June 23, 1964 C. V. JONES, SR 3,138,339

BUILDER MOTION REWINDING AND TIP BUNCH APPLYING MEANS FOR SPINNING FRAMES

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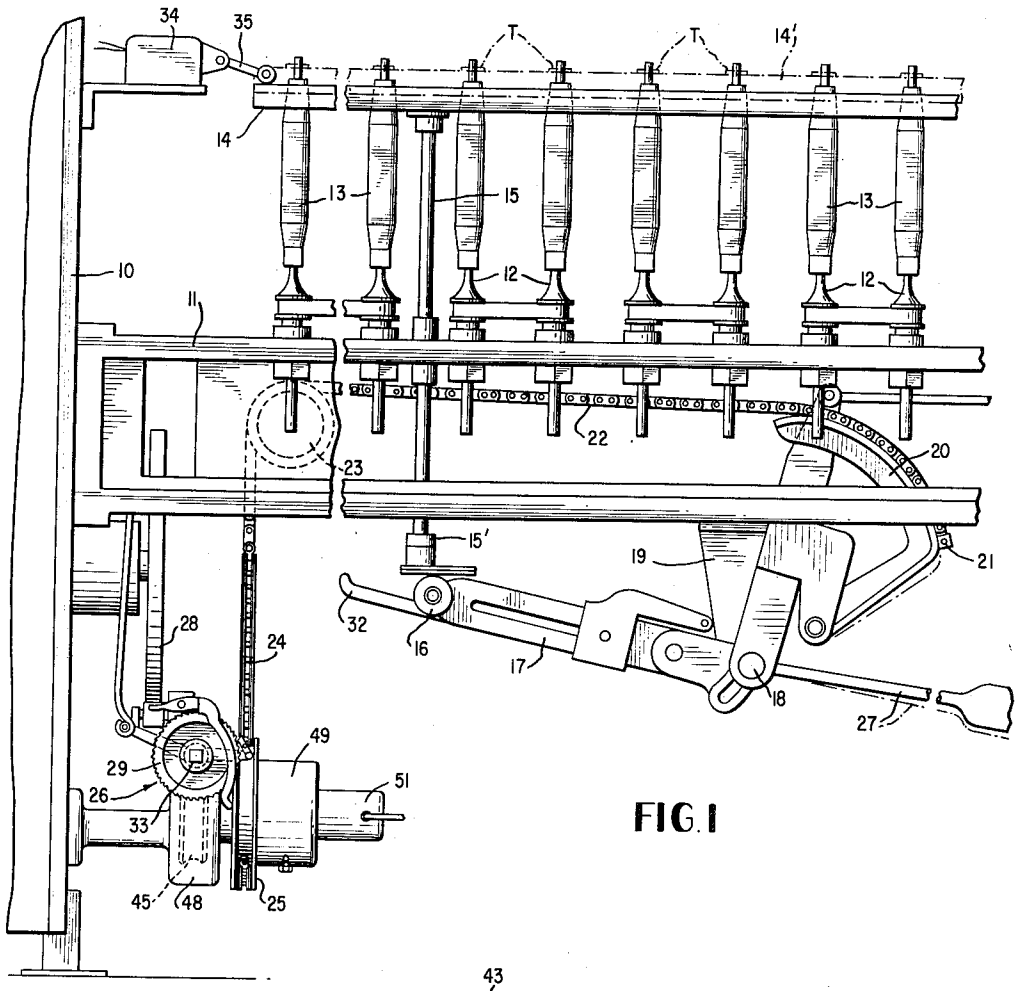


