Feb. 16, 1965 J. R. WHITE 3,169,361

METHOD AND APPARATUS FOR CONTROLLING THE PROCESSING OF FILAMENTARY MATERIAL

Filed Feb. 14, 1963 2 Sheets-Sheet 1

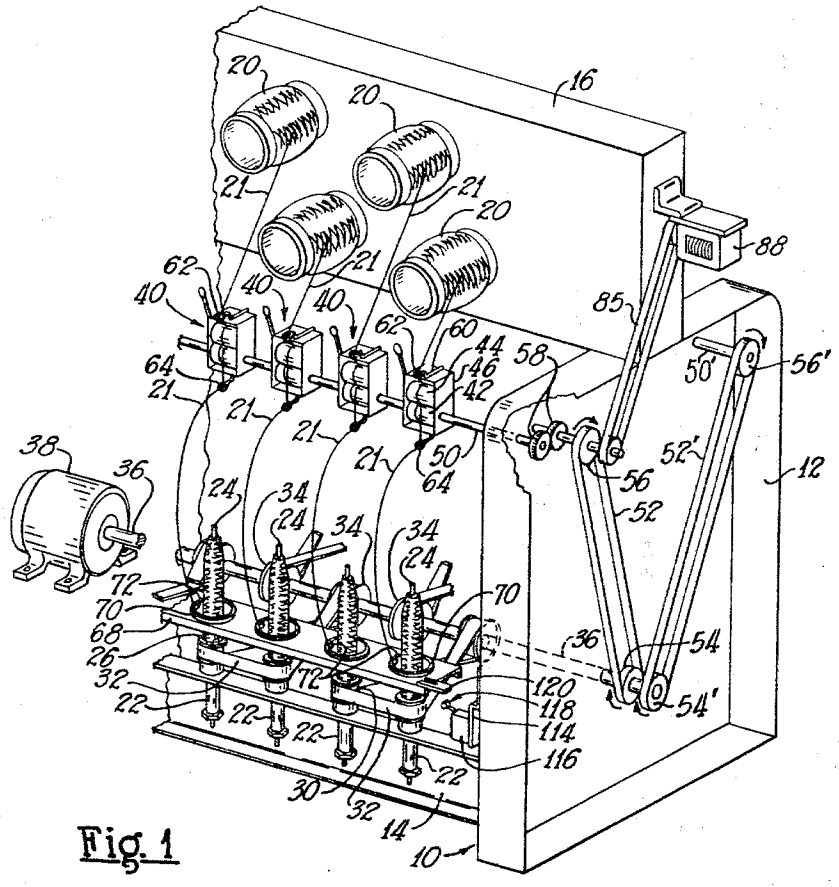


Fig. 1

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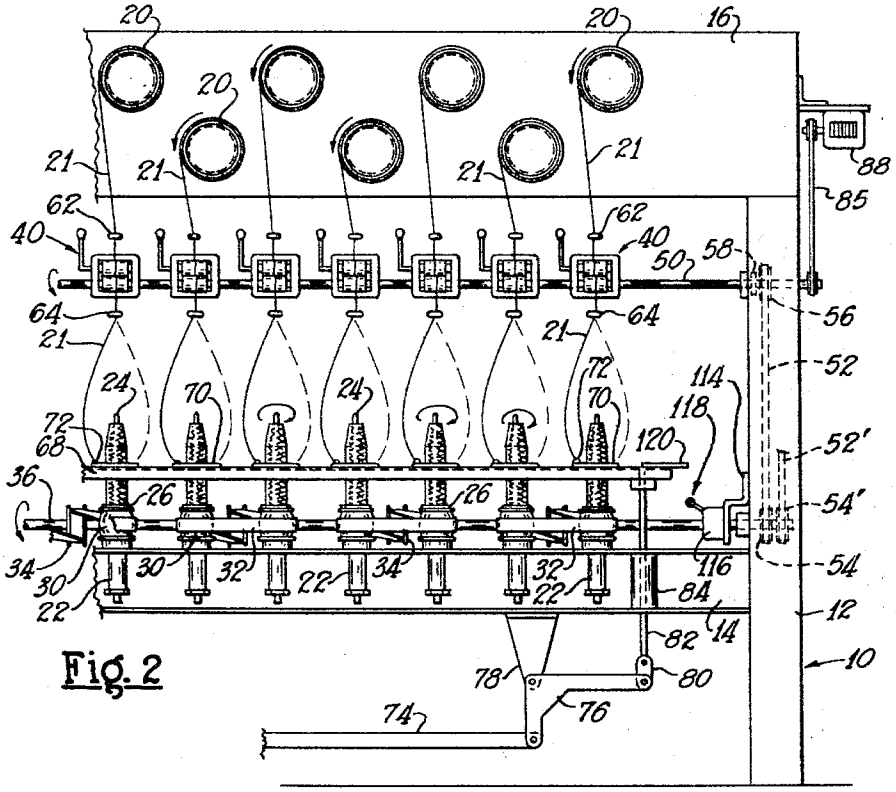


