June 21, 1966 C. J. ANDERSEN ETAL 3,256,683

SPINNING FRAME AND AUTOMATION MEANS THEREFOR

Filed Feb. 20 1964

3 Sheets-Sheet 1

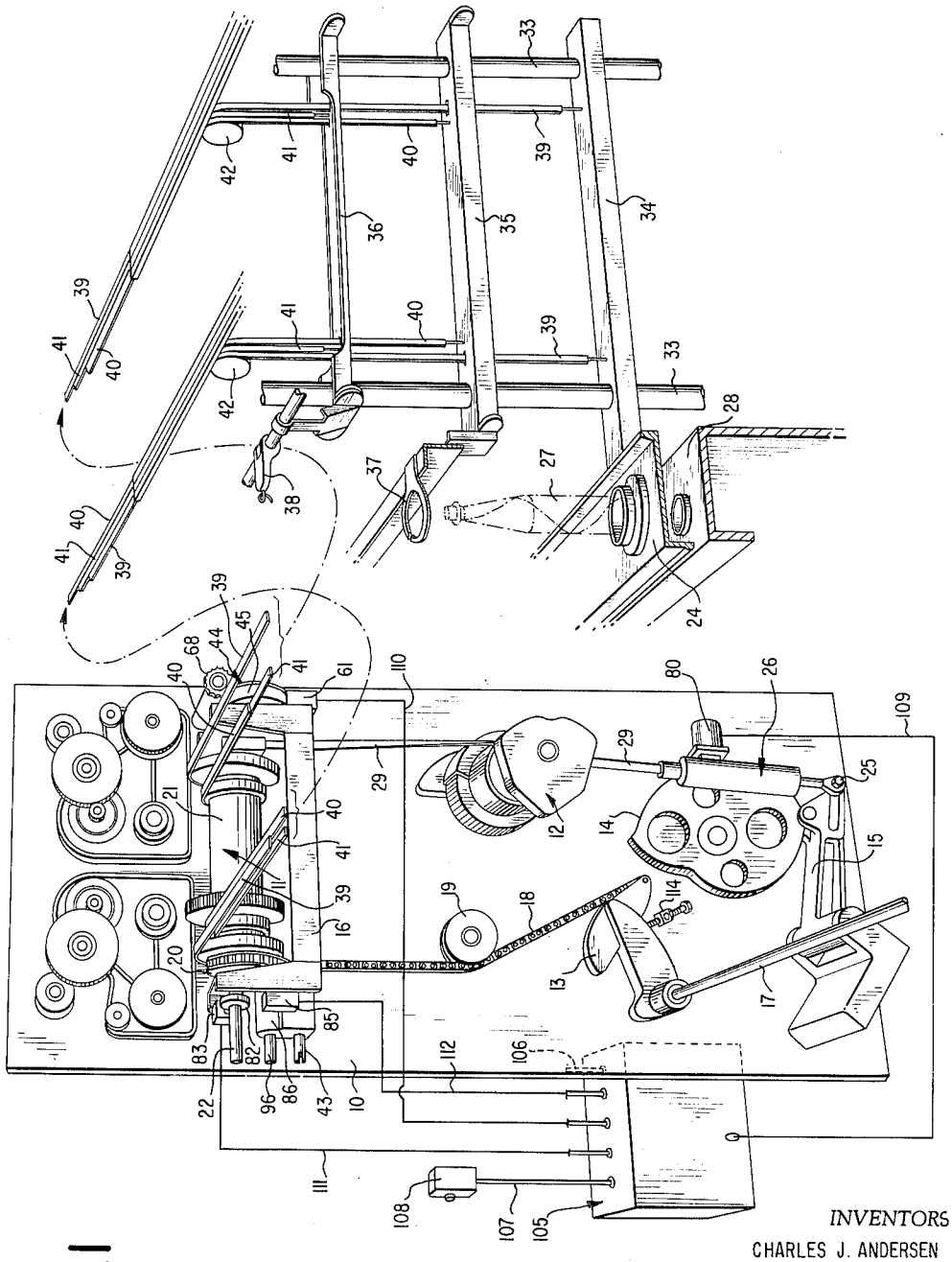


FIG. 1