FIG. 1

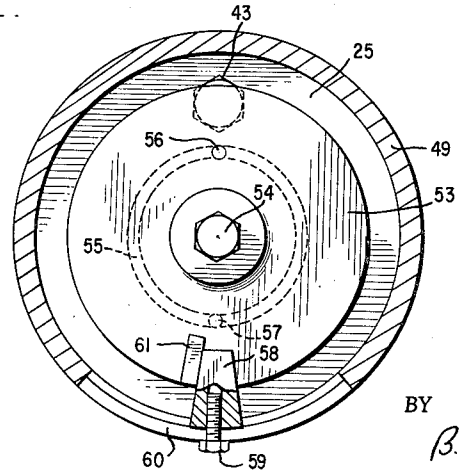


FIG. 4

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FIG. 2

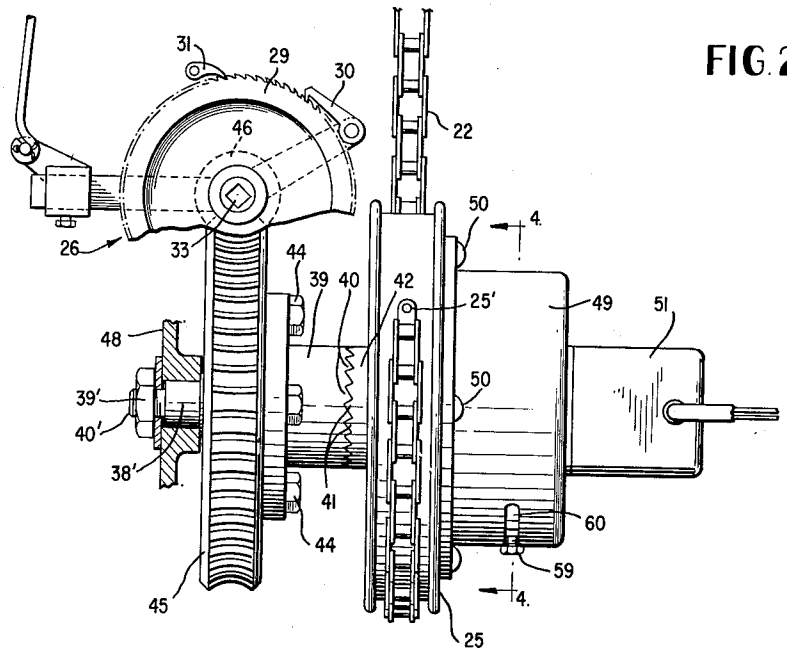
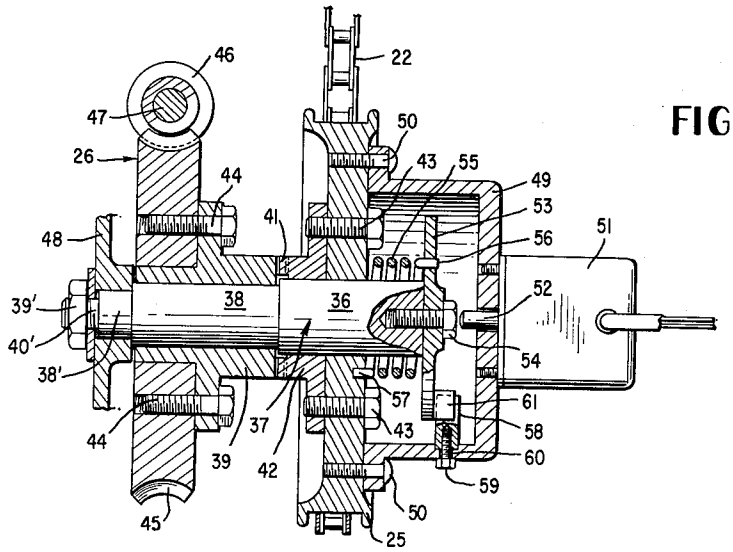


FIG. 3



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United States Patent Office 3,138,339 Patented June 23, 1964

3,138,339

BUILDER MOTION REWINDING AND TIP BUNCH APPLYING MEANS FOR SPINNING FRAMES

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Filed Nov. 19, 1962, Ser. No. 238,424
5 Claims. (Cl. 242—26.4)

This invention relates to improvements in textile spinning frames.

More particularly, the invention comprises a means for automatically rewinding or resetting the builder motion of a textile spinning frame so that the same may operate in an automatic cycle to continuously build bobbins, without the necessity for manual operations.