Fig. 2

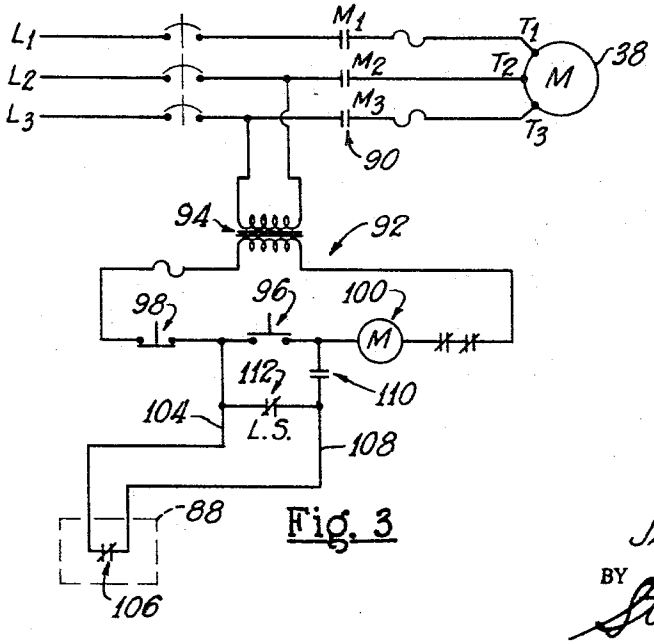


Fig. 3

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United States Patent Office 3,169,361 Patented Feb. 16, 1965

3,169,361

METHOD AND APPARATUS FOR CONTROLLING THE PROCESSING OF FILAMENTARY MATERIAL

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Filed Feb. 14, 1963, Ser. No. 258,463
9 Claims. (Cl. 57—79)

The invention relates to method of and apparatus for processing filamentary materials and especially to a method and apparatus for controlling the operation of a twister and more specifically to a method and means of controlling the relative position of the ring rail at the completion of a twisting operation.

It has been conventional practice in the textile industry to transfer or wind filamentary materials from supply packages onto bobbins or spindles rotating at high speeds and, through the medium of a ring traveler or flyer carried by a ring rail, to impart twist to the filamentary material as it is collected upon a bobbin or a spindle of a twister apparatus. A twister of conventional character is provided with a large number of bobbin carrying spindles which are simultaneously driven at the same speed in order that the same amount of twisted material or yarn is collected on each spindle.

It is imperative that the bobbins have substantially the same amount of yarn to insure uninterrupted weaving or knitting operations. It is conventional to employ a mechanically actuated counting device adapted to be manually preset or adjusted to meter the total yardage to be placed on the bobbins and when such amount of the filamentary material is transferred to the bobbins, the yardage counting device actuates means for interrupting the circuit to the spindle drive motor bringing the motor and spindles to a stop.

The interruption of the motor circuit occurs irrespective of the relative position of the ring rail which is adapted for vertical reciprocatory movement. The ring rail may therefore stop in any position and unless such stoppage occurs at its uppermost or lowermost position, difficulties are encountered in removing the bobbins from the spindles.