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SPINNING FRAME AND AUTOMATION MEANS THEREFOR

Filed Feb. 20 1964 3 Sheets-Sheet 2

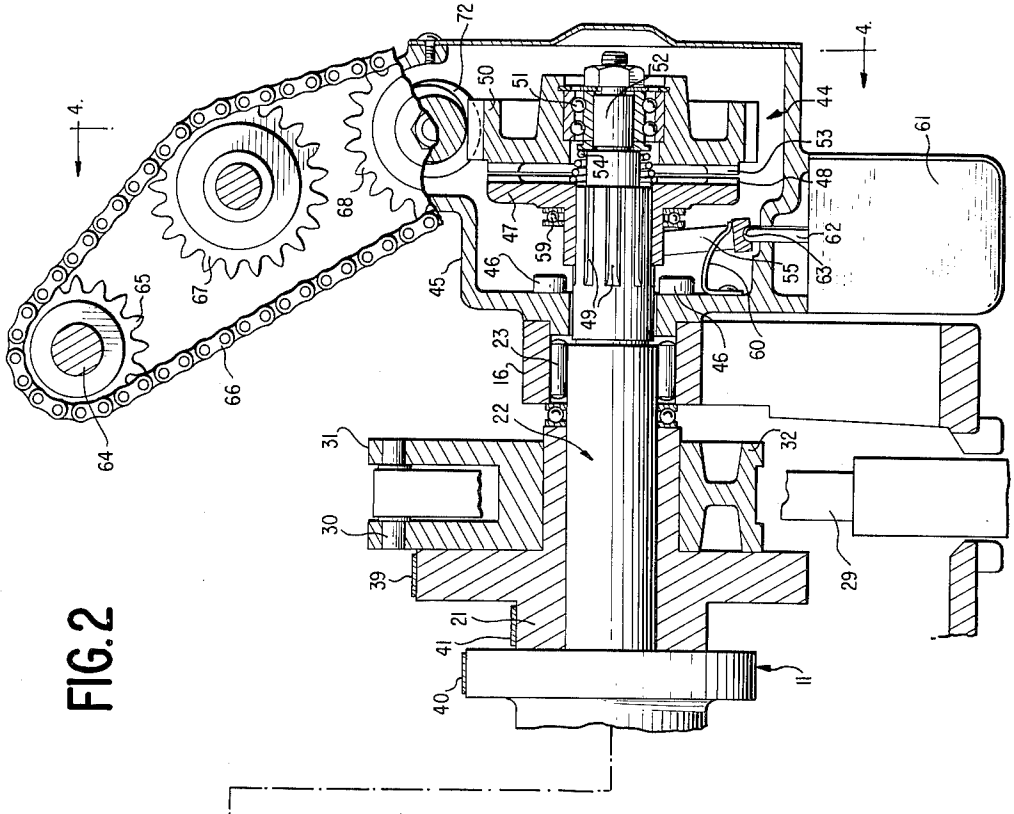
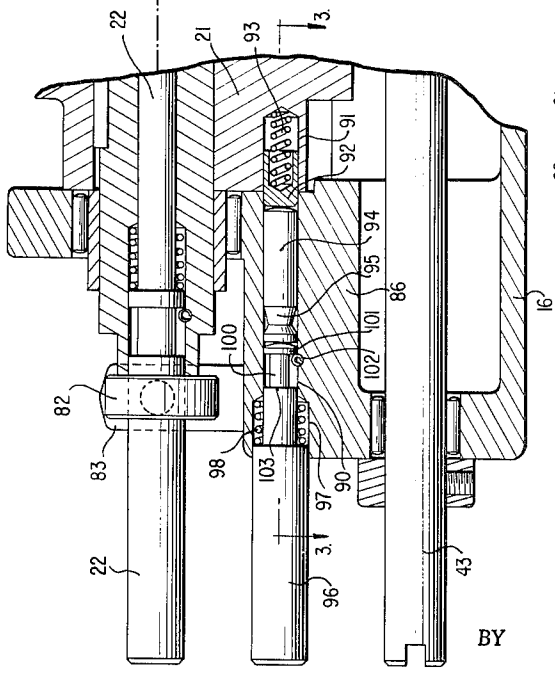