Considerable work has already been done toward rendering spinning frames automatic. Means are known to automatically doff bobbins after the bobbin building operation is completed. Automatic tip bunch applying means for spinning frames are also known, as well as means for automatically lowering the ring rail toward the bobbin doffing position upon completion of bobbin building and/or tip bunch application. However, it is customary to rewind the builder motion manually with a crank inserted in the ratchet gear of the builder motion during the time that the ring rail is being lowered either automatically or manually to the lowermost bobbin doffing position, and it is the primary object of this invention to provide highly simplified and fully automatic means for effecting the rewinding of the builder motion without the necessity for utilizing a manual crank or any other manual means. According to the invention, the builder motion automatic rewinding means is set into motion automatically when the ring rail reaches the uppermost position, as when the bobbins are fully built. The builder mechanism is automatically rewound while the ring rail is being lowered automatically or otherwise, and means is provided to assure that the builder motion is properly conditioned to start the next cycle of bobbin building when the ring rail is in the lowermost position, ready to begin its next oscillating cycle to build a new group of bobbins.

Another important object of the invention is to provide automatic builder motion rewinding means which will in no way interfere with the normal operation of bobbin building by the spinning frame and which requires substantially no alteration of the conventional builder motion structure except for the addition of a small, economical and foolproof attachment thereto in existing or new spinning machines. The invention, in essence, forms a valuable addition to existing or known components utilized for the automation of spinning frames.

Another very important object of the invention is to utilize the automatic builder motion rewinding mechanism to place the well-known tip bunches upon the upper tips of the bobbins subsequent to the completion of bobbin building and prior to the lowering of the ring rail. The invention mechanism is inherently constructed and capable of allowing this additional operation and therefore serves an important dual purpose in the invention.

Other objects and advantages of the invention will be apparent during the course of the following description.

In the accompanying drawings forming a part of this application and in which like numerals are employed to designate like parts throughout the same,

FIGURE 1 is a fragmentary partly diagrammatic front elevation of a spinning frame of the movable ring rail type having the automatic builder motion rewinding means of the invention installed thereon,

FIGURE 2 is an enlarged fragmentary front elevation partly in section of the builder motion and builder motion rewinding means,

FIGURE 3 is a central vertical longitudinal section through the structure shown in FIGURE 2, and

FIGURE 4 is a transverse vertical section with parts omitted, taken on line 4—4 of FIGURE 2.

In the drawngs, wherein for the purpose of illustration is shown a preferred embodiment of the invention, attention is directed first to FIGURE 1 showing the basic elements of a conventional textile spinning frame of the movable ring rail type. In FIGURE 1, the numeral **10** designates a spinning frame head end, upon which is rigidly mounted one end of a fixed spindle rail **11**, supporting a plurality of conventionally driven spindles **12** carrying bobbins **13**. A vertically movable ring rail **14** is provided above the fixed spindle rail **11** to lay the yarn upon the bobbins in a well-known manner for building bobbins of the particular type desired. A series of vertically shiftable support rods **15** have their tops secured to the ring rail **14** and the rods **15** bodily carry the ring rail in a well-known manner so that the same may traverse the bobbins during the building thereof. The bottoms of the support or lifter rods **15** are engaged in a known manner by rollers **16** journaled upon vertically swingable lifter arms **17**, carried by transverse rock shafts **18** which span the spinning frame transversely and are supported upon brackets **19** depending from the spindle rail **11** and rigid therewith. Rigid with each lifter arm **17** is an arcuate quadrant **20** to which is attached at **21** a flexible chain **22**, trained about a guide pulley **23** upon the spinning frame and extending downwardly as at **24** for connection with a chain drum **25** of builder motion **26**, such as the well-known Whitin builder motion.

Each lifter arm and quadrant unit has a counterweighted extension arm **27** rigid therewith, serving at all times to bias the lifter rods **15** and the ring rail **14** upwardly or toward the tops of the bobbins.

