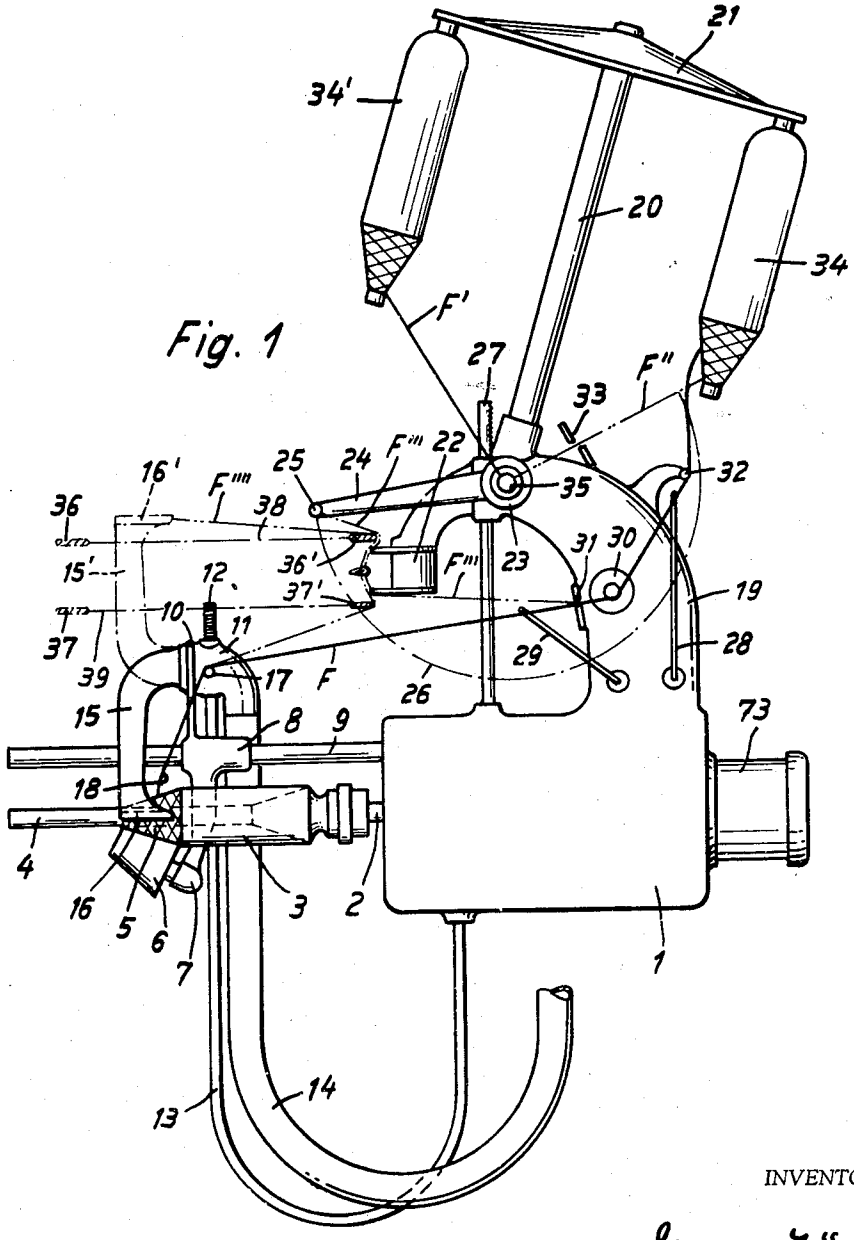
Sept. 27, 1960 S. FÜRST 2,954,178

WINDING MACHINE WITH YARN-END FINDING AND TYING DEVICES

Filed July 29, 1957 2 Sheets-Sheet 1

Fig. 1



INVENTOR.

