts 215 by means of the feeler 214. As a result, the drive-control device according to the invention is put into operation only when the feed means of the machine have failed to provide the winding station with a new supply coil within the proper period of time.

Another way of securing such performance is to connect in the control circuit of the electromagnet 212, in lieu of the above-mentioned time-delay member 217, another feeler contact which senses the amount of yarn still contained on the yarn coil being unwound. This principle of control is embodied in the machine illustrated in FIG. 2.

The machine is provided with the above-mentioned feeler 214 for determining whether a spare coil is located in ready position on the glideway structure 201 and which closes its contacts 215 and thereby energizes the control magnet 212 when a coil is absent from the ready position. However, another pair of contacts 221 is connected in the same control circuit in series with the feeler contacts 215 and is actuable by a feeler lever 220 which engages the yarn coil being unwound. When the amount of yarn on the coil becomes depleted to a given extent, the feeler lever 220 closes its contacts 221 and when at the same time no new supply coil is located in ready position on the glideway structure 201, the feeler 214 also closes its contacts 215. As a result, the magnet 212 can become energized only when the contacts 215 as well as the contacts 221 are closed simultaneously. That is, the winding station is stopped and the control member 50, 51 for the mobile tender is locked, when the feeder means of the machine have failed to supply a new coil and the yarn supply from the coil being unwound becomes depleted. However, as soon as a new supply coil is fed onto the glideway 201 and lifts the feeler 214, the contacts 215 are opened so that the magnet 212 is deenergized. This eliminates the stopping and blocking conditions in the winding station and the winding operation is continued.

In the embodiment described above with FIGS. 1 and 2, the winding station becomes stopped before the yarn-supply coil on the holder peg 67 is completely depleted of yarn. In some cases, however, it is desirable to stop the winding station only when the supply coil is entirely exhausted, because then the travelling tender can be immediately called upon to perform the yarn-end seeking and knotting operations as soon as a new supply coil arrives in the ready position so that the supply-coil exchange is performed with a minimum of further delay. Such performance can be secured by connecting in the control circuit for the winder drive, that is, in the control circuit of the magnet 212 used in the illustrated embodiments, a control contact which is actuable by a yarn guard or feeler 231 responsive to presence of yarn between the supply coil and the yarn-clamping location along the yarn path from the supply coil to the yarn-guiding drum. Thus, in the embodiment illustrated in FIG. 3, a yarn guard 231 is pivotally mounted between the location of the supply coil on peg 67 and the yarn tensioner T and normally rests against the yarn between the tensioner T and a fixed yarn guide such as a yarn cleaner 231*b*. When the supply coil C is exhausted, the yarn guard 231 turns counterclockwise so that an arm 231*a* closes a pair of contacts 230. If at this moment no new supply coil has arrived in the ready position on the glideway structure 201, the contacts 215 are also closed so that the magnet 212 becomes energized. For preventing the yarn guard 37 from turning to contact-closing position before the bell-crank lever 45 is blocked by the lug 210*b*, another electromagnet 232 is connected in the energizing circuit of magnet 212. The magnet 232 thus is excited simultaneously with the magnet 212 and arrests the yarn guard 37 in the illustrated position of FIG. 3.

As soon as the conveyor or other feed means supplies a new coil to the ready position, the contacts 215 are opened by the feeler 214. This interrupts the entire circuit of the current source 213 so that both magnets 212 and 232 are deenergized at the same time. As a result, the lever 210 is pulled back to the illustrated starting position by the action of spring 216, thus eliminating the blocking of the bell-crank lever 45. Furthermore, the yarn guard 37 can now turn counterclockwise because the magnet 232 is no longer excited. Now, the bell-crank

lever 45 performs its turning motion, driven by the connecting rod 46, so that the hook end 48 abuts against the top of the yarn guard 37. As a result, the control lever 37 is turned clockwise a considerably greater extent and thereby releases the latching member 33 which now displaces the tappet 50 with a projection 51 toward the right in order to cause the travelling tender, running on the carrier 3 and rail 4, to be stopped and to perform the supply-coil exchange and the subsequent seeking and knotting of the yarn ends.

To those skilled in the art it will be obvious upon a study of this disclosure that my invention is not limited to the embodiments herein illustrated and described above nor to being employed in conjunction with automatic coil-winding machines of the type described above. The invention is rather also applicable, substantially in the manner described above, in conjunction with other winding machines, particularly any automatically operating yarn-package winding machines of various types and consequently can be given embodiments other than those particularly mentioned 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 a row of winding stations having respective take-up spools and drive means therefor and having respective coil holder means and feeder means for supplying yarn coils to said holder means; a servicing tender movable along said row of winding stations for tying yarn ends coming from a coil on said holder means and from said spool respectively, each of said winding stations having a tender control mechanism for normally controlling said tender to

operate at said station in response to absence of yarn, and each of said stations having a control device responsive to coil depletion of said feeder means in said station and in controlling conenction with said drive means for individually stopping the winding operation of said station in dependence upon said depletion, said control device being connected with said mechanism for rendering said mechanism inactive relative to said tender, whereby said station is prevented from causing said tender to operate during persistence of said depletion.

2. In a winding machine according to claim 1, said feeder means comprising a coil-conveying member in each of said winding stations, releasable means for holding a yarn-supply coil in a given ready position on said member, said control device having a feeler engageable with a coil in said position and electric contacts operable by said feeler in the absence of a coil from said position, and electric control means electrically connected with said contacts and actuable upon said drive means for stopping the winding operation due to operation of said contacts by said feeler.

3. A winding machine according to claim 2, including a time-delay member interposed between said contacts and said electric control means for actuating the latter only upon a given duration of absence of a coil from said position.

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