The builder motion **26** includes the well-known builder motion cam **28** whose shape determines the type of wind of the yarn upon the bobbins **13**, such as warp wind, filling wind or combination wind, etc. The builder motion further includes the usual ratchet gear **29** and coacting pawl means **30** and **31**, all well known in the art and through which the chain **22** on drum **25** is gradually paid out or unwound during the building of bobbins, to allow the ring rail **14** to rise slowly upon each stroke thereof for laying each successive layer of yarn upon the bobbins in a slightly higher position. All of this construction and mode of operation concerning the spinning frame and its builder motion are conventonal and well-known to those skilled in the art and need not therefore be dealt with further herein in detail.

Conventionally, the builder motion **26** operates under influence of cam **28** and in conjunction with the above-described weight biased ring rail lift means to cause the ring rail **14** to oscillate vertically over the bobbins to a higher and higher elevation, until the building of the bobbins is completed, as depicted diagrammatically in FIGURE 1. The ring rail **14** is then disposed at the uppermost limit of its movement and is ready to be shifted automatically or manually toward the bobbin doffing position near the bottoms of the bobbins. This lowering of the ring rail may be accomplished manually by using the foot pedal extensions **32** of the lifter arms **17** or it can be accomplished automatically in various known ways, not shown herein, and forming no part of this invention.

In any event, when the building of the bobbins **13** is completed in the usual manner and the ring rail **14** is at the top of its travel, the chain **22** is substantially fully unwound from the chain drum **25**, and when the ring rail is lowered, it is the usual practice to rewind or reset the builder motion **26** with a hand crank inserted within a rectangular opening **33** of the builder motion ratchet gear **29**. This manual operation rewinds a portion of the chain

22 upon the drum 25 and re-establishes the condition of the builder motion 26 which is essential to starting the next bobbin building cycle, where the ring rail 14 is initially at the bottoms of the several bobbins. According to this invention, the above manual rewinding of the builder motion is dispensed with entirely, and the builder motion is rewound automatically while the ring rail is being shifted to the lowermost position with respect to the bobbins and spindle rail. Upon rewinding automatically, the builder motion 26 will be preconditioned to again begin the controlled paying out of the chain 22 to effect the proper oscillation of the ring rail 14 during the building of a fresh group of bobbins.

The invention proper constitutes a very simple modification of or attachment to the builder motion 26, in conjunction with a time delay limit switch 34 mounted upon the spinning frame structure in the path of movement of the ring rail 14 when the latter reaches its uppermost position as depicted in FIGURE 1. In such position, the ring rail 14 will operate actuator arm 35 of time delay switch 34 and establish a circuit with the invention solenoid, to be described, causing automatic rewinding of the builder motion while the ring rail is being lowered automatically or manually.

With particular reference to FIGURES 2 through 4, showing the invention in detail, the chain winding drum 25 is freely rotatable upon an enlarged portion 36 of a fixed builder motion shaft 37 having reduced portions 38 and 38', the latter being rigidly secured within an opening of fixed worm gear housing 48 by a nut 39' mounted upon a screw-threaded extension 40' of shaft 37. A hub 39 is freely rotatably mounted on the shaft portion 38 and this hub is provided at one end with an annular set of inclined saw toothed clutch teeth 40, for coaction with mating clutch teeth 41 on the opposed end of a ring or hub 42, bolted at 43 to the adjacent side of drum 25 and rigid therewith. The hub 39 is rigidly secured at 44 to a worm gear 45 which is a standard part of builder motion 26, and meshing with worm means 46 on builder motion shaft 47 carrying the ratchet gear 29 and associated elements.

A cover or housing 49 is rigidly secured at 50 to the other side of chain winding drum 25 and has bodily mounted upon its end wall a push type electrical solenoid 51 having an armature 52 which is thrust axially toward the shaft 37 when the solenoid is energized by the closing of the circuit having time delay switch 34 therein.