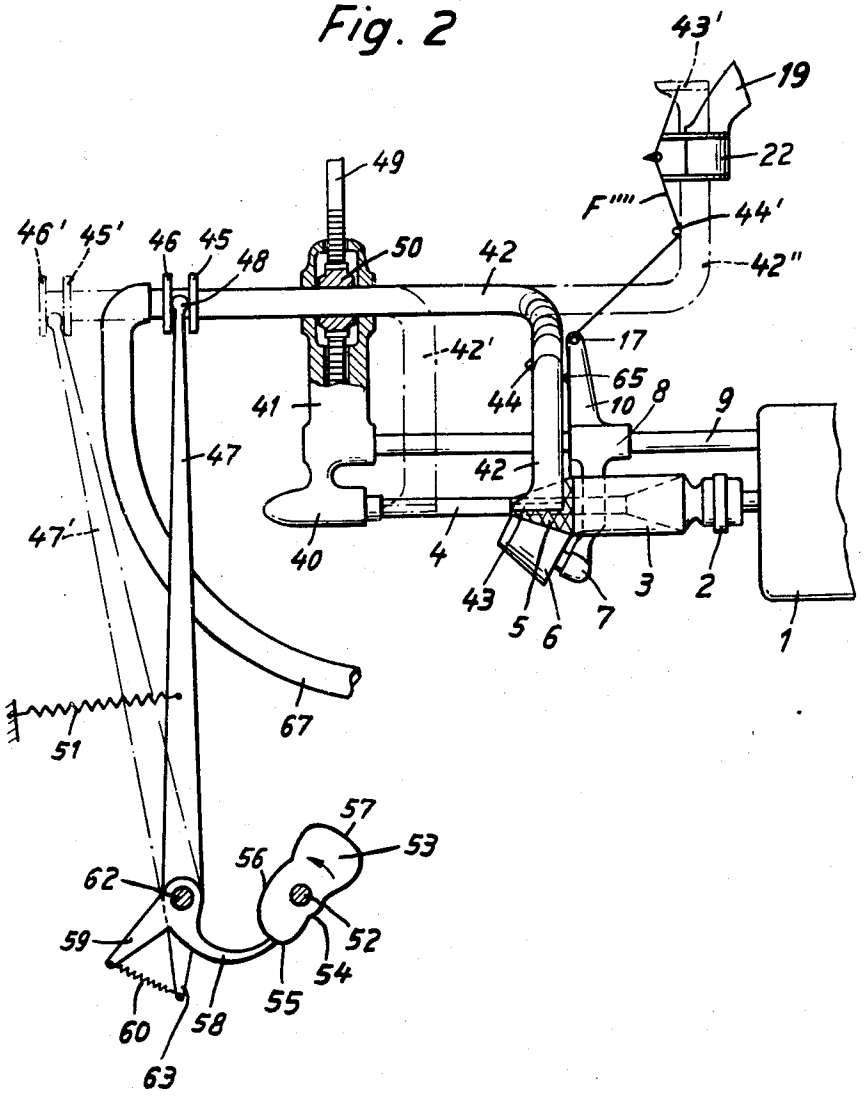
Stefan Fürst

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Fig. 2



INVENTOR.

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WINDING MACHINE WITH YARN-END FINDING AND TYING DEVICES

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

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7 Claims. (Cl. 242—35.6)

My invention relates to automatic machines for winding bobbins, cops, pirns and other packages of yarn and is particularly directed to machines for producing yarn packages of the axially built-up type such as conically tapering pirns for instance.

There are automatic coil winding machines provided with a device for the finding, guiding and tying of yarn ends. In the known machines of this type, the supply coil, the device for the tying of yarn ends, and the yarn entrance point of the take-up spool maintain in a fixed spacial relation to each other during yarn-tying or coil-exchanging operations. Such machines, however, are not applicable for the winding of pirns or other yarn packages that must be built up in the axial direction. If an attempt were made to automate the operating steps in such a pirn winding machine, then the axial build-up of the yarn package would require keeping the winding zone stationary, whereas the journaling and driving mechanisms for the take-up spool or yarn package must be made displaceable axially. This would result in a machine design in which a rather small number of machine components is mounted stationarily, whereas the great majority of components is longitudinally displaceable. The required technological expenditure and large space render such a design impracticable.

It is an object of my invention to obviate these disadvantages and to provide a winding machine for the winding of axially built-up packages that has a relatively small number of displaceable components as compared with those stationarily mounted and occupies much less space than heretofore required for axially operating winding machines with yarn-end finding and tying devices.