This invention embraces a method of and apparatus for controlling the operation of the motor driving the twister spindles and ring rail to condition the motor circuit when a predetermined yardage of filamentary material has been wound on the bobbins, to effect continued rotation of the motor until the ring rail is moved to a predetermined position at which the motor is automatically de-energized.

Another object of the invention is the provision of a method of and apparatus for effecting an interrelation between a yardage counter actuated means and a ring rail actuated means to effect an interruption of the motor circuit upon transfer of predetermined yardage to the collector bobbins and after the ring rail is moved to a position facilitating easy removal of filled bobbins and installation of empty bobbins on the twister spindles.

Further objects and advantages are within the scope of this invention such as relate to the arrangement, operation and function of the related elements of the structure, to various details of construction and to combinations of parts, elements per se, and to economies of manufacture and numerous other features as will be apparent from a consideration of the specification and drawing of a form of the invention, which may be preferred, in which:

FIGURE 1 is an isometric view of a portion of a textile strand or yarn twisting or packaging apparatus embodying an arrangement for performing the method of the invention;

FIGURE 2 is a side elevational view of the portion of the twister mechanism or apparatus illustrated in FIGURE 1, and

FIGURE 3 is a schematic view of the motor control circuit and components for controlling the operation of the twister.

Referring to the drawings in detail and initially to FIGURES 1 and 2, there is illustrated a twister apparatus which is inclusive of a frame **10** comprising end plates **12**, one of which is shown in the drawings, the end plates being connected by means of spindle supporting bolster rails **14** at each side, one of which is shown, and by a supply package mounting structure **16**. The structure **16** is provided with suitable mandrels (not shown), each mandrel supporting a supply package **20** of strand or other filamentary material to be twisted or processed by the apparatus.

Each of the longitudinally extending bolster rails **14** supports a plurality of spindles through the medium of bolster members **22**, each of the bolster members **22** journally supporting a spindle **24**. Each of the spindles **24** is adapted to accommodate a spool or bobbin **26** upon which is wound the strand or filamentary material **21** from an individual supply package **20**. Each spindle is provided with a whorl **30** and the whorls of each pair of spindles are driven by direct contact with a driving belt **32**.

Each of the driving belts **32** engages or takes over a driving pulley **34**, there being a driving pulley for each belt **32**. The driving pulleys **34** are fixedly mounted upon a longitudinally extending drive shaft **36** journaled in suitable bearings carried by the end plates **12** of the frame **10**, the shaft **36** being driven by an electrically energizable motor **38** mounted at one end of the twister frame construction. The twister apparatus includes means for feeding or advancing the strand material **21** from the packages **20**, there being an individual feeding means or unit **40** for each strand at a bobbin winding station.

In the embodiment illustrated, the means for feeding or advancing the filamentary material or strand comprises pairs of feed rolls, each unit comprising rolls **42** and **44** journally supported in a housing or casing **46**, the material feeding units being of conventional construction. The rolls **42** and **44** are driven through suitable friction means from a single shaft **50** which is rotated by a belt **52** engaging a drive pulley **54** on the shaft **36** and engaging a driven pulley **56** adapted through gearing **58** to rotate the shaft **50** at the proper speed.

As shown in FIGURE 1, a similar drive is provided for the companion shaft **50'** driving the feed roll units for the strands at the opposite side of the twister apparatus through a belt **52'** driven by pulley **54'** on the shaft **36** which engages a driven pulley **56'** for the roll feed shaft **50'**. Each of the material feeding units **40** is inclusive of a member **60** having an eye **62** through which passes the strand **21** from the package **20**. The strand is threaded between the driven rolls **42** and **44** and through a guide eye **64**, as shown in FIGURE 1.

The member **60** is connected with conventional cam means within each feed roll unit establishing a friction drive to the feed rolls to advance the strand during the period that the strand **21** is tensioned between the eye **62** in the member **60** and the supply package. In the event of breakage of a strand between the feed rolls and the adjacent strand package, the member **60** is automatically moved by reason of the lack of tension of the strand to disengage the drive for the adjacent feed unit.