FIG.2



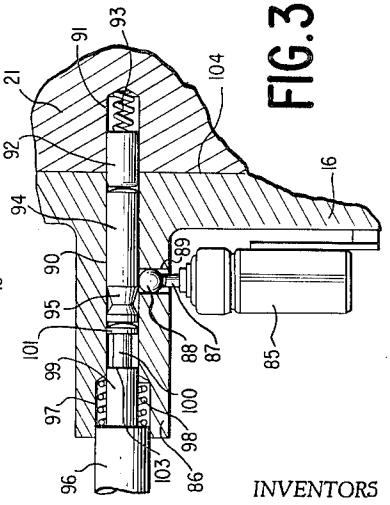


FIG.3

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SPINNING FRAME AND AUTOMATION MEANS THEREFOR

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FIG.7

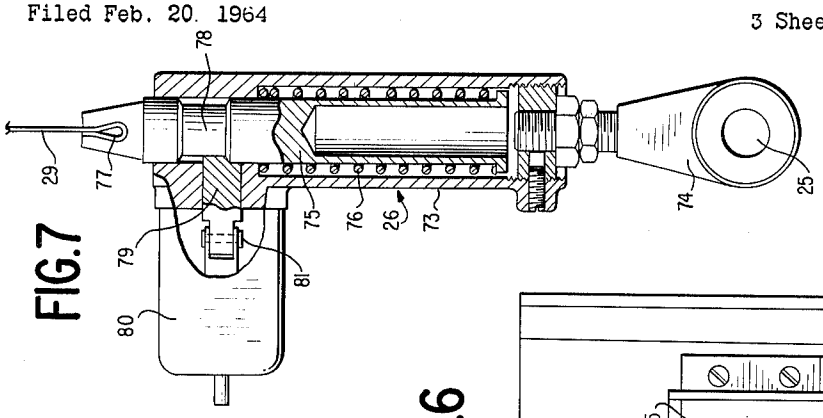


FIG.6

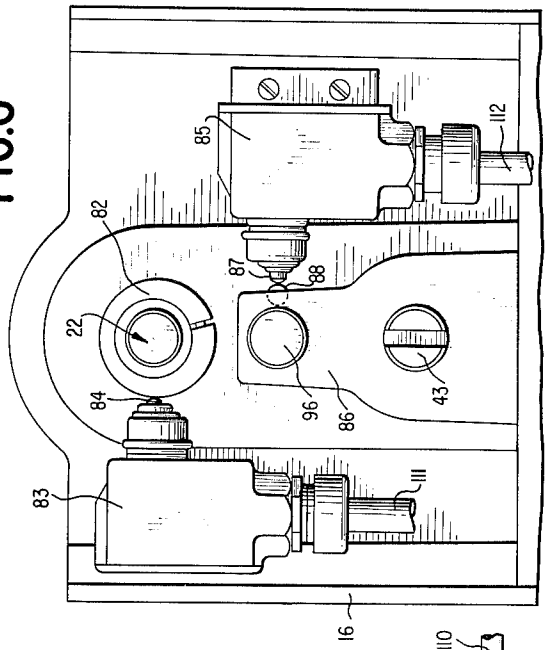


FIG.5

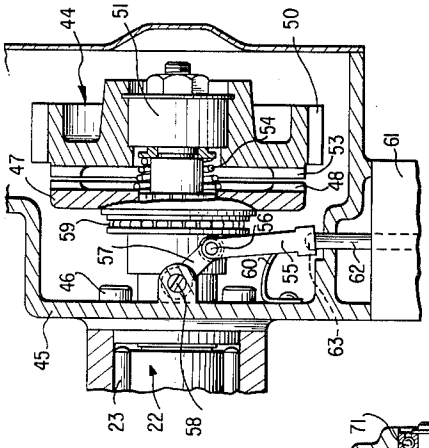
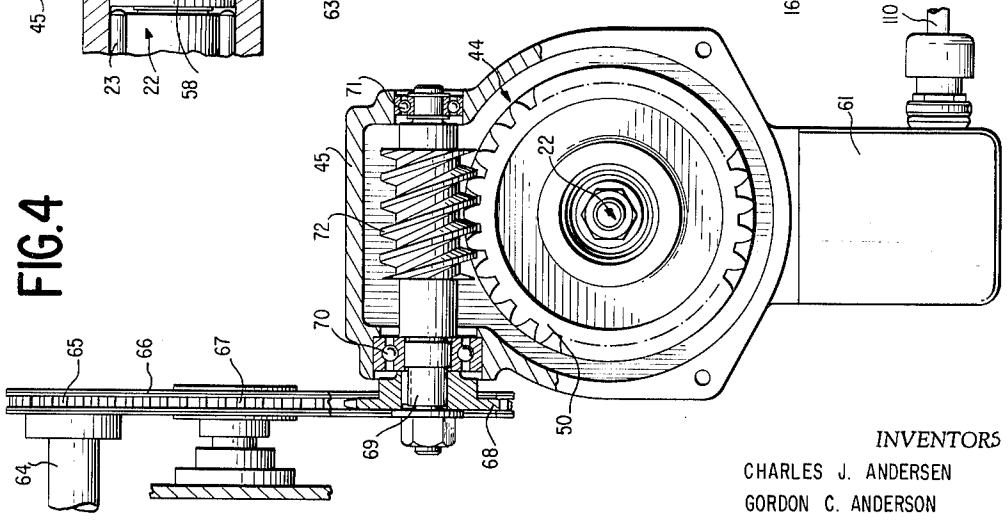


FIG.4



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United States Patent Office 3,256,683 Patented June 21, 1966

3,256,683

SPINNING FRAME AND AUTOMATION MEANS THEREFOR

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Filed Feb. 20, 1964, Ser. No. 346,202
7 Claims. (Cl. 57—54)

This invention relates broadly to textile spinning frames and more particularly to means for rendering a spinning frame substantially automatic in operation.

Prior United States Patent 3,080,701 to H. R. Kennedy et al. discloses automatic means for lowering the ring rail of a spinning machine after the ring rail has reached the "full bobbin" position. When reaching such position, as disclosed in said patent, the automatic electro-mechanical means is set into motion for causing the ring rail to descend to the bobbin doffing position in a controlled manner and at a desired rate, the ring rail then being automatically locked in the lowered position while the power to the spinning frame motor is automatically cut off.

