March 6, 1962 S. FÜRST 3,023,974

COP SUPPLY MECHANISM FOR WINDERS

Filed Feb. 14, 1957

FIG. 1

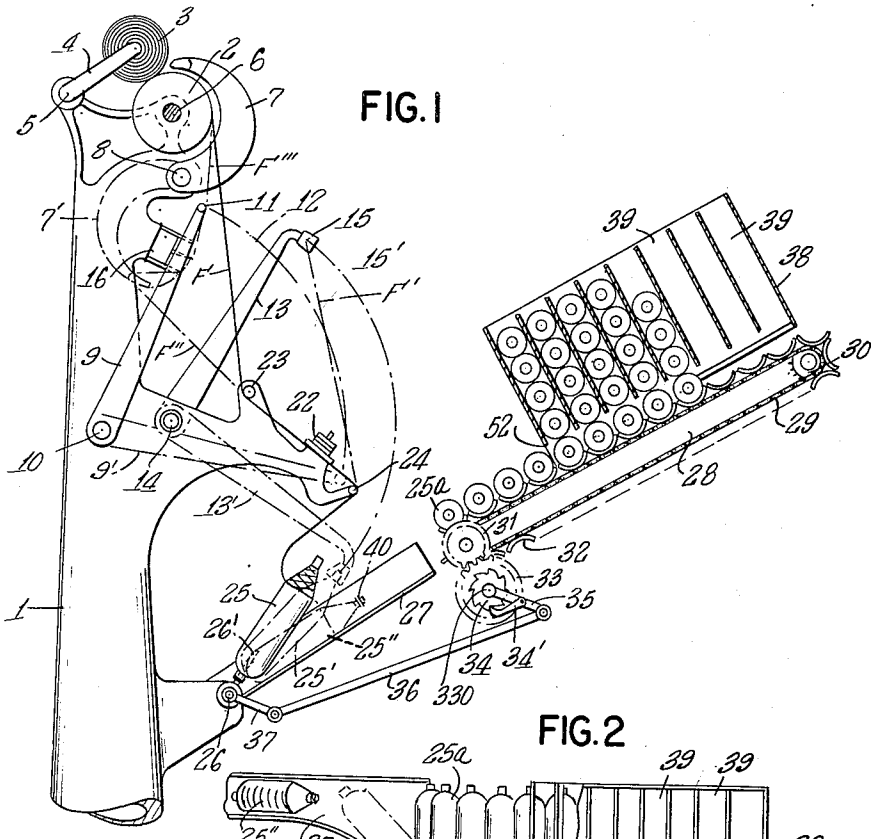


FIG. 2

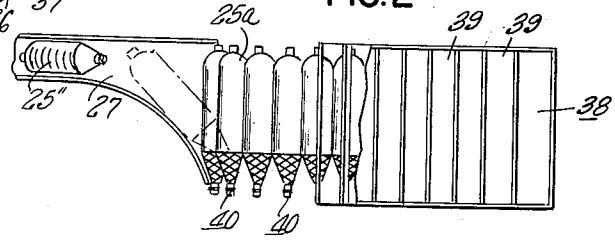


FIG. 3

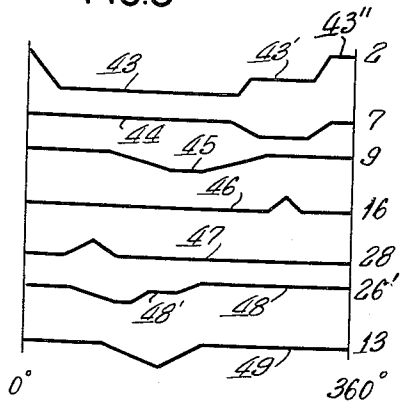
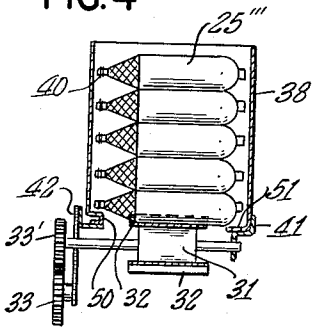


FIG. 4



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COP SUPPLY MECHANISM FOR WINDERS

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

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4 Claims. (Cl. 242—35.6)

My invention relates to automatic or partially automatic yarn-winding machines for winding a body of yarn taken from a number of individual yarn-supplying coils, in sequence.