The twister apparatus includes a conventional ring rail **68**, there being one for each row of bobbins at opposite sides of the twister, the ring rails being reciprocable in vertical directions. Mounted upon each ring rail **68** adjacent and surrounding each spindle **24** is a ring **70**

supporting a traveler or flyer **72** which is freely rotatable around the spindle in a circular orbital path provided by the ring **70**, the adjacent strand **21** being threaded through the traveler **72**.

In the twister shown in the drawings, the motor **38** provides a driving means for rotating the spindles **24** and the bobbins **26**, for vertically reciprocating the ring rail **68** carrying the rings **70** and travelers **72**, and for driving the feed roll units **40**. The arrangement for vertically reciprocating the ring rail is conventional and includes a crank or eccentric (not shown) driven by the motor **38**, the crank or eccentric effecting longitudinal reciprocation of the link or rod **74** which, in turn, actuates two bell cranks **76**, one of which is shown in FIGURE 2, pivotally supported upon a bracket **78** depending from the bolster rail **14**.

Each bell crank **76** is connected by means of a link **80** with a vertically reciprocable rod **82**, the upper end of which is secured to the ring rail **68**. The rods **82** are mounted in suitable guide bushings **84** carried by the bolster rail **14**. An identical arrangement of links, bell cranks and rods is provided at the opposite side of the twister frame for actuating the second ring rail.

In the operation of the twister apparatus, the strand **21** is wound upon the bobbins **26** rotating at high speed and, through the use of the travelers **72**, each strand is twisted as it is collected or wound upon a bobbin. During the winding, the ring rail **68** is continuously reciprocated in order to distribute the strand lengthwise of the bobbin upon which it is being wound in a conventional manner. The twister is provided with a yardage counter or yardage integrator **88** of a type adapted to be manually set or adjusted for the amount of yardage to be placed on each of the bobbins.

The counter mechanism is driven by a belt **85** or other means driven by the motor **38**. In conventional twister apparatus, the counter actuates a switch to interrupt the circuit of the drive motor when the number of yards for which the counter has been set have been wound on the bobbins. Interruption of the circuit to the drive motor brings all driven components of the twister mechanism to rest. In this type of control for interrupting the motor circuit, the ring rail **68** may be in any position when the motor is de-energized. If the rail is stopped at a position intermediate its stroke, difficulties are encountered in endeavoring to remove the filled bobbins or strand packages from the spindles **24**.

The present invention is inclusive of means for effecting continued operation of the motor **38** after the counter **88** has actuated a switch means embodied therein so that the ring rail, feed rolls and the spindles are not brought to rest until the ring rail has been moved to a predetermined position, preferably at its lowermost position, to facilitate easy removal of the filled bobbins **26**. This is accomplished through the provision of control means intercalated in the motor circuit and with the switch means in the counter **88** rendered effective when the ring rail reaches a predetermined position to interrupt the energizing circuit of the drive motor **38**.

The circuit for accomplishing this purpose is schematically illustrated in FIGURE 3. Referring to FIGURE 3, the motor **38** is operated by a three phase power supply designated **L1**, **L2** and **L3** through a magnetic starter **90** of conventional construction. A control circuit **92** is provided for the motor **38** which includes a transformer **94**, a manually operated switch **96** for initiating operation of the motor control circuit, a manually operable stop switch **98** and a relay **100** for closing and opening the motor contacts **M1**, **M2** and **M3** of the magnetic starter.

One side of the manually starting switch **96** is connected by a conductor **104** with a counter actuated switch **106** associated with the counter **88**, the switch **106** being connected by means of a lead **108** with a holding relay **110**, the holding relay **110** being connected with the other side of the switch **96**. Connected across the switch **96** between the conductors **104** and **108** is a limit switch **112** which is in parallel with the counter controlled switch **106**.