According to the invention, the yarn-end finding and conveying movements, required in addition to those serving for conveying the yarn ends to a tying device, are performed in the building-up direction of the take-up spool or approximately in that direction. According to one of the more specific features of the invention, these additional movements are performed by structural components which are mechanically associated with the yarn finding and yarn conveying members. According to another feature, however, the additional movements are performed by the finding and conveying members themselves.

The foregoing objects, advantages and features of my invention will be apparent from the following description taken in conjunction with the drawings in which:

Fig. 1 illustrates a front view of a pirn winding machine with additional devices for performing the above-mentioned movements in the building-up direction of the take-up spool, and

Fig. 2 shows the improved embodiment with a yarn-finding and conveying device which is additionally movable in the building-up direction of the take-up spool.

According to Fig. 1, a winder spindle 2 is revolvably mounted in a housing 1 of the spindle drive and is driven from an electric motor 73 mounted on the housing 1. During operation, a take-up spool 3 is entrained by the

spindle 2 so that a thread F is wound onto the core sleeve or quill 4 of the spool. During winding operation, the spool 3 is filled up axially so that a conical portion 5 is formed at the axially progressing winding zone. The cone 5 is engaged by a pressure roller 6 revolvably mounted on a holder 7. The holder 7 is secured to a hub 8 longitudinally displaceable on a guide rod 9 that extends parallel to the axis of the winder spindle 2. An arm 10 is rigidly joined with the hub 8 and carries a housing 11 in which a rack 12 is longitudinally displaceable. The rack 12 can be displaced by means of a Bowden wire 13 or other transmission.

A flexible suction hose 14 joined with the housing 11 and connects a source of vacuum pressure (not shown) with a suction tube 15 of a yarn-end finder device. Tube 15 is rotatably mounted on housing 11 and terminates into a suction nozzle 16. The suction tube 15 can turn into the broken-line position 15' in which the suction nozzle 16 occupies the position 16'.

The thread F passes over a thread guiding member 17 on housing 11 to a thread guide 18 which causes the thread to move back and forth along the conical portion 5 during the winding operation. The thread guide 18 may be designed as an oscillating arm, slider or as a loop- or drum-type thread guide, the particular design being not essential to the present invention. The thread guide 18 for reciprocating the oncoming thread is connected with the assembly of hub 8 so that the range of the reciprocating thread movement is axially displaced during the winding operation to make the winding zone at portion 5 gradually travel to the left.

The housing 1 of the drive has an upward extension 19 which carries a holder 20. Mounted on holder 20 is a removable magazine disc 21 with carrier pins on which the yarn supply coils 34 and 34' are stuck. Also mounted on the extension 19 are a tying device 22 and a pivot bearing 23 on which an entrainer 24 consisting of a suction tube is rotatable. The end of the entrainer tube 24 is provided with a suction nozzle 25. During pivotal motion of the entrainer 24, the suction nozzle 25 travels along a circular path indicated by a dot-and-dash line and denoted by 26. A rack 27 meshes with a spur gear segment (not illustrated) coaxially joined with the pivot portion of the entrainer tube 24. The extension 19 of housing 1 further carries two pivotally movable sensing members or thread guards 28 and 29, a thread tensioner 30, a thread cleaner 31, a fixed thread guide 32 and a cutter 33.

The supply coil in position 34' at the left of disc 21 in Fig. 1 is located in ready position. The end of the thread F' pulled off coil 34' passes to a suction nozzle 35 where it is kept in readiness for subsequent operation. The other supply coil, namely coil 34 visible at the right of disc 21 in Fig. 1, is positioned in the run-off position. Prior to the winding operation, the thread end F'' coming from the supply coil 34 also passes to the suction nozzle 35. This yarn end is subsequently conveyed to the tying device 22 where it is knotted together with the end of the yarn from take-up spool 3 so that, thereafter, the thread F coming from supply coil 34 is wound onto the take-up spool 3. Before describing this more in detail, it should be noted that a thread end conveyed by the suction nozzle 25 to the tying device 22 is denoted by F'''; a thread end wound off the take-up spool 3 by the suction nozzle 16 and conveyed thereby to the position 16' is denoted by F''''. The thread end F'''', after being placed into position 16' is shifted toward the right by thread deflection members 36, 37 moving along the lines 38, 39, until the members 36, 37 occupy respective positions 36' and 37'. In the position thus reached by the yarn end F'''', this end as well as the end F''' are located in the tying device 22 so that the tying operation can be per-

formed. All suction nozzles of the machine are preferably connected to the same suction source or vacuum.