A disc 53 inside of housing 49 is secured rigidly by a screw 54 or the like to the end of shaft 37. A combined compression and torsional wind-up spring 55 surrounds the shaft 37 within the housing 49 and has one end anchored at 56 to the disc 53, and its other end anchored at 57 to the drum 25. This spring has a compressive force in the axial direction sufficient to maintain the clutch teeth 40 and 41 normally engaged. The spring when wound up also stores energy sufficient to cause rewinding of the chain 22 upon the drum 25 when the clutch teeth 40 and 41 are separated, as will be further described.

In order to assure that the builder motion upon rewinding will be properly conditioned for correct operation during the next cycle of bobbin building, that is, when the ring rail first begins to oscillate from a point adjacent the lower ends of the bobbins, and the chain 22 first begins to be paid out by the builder motion, the following provision is made. A fixed abutment element 58 is adjustably secured within the housing 49 through the medium of a radial screw 59 extending through a slot 60 in the housing. The fixed abutment 58 may therefore be positioned anywhere along the length of this slot 60 and securely locked in the adjusted position. A coacting lug 61 rigidly secured to the outer face of the disc 53 near the periphery thereof is adapted to strike the abutment element 58 to positively limit the degree of rewinding of the chain 22 upon the drum 25, when the spring 55 effects this rewinding upon disengagement of the clutch teeth.

The mode of operation of the invention is as follows:

Assume that the contacts of switch 34 are open and that the circuit to solenoid 51 is open and the solenoid is de-energized and its armature 52 is retracted as shown in FIGURE 3. The clutch teeth 40 and 41 are coupled in driving engagement by the axial force of spring 55 and this spring has no appreciable wind-up or torsional energy stored therein. The chain 22 is wound upon the drum 25 the maximum amount permitted by the engagement of the abutment elements 58 and 61, and the ring rail 14 is near the bottoms of the bobbins ready to start the building of a new set of bobbins.

The spinning frame motor is set into operation in a conventional manner and the builder motion cam and associated elements begins to operate while the spindles 12 revolve with the bobbins 13. The escapement mechanism consisting of ratchet gear 29 and pawls 30 and 31 operate in the conventional manner, and through worm 46 and worm gear 45, the hub 39 revolves in a controlled manner on the fixed shaft 37 to let out or unwind the chain 22 gradually from the drum 25, thus allowing the ring rail 14 to gradually move up with respect to the bobbins during its oscillation in the usual manner. The rotary movement of the hub 39 and worm gear will be imparted directly to the drum 25 because the teeth 40 and 41 are engaged, and the ring rail 14 will oscillate and gradually move upwardly to build the bobbins due to the well-known motion imparted to it by the counterweighted lift arms 17 and associated parts, in conjunction with the action of the builder motion.

This operation continues until the building of the bobbins is complete and the chain 22 is substantially unwound from the drum 25 and the ring rail 14 is at the upper limit of its travel near the tops of the bobbins, as depicted in FIGURE 1. At this time, the ring rail 14 engages the switch actuator 35 and closes the terminals of switch 34, thereby energizing solenoid 51 and thrusting the solenoid armature or plunger 52 outwardly against the screw 54 of fixed shaft 37. At this time, the ring rail 14 may be lowered by the foot pedal means 32 or automatically by means not shown, as where the ring rail actuates a second limit switch not shown in the drawings to energize automatic ring rail lowering means. In any event, the energizing of solenoid 51 causes the entire housing 49 to shift axially away from the hub 39 and associated parts and the hub 42 and its clutch teeth 41 are simultaneously separated from the teeth 40 of hub 39. When this occurs and while the solenoid 51 remains energized during the time delay interval afforded by switch 34, the spring 55 which now has stored torsional energy produced by the prior unwinding of the chain 22 during bobbin building instantly causes the drum 25 to revolve and wind up the chain 22 thereon by an amount limited by the subsequent engagement of the elements 58 and 61. When this automatic rewinding of the builder motion chain is completed, the solenoid 51 is de-energized by reopening of the contacts of switch 34 after termination of the built-in time delay interval, and the armature 52 is retracted and the spring 55 shifts the mating clutch teeth 41 and 40 back into coupling engagement and the builder motion 26 is again conditioned for the next cycle of bobbin building without the need for any manual adjustment. By this time, the ring rail 14 is lowered and the bobbins have been doffed and replaced by fresh bobbins either automatically or manually and the ring rail is at the lower extremity of its normal bobbin building position ready to start the next complete cycle of bobbin building in the usual manner, in conjunction with the builder motion and the counterweighted ring rail lift means.