Prior United States Patent 3,074,224, to H. R. Kennedy et al. likewise discloses electro-mechanical means for rendering a spinning frame substantially automatic in operation including means to automatically apply tip bunches to the tops of bobbins after completion of the normal bobbin building operation, and means to automatically lower the ring rail to the doffing position and lock it in such position while simultaneously cutting off the power to the spinning frame motor. United States Patent 3,059,407 to H. R. Kennedy et al. similarly discloses mechanism on a spinning frame to effect the automatic application of tip bunches to bobbins subsequent to bobbin building and prior to lowering the ring rail either automatically or manually. Patent application Serial Number 214,992, filed Aug. 6, 1962, now Patent No. 3,124,925, allowed Aug. 3, 1963, H. R. Kennedy et al., copending herewith, for Automatic Control System for Spinning Frames, also discloses an automation system broadly similar to the systems in the aforementioned patents and constituting a refinement thereof.

The aforementioned pending application and patents all relate to spinning frames of the movable ring rail type, wherein the ring rail is biased upwardly by counterweight means carried by rockable quadrants having attached thereto a flexible element or elements which are connected with and under the influence of the well-known builder motion. The builder motion coacts with the quadrant and counterweight means in a known manner to cause traversing and gradual elevation of the ring rail with respect to the bobbins during the wrapping of yarn on the bobbins, which is known in the art as "bobbin building." In the mentioned application and prior patents, the automation components for lowering and locking the ring rail and for applying the tip bunch prior to lowering and locking are connected into the conventional spinning frame mechanism in a unique manner to produce the desired results in connection with the particular type of spinning frame above-mentioned having the ring rail biased upwardly by counterweight and quadrant means through lift rods which directly carry the ring rail.

In accordance with the present invention, a similar automation system for spinning frames of a different type is provided to effect the automatic lowering and locking of the ring rail and the automatic shutting off of power to the spinning frame motor and also, if desired, the automatic application of tip bunches prior to ring rail lowering. In brief, the invention involves the adaptation of an

automation system similar although not identical to the systems disclosed in the mentioned application and patents to a spinning frame of the type wherein a movable ring rail and associated parts are suspended on flexible tapes connected with a windlass and wind down mechanism. The ring rail on this type of spining frame is biased upwardly by a torsion bar connected with the windlass at one point thereon through the medium of a flexible element or chain and a compensating scroll. The traversing of the ring rail over the bobbins is accomplished through the medium of a builder motion cam and pick motion and a flexible tape or chain associated therewith and connected with the windlass at another point thereon. This latter mechanism works in opposition to the elevating force of the torsion bar to produce the desired oscillation or traversing of the ring rail over the bobbins during operation of the spinning frame. This type of spinning frame is known in the art and is disclosed by United States Patent 3,072,350 to G. C. Anderson et al. and also by United States Patent 2,770,093 to E. C. Gwaltney and by other patents. The spinning frame in question is also essentially disclosed on pages 10 and 11 of Saco-Lowell Bulletin dated April, 1963 by Saco-Lowell Shops, Boston, Mass. The present application drawings to be described show only so much of the conventional spinning frame structure in said bulletin and in Patent 3,072,350, as is essential to a proper understanding of the invention and only so much of the spinning frame structure as is necessary to disclose fully the adaptation of the automation means to the basic spinning frame.

In light of the foregoing application and patents, it is believed that the objectives of the invention will be clear as well as the advantages thereof during the course of the following description read in connection with the accompanying drawings in which:

FIGURE 1 is a fragmentary partly diagrammatic perspective view of a spinning frame in accordance with said bulletin and said Patent 3,072,350 with the invention means installed thereon,

FIGURE 2 is an enlarged fragmentary vertical section through the windlass and wind down mechanism shown in FIGURE 1,

FIGURE 3 is a fragmentary horizontal section taken on line 3—3 of FIGURE 2,

FIGURE 4 is a fragmentary vertical section taken on line 4—4 of FIGURE 2,

FIGURE 5 is a fragmentary vertical section similar to FIGURE 2 showing elements for operating a clutch in elevation,

FIGURE 6 is an enlarged fragmentary end elevation of the windlass shaft and associated elements as viewed from the left hand side of FIGURE 1, and

FIGURE 7 is an enlarged fragmentary central vertical section through a solenoid operated escapement unit associated with the builder motion arm shown in FIGURE 1.

In the drawings, wherein for the purpose of illustration is shown a preferred embodiment of the invention, attention is directed first to FIGURE 1, wherein the numeral **10** designates the head end of a spinning frame, upon which are mounted a windlass and wind down mechanism **11**, pick motion **12**, compensating scroll **13**, builder cam **14**, builder motion arm **15** and associated elements, substantially as shown in FIGURE 1 of Patent 3,072,350 and on pages 10 and 11 of said Bulletin.