Such yarn-winding machines, as a rule, are provided with a magazine which accommodates one or more yarn-supplying coils. When a supply coil is completely unwound, it is discharged from the machine and the next following coil is moved from the magazine into the unwinding position, whereafter the starting end of the coil is tied together with the yarn end coming from the take-up winding being wound. The supply coils, which may consist of bobbins, cops or any other type of wound bodies of yarn, are hereinafter briefly referred to as "cops" and, for distinction, the larger body of yarn to be wound is referred to as "take-up winding." Neither term is intended to be limited to any particular shape or winding type.

The insertion of the yarn-supplying cops into the magazine on the winding machine is time-consuming. Furthermore, the necessity of repeatedly manipulating the cops on their way from the spinning plant to the rewinding machine involves the danger of damage to the cops. For these reasons, the conventional operation leaves much to be desired.

It is an object of my invention to eliminate the above-mentioned disadvantages.

According to my invention, therefore, the cops or other coils of yarn to be rewound in the winding machine, are arranged in a separate, transportable magazine at a location away from the winding machine and at a time which precedes the rewinding operation proper. The magazine is subsequently placed into the winding machine from which stored coils or cops are automatically offered to the winding mechanisms of the machine. The orderly insertion of the cops into the magazine is preferably effected, manually or automatically, at the spinning machine, although such sorting or inserting may also be done as an intermediate step between the spinning plant and the coil-winding machine. The starting ends of the yarn wound upon each cop contained in the receiving device are seized in the winding machine by suitable entraining devices which transfer the yarn end to a tying mechanism, whereafter the resulting cuttings of yarn, after formation of a knot, are sucked off. The finding and seizing of the starting end of the yarn takes place while the cop is in a position different from the ultimate unwinding position in the machine.

The device for performing the method according to the invention is characterized as follows. A receiving device or magazine for spinning cops is provided, and is filled by hand, or mechanically in an operating or sorting step which precedes the rewinding operation. A mechanical sorting machine is described in companion application Serial No. 642,529, filed February 26, 1957, by Walter Reiners and Stefan Fürst. The receiving device is then placed in front of a winding location of an automatic winding machine, where it serves as a feeder magazine, in cooperation with a conveyor. During each exchange of the yarn supplying coil a replacement spinning cop is released or transferred from the magazine to the receiving thorn of the winding machine. Thereafter a gripper seizes the leading yarn end of the cop so received, and transfers it to the tying device of the winding unit

for the purpose of knotting the yarn end to the trailing end of the body of yarn being wound. According to one aspect of the invention the magazine has a coil-receiving capacity greater than the capacity of the movable conveying device that transfers the cop to the unwinding location proper. The magazine at the winding station, and the conveyor, are so constructed that after complete exhaustion or removal of the magazine, the winding station continues to be supplied with coils, and consequently remains in operative condition for a period of time comprising several coil exchanging operations.

It will be understood from the above that the yarn coils to be rewound are sorted into a receiving device in a step which precedes the rewinding operation and which takes place manually or automatically at the spinning machine, or which takes place between the spinning plant and the winding plant, as described in the above-mentioned copending application Serial No. 642,529 of Walter Reiners and Stefan Fürst. In the present invention, the maginze automatically offers the sorted coils to the winding machine. All of the sorted coils preferably have a reserve yarn winding on one end, these windings being longitudinally aligned in the magazine. The seeking and seizing of the yarn starting end preferably takes place before the cop is in unwinding position. One consequence of this is that the yarn end pulled off remains taut, and since further unwinding is hampered or prevented by the deflection in direction of the yarn. Each cop is released from the magazine, at the winding location, during each cop exchanging operation, a gripper thereafter seizing the yarn starting end and transferring it to the knotting device. The magazine has a greater capacity for cops than the conveyor under it, and when the magazine is emptied several cops are present on the conveyor, to serve as reserve to permit the operation to continue until another magazine can be placed on the conveyor.

The above-mentioned and more specific objects and features of the invention will be apparent from the preferred embodiment of a coil-winding machine illustrated on the drawings, and described hereinafter. In the drawings:

FIG. 1 il'ustrates a single coil-winding station of an automatic winding machine, equipped with a magazine and cop supply device.

FIG. 2 is a top view of a magazine device corresponding to that shown in FIG. 1.

FIG. 3 is an explanatory figure illustrating motion diagrams or time curves of movements of various elements of the machine; and

FIG. 4 is a vertical cross section of the collecting magazine shown in FIGS. 1 and 2.