The foregoing description of operation is concerned entirely with the normal building of bobbins without consideration to the application of tip bunches thereto. However, as previously pointed out, the invention has the capability of also facilitating the automatic applica-

tion of the tip bunch to the upper tip of the bobbin with great accuracy regarding the location of the tip bunch which is important. No structural change whatsoever is made in the invention mechanism to facilitate this additional operation, and the mechanism is inherently capable of serving this dual function.

More specifically, when the bobbins **13** are completely built in a normal manner, the ring rail **14** will have reached the normal upper limit of its travel at the full line position thereof shown in FIGURE 1. In such position as fully explained previously the ring rail through the time delay switch **34** effects energizing of solenoid **51** and separation of the clutch teeth **40** and **41** so that the drum **25** is free to turn independently of the hub **39** on shaft **37** under influence of spring **55** which now has stored winding energy. However, in order that this spring may turn the drum **25** in the reverse direction to rewind the chain **22** thereon, it is necessary to lower the ring rail **14** either automatically or manually so that the quadrant **20** will swing counterclockwise and allow reverse movement of the chain **22**.

When it is desired to produce tip bunches T upon the upper tips of the bobbins **13**, FIGURE 1, the ring rail is allowed to effect the energizing of the solenoid **51** exactly as before stated to cause separation of the clutch parts. However, for tip bunch application, the ring rail is not lowered at this time either manually or automatically but is allowed momentarily to remain under the upwardly biased influence of lifter arms **17** and the counterweight means. Therefore, while the solenoid is energized and the clutch parts are separated and the chain drum **25** is free to turn independently of the builder motion, the counterweighted lift arms **17** simply override the rewinding force of spring **55**, which force is not great but merely sufficient to wind up the chain **22** while the same is slackened. That is to say, during the time that the solenoid **51** is energized and the clutch parts are separated, the counterweighted lifting means for the ring rail will cause it to jump up a slight additional distance to the tip bunch applying position depicted in broken lines at **14'** in FIGURE 1. When this occurs, the spring **55** will merely yield and be wound a little tighter with additional energy for rewinding the chain **22** subsequent to the formation of the tip bunches. When the tip bunches are thus completed in a well-known manner and while the solenoid **51** is still energized, the ring rail will be lowered automatically or manually from the tip bunch position to the doffing position and during this lowering, the invention mechanism will automatically rewind the chain **22** as previously described. Thus, the invention mechanism serves the same purpose in the same manner as before described but has the added capability of functioning as a tip bunch applying means without any structural change whatsoever in the invention.

In order to positively arrest or limit upward movement of the ring rail beyond its tip bunch applying position at **14'**, various positive stop arrangements may be employed. One such arrangement is the provision of a spacer sleeve or stop element **15'** on one or more of the lifter rods **15** which will engage the bottom of the fixed spindle rail **11** when the ring rail is at the tip bunch position. If preferred, a cable or the like with accurately measured slack could have one end anchored to the spindle rail **11** and its other end anchored to the quadrant **20** to positively limit clockwise rotation thereof upon the axis of the shaft **18**.

Thus, the invention provides a means to automatically rewind and precondition the builder motion in a foolproof manner without the necessity for manual cranking and without interfering with the continuous cycling operation of the spinning frame. The invention requires no structural modification of the basic spinning frame components and only a slight modification of the builder motion mechanism as described herein.

It is to be understood that the form of the invention herewith shown and described is to be taken as a preferred example of the same, and that various changes in the shape, size and arrangement of parts may be resorted to, without departing from the spirit of the invention or scope of the subjoined claims.