Referring to FIGURES 1 and 2, a bracket **114** mounted by one of the end plates **12** provides a support for a switch housing **116** enclosing the limit switch **112**, shown in FIGURE 3, the limit switch being provided with a movable actuating arm **118**. Mounted upon the ring rail **68** is a plate or member **120** disposed in a position to engage the arm **118** of the limit switch **112** at each reciprocation of the ring rail **68**. In the embodiment illustrated in FIGURES 1 and 2, the limit switch housing **116** is disposed whereby the member **120** on the ring rail **68** engages and actuates arm **118** at a lowermost position of the ring rail **68**.

In the operation of the twister, the operator first adjusts or sets the counter **88** to the yardage desired to be packaged or wound on the bobbins **26** and then manually closes the switches **96** of the control circuit **92**. This operation energizes the relay **100** controlling the contacts **M1**, **M2** and **M3** of the motor starter **90** to initiate operation of the drive motor **38**. A holding relay **110** is energized providing a circuit for the motor **38** through the normally closed switch **106** in the counter and through the relay **110**.

At each reciprocation of the ring rail **68** during bobbin winding operations, the member **120** actuates the arm **118** of the limit switch **112** but such switch does not affect the circuit to the motor **38** as the circuit is maintained through the closed switch **106** of the counter mechanism. When the counter **88** registers the yardage for which it has been previously manually set, the counter automatically opens the switch **106**.

The opening of the switch **106** does not interrupt the control circuit for the motor **38** as the motor continues to operate during the period that the limit switch **112** is in circuit-closing position. The twister continues to be operated by the drive motor **38** until the ring rail **68** reaches a position at which the member **120** actuates the arm **118** of the limit switch **112** to open the control circuit for the motor **38** through deenergization of the holding relay **110** whereby the drive motor **38** and the driven components of the twister are brought to rest.

Through this method and arrangement, the ring rail **68** is always moved to a predetermined position at the completion of winding operations. In the embodiment illustrated, the member **120** actuates the limit switch **112** when the ring rail is at its lowermost position and is brought to rest in this position.

The filled bobbin **26** may then be readily removed from all of the spindles and replaced with empty bobbins. While the limit switch is positioned with respect to the ring rail **68** to cause the ring rail to be brought to rest in its lowermost position, it is to be understood that by changing the position of the limit switch housing **116**, the ring rail **68** may be automatically brought to rest in any desired position after the amount of yardage for which the counter **88** has been set has been wound on the bobbins.

It is apparent that, within the scope of the invention, modifications and different arrangements may be made other than as herein disclosed, and the present disclosure is illustrative merely, the invention comprehending all variations thereof.

I claim:

1. The method of controlling the operation of apparatus for transferring filamentary material from supply packages to rotating bobbins through the medium of a movable guide for distributing the filamentary material on the bobbins including the steps of presetting a yardage counter for the amount of yardage of filamentary material to be collected on the bobbins, initiating operation of a motor driving the bobbins and actuating the

yardage counter and the guide, automatically actuating a switch by the counter when the predetermined yardage of filamentary material has been transferred to the bobbins to condition a control circuit for the motor, and thereafter automatically de-energizing the motor when the moving guide attains a predetermined position.

2. The method of controlling the operation of twister apparatus wherein filamentary material is transferred to rotating bobbins through the medium of a movable ring guide rail and ring travelers including the steps of presetting a yardage counter for the amount of yardage of filamentary material to be collected on the bobbins, initiating operation of a control circuit to energize a motor driving the bobbins and actuating the yardage counter and moving the ring rail, automatically opening a switch in the motor control circuit by the counter to condition the motor control circuit when the predetermined yardage has been transferred to the bobbins, and thereafter automatically opening the control circuit to de-energize the motor when the ring rail is moved to a predetermined position.

3. In combination with apparatus for transferring filamentary material from supply packages to rotating bobbins having an electrically energizable motor for rotating a plurality of bobbins and effecting reciprocating movement of a guide rail for distributing the material on the bobbins, a yardage counting means driven by the electrically energizable motor, said yardage counting means being adjustable to predetermine the yardage to be wound on the bobbins, a control circuit for said motor, a first switch means in said circuit actuable by said counting means, and a second switch means intercalated with said first switch means arranged to interrupt operation of the motor when the guide rail attains a predetermined position.