In a machine frame 1 designed as a suction conduit, there is rotatably journalled a yarn-guiding drum 2 which drives a take-up spool 3. The spool 3 is journalled on a spool frame 4 pivotally mounted about pivot 5 on the machine frame 1. The yarn-guiding drum 2 is mounted on a rotatably journalled shaft 6. A suction tube 7 is pivotally rotatable about a pivot 8 and can be turned into a position 7'. A lever 9, designed as a suction tube and gripper, is pivotally mounted at 10 on the machine frame 1. The upper end 11 of lever 9 is designed for the reception of the yarn. The lever 9 turns along a circular path 12 into a position 9'. Built into the machine frame 1 is a tying device 16, of known design. A lever 13 is pivotally mounted at 14 on the machine frame 1. The upper end 15 of lever 13 is designed for the seizing and gripping of the yarn-starting end. The lever 13 turns along a circular path 15' into the position 13'. A yarn tensioner is denoted by numeral 22. A yarn-guiding pin is designated 23. Located near the yarn tensioner 22 is another yarn-guiding pin 24. The yarn F coming from a supply coil 25 is passed about the guiding pin 24. The

supply coil 25 is received on thorn 26' mounted on a pivot 26. It can be turned into the position 25' and 25''. The coil is speared upon the thorn through its lower open core end. The lead-off position 25 must be centered with guide 24 while the end pickup position 25' is arranged so that gripper 15 on arm 13 does not interfere either with the guide 24 or with chute 27.

After a new coil is transferred into the intermediate position 25', the yarn is taken off by gripper end 15 of lever 13, and reaches the straight-line position F' between guide pin 24 and gripper 15. After such transfer into this position, the arm 9 turns downward. The opening 11 of the arm 9, thus travelling, intersects the path of the yarn F' and entrains the yarn when the arm returns from position 9' back into the position 9. Thereafter, the seeker arm 7, after bringing the other yarn end from coil 3, turns clockwise back into its lower position 7'. During this clockwise travel, the arm 7 seizes the yarn which now extends between members 24 and 11 in an intermediate non-illustrated position, due to the transfer from the position F'. The yarn is then seized from the latter position by arm 7 with the aid of a projection at the front end of the arm. This projection is visible in the position 7' where the yarn, after return of the arm into position 7', is in the position F''. During this turning motion of arm 7 in the downward direction, the yarn coming from below and the yarn coming from above arrive in front of the knotter 16, where the two yarn ends are tied together. The running of the yarn beneath the tensioner 22 and behind the yarn guide 23 thus takes place automatically.

When the yarn is broken, then the loose end is located between the yarn tensioner 22 and the yarn guide 24. There it is entrained, during the downward turning motion of arm 9, and is brought to position F' in the same manner as described above for the yarn coming from a new coil.

Mounted on the standard 1 of the machine frame structure is a slideway 27. A cop-conveying device 28 forms an upward extension of slideway 27 and is equipped with an endless conveyor chain 29 guided about rollers 30 and 31. The conveyor chain is provided with transverse receiving trays 32. The trays are segments of a cylinder and are fixedly or pivotally attached to the chain 29 in known manner. The roller 31 is driven by a spur gear 33. The shaft 330 of gear 33 carries a ratchet 34 engageable by a ratchet pawl 34' which is pivoted to an arm 35. Arm 35 is pivotally linked by a connecting rod 36 to an arm 37 mounted on the pivot shaft 26 of the thorn. Reciprocating movement of connecting rod 36 and arms 37, 35 causes the gear 33 to advance the conveyor chain 29 one step. The trays 32 receive respective yarn-supplying cops 25*a* taken from a coil-receiving device or magazine 38. The magazine 38 is partitioned into a number of cop-receiving portions or chutes 39. Each cop, as usual, has a body of yarn wound crosswise upon a core such as a hollow tube. The starting end or reserve of the yarn on each individual cop is wound about one end of the core in parallel turns 40. The magazine device 38 is placed upon guide rails 41 and 42 (FIG. 4), being provided with flanges 50, 51. The trays 32 of the conveying device 28 pass through the bottom opening 52 of the magazine structure.

In the following description of the operation of the machine, reference will be made to the motion diagrams in FIG. 3. The various curves can be taken as representative of the actuating surfaces of conjointly driven cams which produce the desired automatic sequence of operations. The 0° position denotes the starting of the cop-exchanging operation which takes place when a previously unwound cop 25 is to be replaced by another cop delivered from the magazine 38. The 360° position denotes the end of the coil-exchanging operation and beginning of the following period in which the yarn from the substituted cop is wound onto the material on take-up spool 3. The curve 43 indicates the changes in rotating speed of the yarn-guiding drum 2. Curve 44 denotes the changes in motion of the suction tube 7, time curve 45 the motion of suction lever 9, curve 46 the operation of the tying device 16. Curve 47 indicates the motion and time relation of the cop-supplying conveyor device 28. Curve 48 relates to the movement of the thorn 26' and curve 49 indicates the motion of the suction lever 13.