The machine operates as follows:

When during winding operation, while thread F is running from supply coil 34 onto take-up spool 3, a thread break occurs, the drive motor 73 for the winder spindle 2 is automatically stopped in the conventional manner, for instance in response to operation of thread guard 29, and the winder spindle 2 is reversed for a short interval of time so that the thread end of spool 3 can be seized by the suction nozzle 16 of finder tube 15. Thereafter the tube 15 turns into position 15' thus placing the suction nozzle 16 and the entrained yarn end of spool 3 into the position 16'. The pivotal movement of suction tube 15 is effected by operation of the rack 12 under control by the Bowden wire 13.

The suction tube 24 of the entrainer device turns about its pivot axis so that its nozzle 25 moves along the circle 26 into the range of the yarn F passing from the supply coil 34 to the tensioner 30. The yarn end is seized by the suction nozzle 25, and the nozzle then turns along circle 26 into the range of the tying device 22. Now, the yarn deflector members 36, 37 are displaced along the lines 38 and 39 into respective positions 36' and 37', such displacement being effected by suitable control means such as a cam drive (as shown in Fig. 2) which also controls the operation of the other component devices of the machine. The displacement of the yarn entrainers 36, 37 deflects the thread, previously conveyed from the winding zone 5 of take-up spool 3, to the position 16' by the operation and pivotal motion of the suction nozzle 16, thus placing this yarn end into the position F''''. The yarn end of the supply coil, likewise conveyed to the suction nozzle 25, is also deflected by the deflectors 36, 37 into the position F''', so that both yarn ends F'''' and F''' are conveyed to the tying device 22 to be joined thereby in the known manner.

Since the path of the deflectors 36, 37 along lines 38, 39 extends parallel or approximately parallel to the building-up direction of the spool 3, it is irrelevant, with respect to the above-described operation, whether a thread break and the ensuing pivotal displacement of the suction tube 15 take place immediately after commencement of a winding operation or only after the spool 3 is nearly completed. In each displaced position 15' of the suction tube 15 the thread passing from the winding location 5 to the suction-nozzle position 16' is engaged and entrained by the members 36, 37 and is always placed into the same poistion 36', 37' in front of the tying device 22.

Upon occurrence of thread break the automatic operations are released in the known manner by the thread guard 29. When the supply coil 34 becomes depleted, the thread guard 29 responds to absence of the thread F between the thread guide 32 and the tensioner 30 and, by causing the magazine disc 21 to turn one step, shifts a new supply coil 34' into the run-off position so that the starting end of the thread from this new coil is now placed into the position F' from which it is fetched by the suction nozzle 25 and displaced along the circular path 26. During the return motion of the suction nozzle 25 the yarn end F'' is severed by the cutter 33 so that the thread F'' which is kept in readiness by the suction nozzle 35 is not pulled out of that latter nozzle.

The winding machine illustrated in Fig. 2 is largely similar to that described above with reference to Fig. 1, similar machine components being identified by the same reference numerals respectively.

According to Fig. 2, the core or quill 4 of the take-up spool or pirn 3 to be wound is journaled on a counter bearing 40 mounted on a housing 41. The suction tube 42 of a finder device is mounted in the upper portion of housing 41 and is rotatable as well as longitudinally displaceable relative thereto. The suction tube 42 terminates in a suction nozzle 43. Mounted on tube 42 are a thread guide 44 active only for preparing the tying operation, two stop rings 45, 46 and a flexible suction hose 67. The suction tube 42 is axially displaceable to the position 42' and also to the position 42'' and is simultaneously rotatable about its pivot axis. The axial displacement is controlled by a lever 47 whose upper end is straddled by the two stop rings 45 and 46. Pivotal rotation of tube 42 is imparted thereto by means of a rack 49 meshing with a pinion 50 which is joined with the tube 42, for instance by a key way, and is mounted within the housing 41.