As shown in said patent and Bulletin, the mechanism **11** is supported upon a bracket and bearing structure **16**, rigidly secured to the head end **10**. A torsion bar **17** extends longitudinally of the spinning frame and has one end thereof secured to the compensating scroll **13** near the head end **10**. The remote end of the torsion bar **17** is anchored adjustably to a conventional mechanism, not shown, on the spinning frame, as shown in said Bulletin

and patent. The torsion bar **17** is tensioned to transmit a downward pull through the compensating scroll **13** on a chain or flexible element **18** connected with the compensating scroll and engaging a guide pulley **19** on the head end **10** above the compensating scroll. The upper end portion of the chain **18** is secured to and wound upon a pulley section **20** formed upon a windlass sleeve or spool **21**, which sleeve is suitably pinned to a windlass shaft **22**, journaled for rotation in bearing means **23** on the structure **16**. The torsion bar **17** through chain **18** tends to rotate the windlass sleeve **21** in one direction for biasing the ring rail **24** upwardly at all times.

In counterbalancing relation to the action of torsion bar **17**, the well-known builder cam **14** acts upon the rockable arm **15** to raise and lower it. The inner end of this arm **15** is pivotally connected at **25** to the lower end of a solenoid-operated escapement unit **26** to be described fully hereinafter and utilized in the automatic application of tip bunches to the tops of the bobbins on the spinning frame. One such bobbin **27** is shown in broken lines in FIGURE 1, in relation to the ring rail **24** which is locked in the lowered position near the bottoms of the bobbins and near and above the stationary spindle rail **28** which supports the bobbin spindles rotatably.

The upper end of unit **26** is connected with a flexible tape **29** which is looped about a drum portion of pick motion **12** containing planetary gearing. The tape **29** extends above the pick motion **12** and has its upper end secured at **30**, FIGURE 2, to ears **31** on a pulley portion **32** of the windlass sleeve **21**. The tape **29** is windable upon the pulley portion **32** for turning the sleeve **21** reversely and in opposition to the turning thereof by the torsion bar **17** and associated elements. This mode of operation is well known and all of the construction thus far described with the exception of the unit **26** is disclosed in Patent 3,072,350 and in said Bulletin.

With continued reference to FIGURE 1, a plurality of fixed spaced vertical guide bars **33** are provided at intervals along the spinning frame, inwardly of the spindle rail **28**. Carriage bars **34**, **35** and **36** have movable guided engagement with the bars **33** and are adapted to be elevated and lowered thereon. The bars **34** are rigid with and carry the movable ring rail **24**. The bars **35** carry the movable balloon control rings **37** and the bars **36** carry the usual thread guide means **38**. The carriage bars **34**, **35** and **36** are suspended on tapes **39**, **40** and **41**, which tapes are trained over guide sheaves **42**, suitably journaled upon the spinning frame. These tapes then extend horizontally toward the head end **10** and are secured to and wound on circular disc or pulley portions of the windlass sleeve **21**, as depicted in FIGURE 1 and in said Bulletin and patent. As shown in FIGURE 1, the disc portions on the sleeve **21** which engage the respective lifter tapes are of differing diameter in order to provide the proper differential movement to the carriage bars **34**, **35** and **36**. It will be understood that the system of lifter tapes extends horizontally along the entire spinning frame and additional sets of guide sheaves **42** are provided to train the tapes downwardly for connection with additional sets of carriage bars operable on additional guide bars **33**, not shown. Again, all of this structure is conventional and shown in said Bulletin and Patent 3,072,350, and only so much of the structure has been illustrated in FIGURE 1 as is necessary to a proper understanding of the invention yet to be described in detail.

Before proceeding to describe the invention proper, it may be explained that during the operation of the spinning frame as thus far described and shown in said Bulletin and patent, the following takes place. The energy in the torsion bar **17** tensions the chain **18** and constantly tends to revolve the windlass sleeve **21** and its shaft **22** in a direction for elevating the ring rail **24** with respect to the bobbins **27**, mounted rotatably on the stationary spindle rail **28**. In opposition or counterbalancing relation to the torsion bar and associated elements, the builder motion cam **14** oscillates the arm **15** and the tape **29** and during this action, the tape **29** intermittently revolves the sleeve **21** in the opposite direction to cause lowering of the bars **34**, **35** and **36** and the elements carried thereby including the ring rail **24**. This action causes the proper traversing of the ring rail **24** over the bobbins to build them with a filling wind, warp wind or combination wind depending upon the shape of the cam **14**.

In any event, when the bobbins **27** are built to completion and the ring rail **24** is near the tops of the bobbins, the same must be lowered to allow bobbin doffing and this is done manually by applying a hand crank to a manual wind down shaft **43** on the windlass and wind down mechanism **11**, as disclosed in FIGURE 1 of said Patent 3,072,350 and also in said Bulletin. As will become apparent when the description proceeds, the invention provides means for automatically lowering the ring rail when the bobbins are built and automatically locking the same in the bobbin doffing position and automatically shutting off the power to the spinning frame motor when the ring rail is down, together with means for automatically applying tip bunches to the bobbins, if desired, prior to automatic lowering of the ring rail. In brief, the invention now to be described allows substantially full automatic operation of the spinning frame in conjunction with automatic doffing machinery, if employed. All that the operator need do is observe the machine and push a starter button and a lock release button at the beginning of each new bobbin building operation.