What is claimed is:

1. In a spinning frame of the movable ring rail type, a builder motion comprising a relatively stationary shaft, a worm gear rotatable upon said shaft and having a clutch part, means including a builder motion cam and an escapement device to impart rotation to said worm gear and clutch part, a drum rotatable upon said shaft and having a clutch part for coupling engagements with the clutch part of said worm gear, a flexible element secured to said drum and windable thereon and adapted for attachment to ring rail counterweighted lift means, a spring interconnecting said shaft and drum and urging said clutch parts toward coupling engagement and storing winding energy upon turning of said drum in one direction by said worm gear while said clutch parts are coupled, a solenoid secured to said drum and having a push-type armature which upon energizing of said solenoid engages said shaft and shifts the clutch part of said drum out of engagement with the clutch part of said worm gear, and a time delay switch on the spinning frame in the path of movement of the ring rail and operable to energize said solenoid and to maintain it energized during a time interval sufficient for said spring to rewind said flexible element on said drum.

2. In a spinning frame, a movable ring rail to lay yarn on bobbins for building the same, counterweighted lift means for said ring rail constantly biasing the same upwardly, a builder motion including a relatively stationary shaft, a first clutch element rotatable upon said shaft and adapted to be driven, means including a builder motion escapement device to impart rotation to said first clutch element, a drum rotatable upon said shaft and having a second clutch element for coupling engagement with the first clutch element, a flexible element secured to said drum and windable thereon and adapted for attachment to said lift means, a spring interconnecting said shaft and drum and urging said clutch elements toward coupling engagement and storing winding energy upon turning of said drum in one direction by said means while said clutch elements are coupled, electromechanical means on said drum which when energized engages said shaft and shifts said second clutch element out of engagement with said first clutch element, and a time delay switch on the spinning frame in the path of travel of the ring rail and operated thereby when the ring rail is positioned near the tops of the bobbins at the completion of bobbin building to then energize said electromechanical means and maintaining such means energized for a sufficient time interval to maintain said clutch elements disengaged while said lift means raises the ring rail to a tip bunch applying position followed by automatic rewinding of the flexible element on said drum during lowering of the ring rail, whereby the builder motion is automatically preconditioned for the start of the next bobbin building cycle of operation with the ring rail near the bottoms of the bobbins, said rewinding effected by the action of said spring on said drum.

3. The invention as defined by claim 2, and wherein said electromechanical means includes a solenoid bodily mounted upon said drum and including an armature which upon extension thereof while the solenoid is energized engages said shaft to shift the second clutch element away from the first clutch element while compressing said spring, said spring adapted to be overridden by said lift means while said clutch elements are disengaged and when the lift means is shifting the ring rail to said tip bunch applying position.

4. In a spinning frame of the movable ring rail type, a ring rail adapted to traverse a plurality of bobbins to

build the same with yarn, lift means for said ring rail urging the same upwardly during bobbin building, a flexible element connected with said lift means, a winding and unwinding drum for the flexible element attached thereto, builder motion means operable to regulate the gradual unwinding of the flexible element from said drum including a shaft carrying said drum and a first clutch element rotatable upon said shaft, a companion clutch element on said drum and shiftable therewith toward and away from coupling engagement with the first clutch element, a coiled control spring capable of exerting expansive and torsional forces simultaneously interconnecting said shaft and drum and maintaining said clutch elements normally engaged by its expansive force and storing torsional energy for rewinding the flexible element on the drum during unwinding of the flexible element, an electrical control switch on the spinning frame in the path of movement of the ring rail and actuated by the ring rail when the latter is at the upper limit of its movement during bobbin building, and a solenoid bodily mounted on said drum and electrically connected with said switch and energized thereby

and having an armature working in opposition to the expansive force of said spring and against said shaft to thereby separate said clutch elements, said torsional force of said spring then immediately rewinding the flexible element on said drum during lowering of the ring rail.

5. The invention as defined by claim 4, and positive stop means on said drum and shaft and engageable during said rewinding to positively limit said rewinding and precondition said builder motion means for the start of the next bobbin building cycle of operation.

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