The suction tube 42 of the finder device is longitudinally displaceable relative to pinion 50 but is not rotatable relative thereto. Upon longitudinal displacement and rotation of the suction tube 42 to the position 42'', the suction nozzle 43 occupies the position 43'. As in Fig. 1, the thread end brought to the tying device 22 is denoted by F''''.

When lever 47 has displaced the suction tube 42 toward the left into the position 42', the lever occupies the broken-line position 47' and places the stop rings 45, 46 into respective positions 45', 46'. Lever 47 is biased counterclockwise by a spring 51 and is controlled by means of a cam disc 53. Cam 53 is rotatable on a stationarily journaled shaft 52 and has several sequential cam portions 54, 55, 56 and 57. A follower lever 58 slides on the cam periphery of disc 53 and has an arm 59 biased by a spring 60. Spring 60 is attached to an extension 63 of lever 47 and is stiffer than the spring 51. The lever 58, 59 is pivotally mounted on a stationary pivot pin 62 which also forms the pivot for lever 47.

The above-mentioned arm 10 of hub 8 is provided with a stop 65 for limiting the axial displacement of suction tube 42 toward the right. When tube 42 is shifted axially into abutment with stop 65, the nozzle 43 is located immediately in front of the winding zone at coil portion 5 regardless of where that zone may be located at that time.

During winding operation of the machine shown in Fig. 2, the suction tube 42 of the finder device is at first in the position 42'. When, in response to thread break, the automatic control means commences to operate, the suction tube 42 at first moves into the illustrated full-line position. That is, it moves toward the right until it abuts against the stop 65 of the arm 10. Then the suction nozzle 43 has reached the conical winding range 5 of the take-up spool 3. The just-mentioned displacement of suction tube 42 is effected under control by the cam disc 53. Due to rotation of this disc, the cam follower 58, after passing along cam portion 54, enters onto the cam portion 55. As a result, the follower 58 with arm 59 are turned clockwise about pivot 62. The spring 60 pulls extension 63 and thus lever 47 in the same direction so that, by action of the lever end 48 and stop rings 45 and 46, the suction tube 42 is shifted toward the right until the motion is terminated by the stop 65. The further motion of lever 58 and arm 59 is taken up by the spring 60 which now becomes more tensioned.

Thereafter, the winder drive is effective to temporarily turn the take-up spool 3 in the reverse direction so that the loose thread end from spool 3 is sucked up by the suction nozzle 43. After seizure of the thread end, the nozzle tube 42 is turned by means of rack 49 and pinion 50 and is simultaneously displaced toward the right so that it occupies the position 42'' and suction nozzle 43 is in position 43'. For inserting the thread end F'''' into the tying device 22, the thread guide 44 on suction tube 42 is effective to entrain the thread F'''' when turning into the position 44' during the rotating motion of the suction tube. The movement toward the right of suction tube 42 is likewise controlled by the cam disc 53 whose cam portion 56 passes along the follower lever 58 before the cam portion 57 becomes effective. As a result, the lever 63, 47 is turned clockwise to such an extent that the suction tube 42 occupies the position 42'. The thread coming from the supply coil can then be conveyed to the tying device in the same manner and by the same means as described above with reference to Fig. 2.

The embodiment of Fig. 2 differs from that of Fig. 1 fundamentally by the fact that the yarn-seizing suction tube 42 of the finder device is capable to perform a rotating motion about its pivot axis as well as longitudinal motion in the building-up direction of the take-up spool. It is therefore irrelevant, for properly seizing the yarn end, whether the winding of take-up spool 3 has just commenced or is nearly completed at the moment a thread break occurs. In each event, the suction tube 42 is first moved axially to the stop 65 in order to automatically feel itself into the necessary proximity to the conical winding zone regardless of where that zone may be located at that instant.

The above-described pivotal motion of the finder-device suction tube is effected by the control means of each individual winding station, whereas the axial displacement, in a multi-station machine, may be effected by drive means common to several winding stations.