The invention proper, with reference to FIGURE 2, comprises a clutch unit **44** on one end of the windlass bracket structure **16**. A clutch housing **45** is rigidly secured at **46** to the end of the bracket structure **16** remote from the manual wind down shaft **43** and outboard of the main bearing **23** for windlass shaft **22**. A clutch head or disc **47** having tapered teeth **48** on one face thereof is splined to the shaft **22**, as indicated at **49**, whereby the clutch head **47** turns with the shaft **22** and is axially slidable thereon. A wind down worm gear **50** is freely rotatably mounted on a ball bearing **51** carried by a reduced extension **52** of the shaft **22**. The inner face of worm gear **50** has tapered clutch teeth **53** formed thereon for coupling engagement with the teeth **48** of clutch head **47**. A compressible coil spring **54** serves normally to maintain the clutch head **47** separated from the gear **50** having the teeth **53**, as shown in FIGURE 2, so that the gear **50** may revolve continuously without imparting rotation to the clutch head **47** and shaft **22**. The gear **50** is held against axial movement on the shaft portion **52**, as shown. Clutch head **47** is adapted to be thrust into clutching or coupling engagement with gear **50** by means of a yoke **55**, FIGURE 5, pivotally connected at **56** with short links **57** having corresponding ends pivoted at **58** to the housing **45**. A thrust bearing **59** on the clutch head **47** is engaged by rollers on the inner end of the yoke **55** to effect axial shifting of the clutch head smoothly. A leaf spring **60** attached to the housing **45** bears upon the bottom of the yoke **55** and urges the same downwardly, FIGURES 2 and 5, or toward a position rendering the clutch inactive. The clutch is rendered active at the desired time, automatically, by a solenoid **61**, rigidly mounted upon the bottom of housing **45** and having a thrust type plunger **62**, shown retracted in the drawings, having socketed engagement at **63** with the bottom of the yoke **55**. When the solenoid **61** is energized, the plunger **62** and yoke shift the clutch head **47** into coupling engagement with the gear **50** so that continued turning of the gear **50** will drive or revolve the windlass shaft **22** positively in one direction for lowering the ring rail **24** automatically. The construction shown in FIGURES 2 and 5 pertaining to the clutch, yoke **55**, and associated elements, is

disclosed in the mentioned copending application Serial Number 214,992, now U.S. Patent 3,124,925.

The front draft roll of the spinning frame, indicated at 64, FIGURE 2, carries a sprocket wheel 65, engaged by an endless chain 66, trained over an idler sprocket wheel 67 and engaging another sprocket wheel 68 on a shaft 69, FIGURE 4, journaled on bearings 70 and 71 in housing 45 near the top thereof. The shaft 69 carries a worm 72 within the housing 45 in constant mesh with the teeth of worm gear 50 and driving the latter continuously. The front draft roll 64 continuously revolves during the operation of the spinning frame, and the invention components shown in FIGURES 2, 4 and 5 are powered from the front draft roll.

The aforementioned escapement unit 26 shown in FIGURE 1 constitutes an invention component and is detailed in FIGURE 7. This unit and its general purpose on a different type of spinning frame is disclosed substantially in the aforementioned Patent 3,059,407 to H. R. Kennedy et al. for Automatic Tip Bunch Building Mechanism for Spinning Frames. Briefly, the unit 26 comprises tubular housing 73 having a clevis 74 rigidly and adjustably secured to one end thereof for pivotal connection at 25 with the arm 15, FIGURE 1, as previously described. A plunger 75 engages telescopically within the housing 73 and is held normally retracted by a compressible coil spring 76, as shown in FIGURE 7. The outer end of plunger 75 is attached as at 77 to the lower end of tape 29. The plunger 75 has a detent groove 78 formed therein adapted to receive the inner end of a latch bolt 79 serving in FIGURE 7 to latch the plunger 75 in the retracted position. A solenoid 80 is rigidly secured to the housing 73 and has its armature connected at 81 with the bolt 79, whereby energizing of the solenoid 80 may effect retraction of the bolt 79 from the groove 78 and release of the plunger 75 and extension thereof under influence of the windlass sleeve 21, torsion bar 17 and associated elements. As will be further described, the unit 26 controls automatically the application of tip bunches to the tops of bobbins 27 after the completion of bobbin building and prior to automatic lowering of the ring rail by the means shown in FIGURES 2, 4 and 5. The spring 76 serves to return the plunger 75 to the retracted position shown in FIGURE 7.

The invention further comprises an eccentric cam 82 adjustably secured to a reduced end portion of the windlass shaft 22 and adapted to turn with this shaft. A control switch 83 having an actuating plunger 84 is suitably mounted fixedly on the windlass bracket structure 16, FIGURE 6. The actuator plunger 84 rides on the periphery of cam 82. The switch 83 is open when the low portion of cam 82 engages plunger 84 and the switch becomes closed when the higher portion of the cam engages the plunger 84. Simultaneously with the closing of switch 83, the control timer unit 105 is energized to permit lowering of the ring rail 24 which will complete the cycle as to be described later in detail.