The yarn portion extending from the supplying cop 25 to the head 15 of suction lever 13 is denoted by F'. During the cop-exchanging operation, this yarn portion is at F'', in which position it extends between the yarn tensioner 22 and the suction tube 7, then turned into the position 7'. At the same time a trailing yarn end F''' extends from the take-up spool 3 to the suction tube 7 in its position 7'.

The operation of the device is as follows. During exchange of a supply coil, the transfer of the broken yarn ends takes place substantially in accordance with German Patent No. 923,415 resp. U.S. Patent 2,769,599 as well as that described in the copending application to a Method and Device for Seizing, Positioning and Tying of Starting End of Yarn to be Wound, filed by Walter Reiners and Stefan Fürst, February 14, 1957, Serial No. 640,166, now Patent No. 2,936,130. However, in the present case the yarn end of the replacing coil is seized after the coil is speared on the thorn. During each such coil-exchanging period, the lever 13, which turns with its end 15 during the coil-exchanging operation along the circular path 15' into the position 13', seizes a yarn-starting end 40 by means of the gripper 15. During upward movement of lever 13, the yarn end 40 of the supply coil now in position 25' is transferred to the position F' where, at the proper moment, it is moved to the device for connecting the ends of the yarn, the connecting operation being as described in the German Patent No. 923,415 resp. U.S. Patent 2,769,599 as well as in the copending application referred to immediately above.

The time sequence of the individual movements, during the above-described cop-exchanging, yarn-finding and tying operations, is as follows. During the coil-exchanging operation, commencing at the initial moment, the thread-guiding drum 2 which, in addition to guiding the yarn, also drives the take-up spool 3, is switched over to run at slow speed in the reverse direction as is apparent from curve 43. The end of the yarn on spool 3 which previously ran onto the spool, now is returned into the range of suction tube 7 so that the yarn end is sucked into the interior of tube 7. During this sucking operation of tube 7, the thorn 26' on pivot shaft 26 and hence also the arm 37, rod 36 and arm 35 are moved clockwise by operation of gear 33 and ratchet 34 and pawl 34' through an angle which corresponds to one conveying division of the conveyor chain 29 which simultaneously has its top run travel toward the left. As a result, the lowermost cop 25*a* is discharged onto the slideway 27 and drops into the position shown at 25'' by dot and dash lines. In this position, the cop is speared onto the thorn 26' from which the previously uncoiled cop 25 has been removed. The movement of the thorn 26' into the proper spearing position is apparent from the motion diagram in FIG. 3, and the operation of the releasing motion that causes the cop 25*a* to pass into spearing position is represented by time curve 47. After spearing the cop, the thorn 26 turns upwardly into an intermediate position according to portion 48' of time curve 48. The cop is now in the position 25'. The suction lever 13 turns downwardly according to time curve 49 and, when in its lowermost position 13', places its suction head 15 over the top of cop 25 so that the starting end 40 of the yarn on cop 25' is seized. Immediately thereafter the suction lever moves back into the position 13 and takes the starting end of the yarn along so that the yarn portion coming from the cop now extends between the guide pin 24 and the suction head 15 as shown at F' in FIG. 1. Now, the suction

lever 9 turns from position 9' about pivot 10 upwardly according to time curve 45 in FIG. 3. The suction lever 9, upon passing its suction end 11 along the thread portion F', seizes the yarn and moves it in the direction of the tying device 16, as is more fully described in the German Patent No. 923,415 resp. U.S. Patent 2,769,599. At about the same time, the suction tube 7, containing the yarn end F''' coming from the take-up spool 3, turns downward into the position 7'. As a result, the yarn end F''' is likewise supplied to the tying device 16. The yarn end coming from the supplying cop 25 is diverted by the suction tube 7, when in position 7', so that the yarn end occupies the position F''. Now the two yarn ends F'' and F''', coming from the cop 25 and the spool 3 respectively, are arranged side by side in the tying device 16 so that they can be knotted together in the known manner. In the meantime, the yarn-guiding drum 2 is stopped according to the portion 43' of time curve 43 in FIG. 3. The tying device 16 is now actuated in accordance with time curve 46 while the guiding drum 2 and the take-up spool 3 remain at rest. Upon completion of the tying operation, the guiding drum 2 is again started to run in the forward direction in accordance with portion 43'' of time curve 43. This commences the yarn rewinding operation in the conventional manner so that the yarn F coming from cop 25 is wound onto the spool 3.