It will be apparent to those skilled in the art, upon a study of this disclosure, that my invention permits of various modifications and can be embodied in devices other than those particularly illustrated and described herein, without departing from the esesntial features of my invention and within the scope of the claims annexed hereto.

I claim:

1. Machine for winding axially built-up yarn packages, comprising a holder for a supply coil, spooling means for accommodating the package to be wound, thread guiding devices defining a path for thread from said holder to said spooling means, a thread tying device near said path, an entrainer device having a first thread-end seizing member movable from a path location near said holder to said tying device for conveying the thread end of said supply coil to said tying device, a finder device having a second thread-end seizing member movable from said spooling means to said tying device for conveying to said tying device the thread end of the package to be tied together with said supply-coil end, said seizing member of said finder device being displaceable in axial direction of said spooling means and being also movable in radial direction relative to said spooling means for conveying the package thread end from said spooling means to said tying device.

2. Machine for winding axially built-up yarn packages, comprising a holder for a supply coil, spooling means for accommodating the package to be wound, thread guiding devices defining a path for thread from said holder to said spooling means and having a guide means engageable by the thread near said spooling means, said guide means being reciprocable along a fractional portion of the axial length of the package to be wound and having a stroke range axially displaceable along said spooling means whereby an axially built-up yarn package is wound, a thread tying device near said path, an entrainer device having a first thread-end seizing member movable from a path location near said holder to said tying device for conveying the thread end of said supply coil to said tying device, a finder device having a second thread-end seizing member movable from said spooling means to said tying device for conveying to said tying device the thread end of the package to be tied together with said supply-coil end, said seizing member of said finder device being displaceable in axial direction of said spooling means into said stroke range and being also movable in radial direction relative to said spooling means for conveying the package thread end from said stroke range to said tying device.

3. Machine for winding axially built-up yarn packages according to claim 2, comprising displacing mechanism connected with said thread guide means and with said second seizing member for jointly displacing both in the axial direction of said spooling means.

4. In a machine according to claim 2, said second seizing member being axially displaceable independently of the axial stroke displacement of said thread guide means and having a normal position axially remote from said stroke range, and control means connected with said second seizing member for axially displacing it from said inactive position into said range prior to operation of said tying device.

5. Machine for winding axially built-up yarn packages, comprising a holder for a supply coil, spooling means for accommodating the package to be wound, thread guiding devices defining a path for thread from said holder to said spooling means and having a guide means engageable by the thread near said spooling means, said guide means being reciprocable along a fractional portion of the axial length of the package to be wound and having a stroke range axially displaceable along said spooling means whereby an axially built-up yarn package is wound, a thread tying device near said path, an entrainer device having a thread-end seizing member movable from a path location near said holder to said tying device for conveying the thread end of said supply coil to said tying device, a finder device having a suction tube provided with a suction nozzle, said suction tube being rotatable and having an axis of rotation parallel to the axis of said spooling means, and said suction tube being axially displaceable along said axis of rotation for shifting said nozzle into said stroke range to seize the thread end at the spooling means, and said nozzle being located at said tying device when said tube is rotated away from said range, whereby said nozzle conveys said latter end to said tying device to be tied together with said other thread end.

6. A machine according to claim 5, comprising a support displaceable axially along said spooling means, said thread guide means being mounted on said support whereby displacement of said support causes displacement of said stroke range, and said suction tube having a pivot bearing mounted on said support and defining said axis of rotation so that said nozzle is displaced axially together with the stroke-range displacement of said thread guide means, and a control mechanism connected with said suction tube for rotating it in said pivot bearing.

7. A machine according to claim 2, comprising first control means connected with said finder device for imparting radial movement to said second thread-end seizing member, and a drive having a transmission connected with said finder device for axially displacing said second seizing member independentliy of said radial movement.

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CERTIFICATION OF CORRECTION

Patent No. 2,954,178 September 27, 1960

Stefan Fürst

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

In the grant, lines 1 and 2, and in the heading to the printed specification, lines 4 and 5, the address of the inventors, for "Gladbach, Germany", each occurrence, read -- M.Gladbach, Germany --.

Signed and sealed this 25th day of April 1961.

(SEAL)

Attest:

ERNEST W. SWIDER
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Commissioner of Patents