A normally closed switch 85 is likewise secured to the bracket structure 16 adjacent one side of an extension 86 on the bracket structure 16 or windlass mechanism. The switch 85 has an actuating plunger 87 engaging a ball 88, movable within a radial opening 89 in the extension 86. The extension 86 has a through bore 90 adapted to register with a single opening 91 formed in the adjacent end of the windlass sleeve or spool 21, FIGURE 3. A short locking pin 92 is mounted movably within the opening 91 and is adapted to be thrust forwardly and into the bore 90 by a compressible spring 93 behind the pin 92, as shown in FIGURE 3. That is to say, when the windlass sleeve 21 rotates sufficiently to cause the opening 91 to register with the bore 90, the pin 92 will automatically enter the bore and positively lock the windlass sleeve 21 against further rotation. As will be described, this only occurs when the ring rail 24 has been fully lowered to the doffing position shown in FIGURE 1, at which time the ring rail is locked and the power to the wind down mechanism is cut off and consequently to the spinning frame motor.

As shown further in FIGURES 2 and 3, an intermediate plunger 94 is contained within the through bore 90, having near one end thereof a reversely conically tapered detent groove 95 adapted to receive the ball 88 as depicted in FIGURE 3. A manual knob or plunger 96 extends forwardly of the bracket structure 16 and extension 86 and engages within an opening 97 of the latter. The plunger 96 is urged outwardly by a spring 98 surrounding a reduced plunger portion 99 projecting into the bore 90. Within this bore, the plunger 96 has a further reduced extension 100 carrying a head 101 in abutting relation to one end of the intermediate plunger 94. A roll pin 102, FIGURE 2, serves to positively limit outward movement of the plunger 96. Manual movement of the plunger 96 inwardly is likewise limited by engagement of the shoulder 103 with roll pin 102. The extent of movement of the plunger 96 inwardly or the distance between the roll pin 102 and the shoulder 103, FIGURE 2, is such that when the plunger 96 is pushed inwardly, the pin 92 will be forced into the opening 91 just far enough to clear the bore 90 and the abutting rounded ends of the elements 92 and 94 will then be flush with the abutting faces 104 of the sleeve 21 and bracket structure 16. Thus, there is no possibility of either of the elements 92 or 94 failing to release the windlass sleeve for rotation when the plunger 96 is pushed inwardly. When the ball 88 is riding on the periphery or cylindrical portion of the plunger 94 prior to entry of the pin 92 into the bore 90, the switch 85 is closed. When the pin 92 does enter the single bore 90 of the bracket structure 16 to lock the windlass sleeve, FIGURE 3, the ball 88 moves from the groove 95 and the switch plunger 87 is compressed and the switch 85 is opened to break the circuit to the wind down solenoid 61.

A control timer box 105 is suitably mounted within a cabinet space provided on the outer side of the head end 10, FIGURE 1. This control timer box or unit and its function is fully disclosed in said application 214,992, now United States Patent 3,124,925 and there is no necessity for completely describing the circuitry, switches, switch operating cams and the timer motor which cycles the cams in this application. These elements are contained in the control timer box 105 and are fully described in said application and they serve exactly the same purpose and operate in the same manner in connection with this invention as they do with the invention in said application.

It is sufficient to state that a cable 106 leading from the unit 105 extends to the terminals of the spinning frame motor, not shown. Another cable 107 leading from the unit 105 is connected with the main manual stop and start switch 108 for the spinning frame. An additional cable 109 electrically interconnects the control timer unit 105 with the solenoid 80 of the escapement unit 26. Still another cable 110 electrically interconnects the solenoid 61 of the ring rail lowering clutch unit 44 with the control timer unit 105. Additional wires or cables 111 and 112 electrically interconnect the switches 83 and 85 with the unit 105, as depicted diagrammatically in FIGURE 1. Wiring has been omitted in the other views of the drawings for clarity of illustration and the circuitry is very simple and substantially conventional in light of said application and patents and will be readily understood by anyone skilled in the art.

Operation

Assuming that the ring rail 24 has been lowered and locked automatically as shown in the drawings, and that the spinning frame motor and all power has been shut

off by the control timer unit **105**, the machine is now ready for the start of a new complete cycle of operation as soon as bobbin doffing is completed either automatically or manually.

To start the next cycle of operation, the operator merely pushes the plunger **96** inwardly the full extent until the shoulder **103** engages roll pin **102**. This will shift the locking pin **92** out of the single bore **90** and release the windlass sleeve **21** or spool for rotation. Simultaneously, the ball **88** will move into the groove **95** and the switch **85** will close re-establishing the circuit through the control unit **105** with the wind down solenoid **61**. While continuing to hold the plunger **96** inwardly, the operator pushes the button of the starting switch **108** which immediately starts up the spinning frame motor and causes movement of the front draft roll **64** and the other conventional components of the spinning frame depicted in FIGURE 1. As soon as the windlass sleeve **21** begins to turn, which will be instantly, the operator releases the plunger **96** and the pin **92** will have cleared the bore **90** and cannot be thrust out of the opening **91** again until this opening registers with the bore **90**.