4. In combination with a twister apparatus having an electrically energizable motor for rotating a plurality of bobbins and effecting vertical reciprocation of a ring rail, a yardage counting means driven by the electrically energizable motor, said yardage counting means being manually adjustable to predetermine the yardage to be wound on the bobbins, a control circuit for said motor, a first switch means in said control circuit actuable by said counting means, a second switch means in said control circuit arranged to be actuated at each reciprocation of the ring rail, said first switch means being arranged to be opened by the counting means when the predetermined yardage of material has been wound on the bobbins to condition the control circuit whereby subsequent actuation of the second switch means de-energizes said motor.

5. In combination with a twister apparatus having an electrically energizable motor for rotating a plurality of bobbins and effecting reciprocation of a ring rail, a yardage counter operable during rotation of the bobbins, said counter being settable to predetermine yardage to be wound on the bobbins, a control circuit for said motor, yardage counter actuated switch means in said control circuit, a second switch means in said control circuit actuated by means associated with the ring rail, said switch means being intercalated whereby said second switch means is ineffective to interrupt operation of the motor until the counter actuated switch means is moved to open position.

6. In combination with a twister apparatus having an electrically energizable motor for rotating a plurality of bobbins and effecting reciprocation of a ring rail, a yardage counter operable during rotation of the bobbins, said counter being settable to predetermine yardage to be wound on the bobbins, a control circuit for said motor, yardage counter actuated switch means in said control circuit, ring rail actuated switch means in said control circuit, said switch means being intercalated whereby said ring rail actuated switch means is ineffective to interrupt operation of the motor until the counter actuated switch means is in open position.

7. In combination with a twister apparatus having an electrically energizable motor for rotating a plurality of bobbins and effecting reciprocation of a ring rail, a yardage counter operable during rotation of the bobbins, said counter being settable to predetermine yardage to be wound on the bobbins, a control circuit for said motor, a first switch means in said control circuit arranged to be actuated by said yardage counter when the predetermined yardage is wound on the bobbins, a second switch means in said control circuit adapted to be actuated during movement of said ring rail, said first and second switch means being intercalated whereby said second switch means is ineffective to interrupt operation of the motor until the counter actuated switch means is in open position, said second switch means being effective to de-energize said motor when the ring rail is moved to a predetermined position.

8. In combination with apparatus for winding filamentary material on rotatable bobbins from supply packages, a member, filamentary material guide means for each bobbin supported on said member, said member being movable relative to said bobbins to distribute the filamentary material lengthwise of the bobbins, a yardage counter adapted to be preset to predetermine yardage of filamentary material to be wound on the bobbins, an electrically energizable motor arranged to rotate the bobbins and counter and actuate said movable member, a control circuit for said motor, said circuit including a first switch associated with the yardage counter, a second switch in parallel with said first switch, said second switch being arranged to be controlled by means associated with said movable member, said first switch arranged to be opened by the yardage counter when the predetermined yardage of material has been wound on the bobbins to condition the control circuit whereby subsequent actuation of the second switch de-energizes the motor when said member attains a predetermined position.

9. In combination with apparatus for winding filamentary material on rotatable bobbins from supply packages, a ring rail, filamentary material guide means for each bobbin supported on said ring rail, said ring rail being reciprocable relative to said bobbins to distribute the filamentary material lengthwise of the bobbins, a yardage counter adapted to be indexed to predetermine yardage of filamentary material to be wound on the bobbins, an electrically energizable motor arranged to rotate the bobbins and counter and reciprocate said ring rail, a control circuit for said motor, said circuit including a first switch associated with the yardage counter, a second switch in parallel with said first switch, said second switch being associated with means concomitantly movable with the ring rail, said first switch arranged to be opened by the yardage counter when the predetermined yardage of material has been wound on the bobbins to condition the control circuit whereby subsequent actuation of the second switch de-energizes the motor.

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