The automatic sequence of operations is carried out by conventional means. The oscillation of levers 7, 9, and 13 is actuated by three follower levers and three cams preferably on one rotating shaft. The guide drum is reversed by means of cam controlled reversing gears. This is described in the companion application of Walter Reiners and Stefan Fürst, referred to above, Serial No. 640,166, now Patent No. 2,936,130. The oscillation of the thorn pivot 26 is similarly obtained by a cam and lever follower. The pivot is turned, to the left for example, to reject the empty cop when a sensing device determines that the yarn end has left or is about to leave the depleted cop.

It will be obvious to those skilled in the art, upon study of this disclosure, that the invention is not limited to the particular embodiment described and illustrated herein, but may be modified without departing from the essential principles and features of the invention, and within the scope of the claims annexed hereto.

I claim:

1. For use in a winding machine which rewinds yarn from a yarn supply into a yarn package, a device for automatically feeding full supply bobbins to replenish said supply, comprising a magazine having a plurality of partitions forming compartments for holding full supply bobbins having respective bobbin tips all oriented in the same direction, said magazine having fixed thereto inwardly protruding side flanges defining a lower opening shorter than the length of a bobbin to support a stack of bobbins in each compartment on said flanges during transportation of a loaded magazine from a remote location, each partition having one end spaced above said flanges to form passage openings for advance of lowermost bobbins of said compartments along a path parallel to and above said flanges and to exit from said magazine only through said passage openings between said ends and said flanges, a conveyor disposed in position to receive the bobbins from the passage openings between said ends and said flanges for transferring the bobbins one at a time to a predetermined discharge location at the winding machine, said magazine being removably mounted and defining a magazine unloading location over said conveyor for ready exchangeability with other magazines so that a magazine can be filled with said supply bobbins at said remote location and be readily exchanged for the magazine positioned at said unloading location without causing delay in the frequency of said transferring of the bobbins, said conveyor having a plurality of individual receiver means each positionable through said lower openings to receive one oriented bobbin from the magazine and to advance same along said path through said passage openings, and means to actuate said conveyor to discharge from one of said receiving means a bobbin with its bobbin tip oriented in a predetermined direction when said supply is exhausted.

2. The device defined in claim 1, said compartments being arranged to be emptied in sequence into respective individual receiver means, the compartment which is positioned to empty last having its bottom opening located over a particular receiving means which is at least one bobbin removed from said one receiving means which is discharging a bobbin, whereby a storage of a plurality of bobbins is provided between said magazine and said discharge location to effect the continuance of the bobbin feeding without causing delay in the operation of the winding machine due to absence of yarn supply while an empty magazine is being exchanged for a full one.

3. The device defined in claim 1, said magazine having a bobbin holding capacity greater than the bobbin carrying capacity of said conveyor.

4. For use in a winding machine which rewinds yarn from a yarn supply into a yarn package, a device for automatically feeding full supply bobbins to replenish said supply, comprising a magazine having a plurality of partitions forming compartments for holding full supply bobbins having respective bobbin tips all oriented in the same direction, said magazine having fixed thereto inwardly protruding side flanges defining a lower opening shorter than the length of a bobbin to support a stack of bobbins in each compartment on said flanges during transportation of a loaded magazine from a remote location, each partition having one end spaced above said flanges to form passage openings for advance of lowermost bobbins of said compartments along a path parallel to and above said flanges and to exit from said magazine only through said passage openings between said ends and said flanges, a conveyor disposed in position to receive the bobbins from the passage openings between said ends and said flanges for transferring the bobbins one at a time to a predetermined discharge location at the winding machine, said magazine being removably mounted and defining a magazine unloading location over said conveyor for ready exchangeability with other magazines so that a magazine can be filled with said supply bobbins at said remote location and be readily exchanged for the magazine positioned at said unloading location without causing delay in the frequency of said transferring of the bobbins, said conveyor having a plurality of individual receiver means each positionable through said lower openings to receive one oriented bobbin from the magazine and to advance same along said path through said passage openings, means to actuate said conveyor to discharge from one of said receiving means a bobbin with its bobbin tip oriented in a predetermined direction when said supply is exhausted, said conveyor comprising gear means operably connected thereto for advancing said receiving means, said means to actuate the conveyor comprising ratchet means mounted for causing rotation of said gear means, a pawl engageable and disengageable with said ratchet means for stopping and starting rotation thereof, and an actuating rod operably linked to said pawl, whereby reciprocating movement of said rod causes said gear means to advance the conveyor with its receiving means one step.

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