Through the normal operation of the builder cam **14**, pick motion **12**, torsion bar **17**, compensating scroll **13** and the windlass mechanism **11**, the ring rail **24** is caused to oscillate vertically and to gradually rise over the bobbins **27** while building the same with wraps of yarn. This operation is conventional in the spinning frame of the type disclosed and need not be dealt with further.

When the bobbins are fully built, the ring rail **24** will be positioned near the tops thereof as disclosed in said prior patents and application. The position of the windlass sleeve **21** or its extent of rotation is always directly proportional and related to the position of the ring rail **24** throughout the cycle of operation of the spinning frame. Therefore, when the ring rail is at the full bobbin position, the eccentric cam **82** on the windlass shaft **22** will have its high part beginning to engage the plunger **84** of normally open switch **83**, and this switch will instantly be closed to complete a circuit through the control timer unit **105** and through the cable **109** with the solenoid **80** of escapement unit **26**. This energizing of the solenoid **80** will instantly cause retraction of the bolt **79** and release an extension of the plunger **78** due to the tension which is always on the tape **29** and which tension is sufficient to overcome the spring **76**. This added length or slack suddenly placed in the tape **29** allows the windlass sleeve **21** to turn a further slight distance under influence of the torsion bar **17** to quickly elevate the ring rail **24** to the tip bunch applying position, not shown herein but fully illustrated and described in the mentioned prior patents and application. The compensating scroll **13** must be equipped with a positive stop screw **114**, FIGURE 1, to positively arrest movement of the ring rail **24** above the predetermined correct tip bunch position and to prevent reliance solely on the tape **29** for this purpose. The timer motor and a cam, not shown, within the unit **105** and corresponding to the timer motor **128** and cam adjacent the switch ET–4 in said application and the circuit through the switch **83** is maintained automatically during the required tip bunch applying operation. This same circuit continues to be maintained after tip bunch application is completed and then automatically through another cam and switch in the unit **105**, the solenoid **61** becomes energized. Prior to this, the solenoid **61** has been de-energized and the plunger **62** is retracted and the clutch head **47** is separated from the gear **50** and this gear has been turning freely and continuously on the shaft portion **52** without causing rotation of the clutch head **47** and shaft **22**. When the solenoid **61** is thus automatically energized, the clutch head **47** is coupled instantly to the gear **50** as previously explained and continued rotation of the gear **50** imparts through the clutch head **47** positive rotation to the windlass shaft **22** and the sleeve **21** upon it in the direction for winding down and lowering the ring rail **24** automatically and in overriding relation to the torsion bar **17**, chain **18** and associated elements. The control timer unit **105** holds the solenoid **61** energized, thereby lowering the ring rail.

When the ring rail is fully lowered as shown in the drawings, the opening **91** will have again moved into registration with the single bore **90** of bracket structure **16**, and the spring **93** will force pin **92** into bore **90** as shown in FIGURE 3 and this will lock the windlass sleeve **21** and consequently positively lock the ring rail **24** in the fully lowered position. When this occurs, the normally closed switch **85** will be opened due to movement of the ball **88** out of the detent groove **95**, and this opens the circuit through the cable **110** to the wind down solenoid **61**. The opening of the switch **85** de-energizes the solenoid **61** of the clutch unit **44** and allows automatic separation of the clutch head **47** from the gear **50** which is the condition shown in FIGURES 2 and 5. The control timer unit **105** now shuts off the power, the unit **26** is reset, the clutch unit **44** is de-activated and the ring rail is locked down by the means shown in FIGURE 3. The circuitry is now conditioned for the beginning of a new cycle of operation, and when this is desired, the operator need only again push the plunger **96** and operate the main starting switch **108**, as previously explained.

The invention, therefore, effects automatically on a spinning frame of the type disclosed, the application of the tip bunches, the lowering and locking of the ring rail and the shutting off the power to the spinning frame motor and the windlass and wind down mechanism. The invention resides in the application of the clutch unit **44** to the windlass and wind down mechanism and in the application of the unit **26** between the tape **29** and builder motion and also in the provision of the locking means shown in FIGURE 3, the control unit **105** and the switches **83** and **85** to the particular type of spinning frame in question.

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.

Having thus described our invention, we claim:

1. In a spinning frame of the type having a stationary spindle rail, a movable ring rail, carriage and vertical guide means for said ring rail, lifter tapes for said carriage means, a windlass and wind down mechanism connected with said lifter tapes to wind up and pay out the same, a torsion bar to supply energy, flexible means interconnecting the torsion bar and said mechanism for turning the latter in one direction to lift the ring rail, a builder motion, a flexible element interconnecting the builder motion and said mechanism to turn the latter in an opposite direction and in opposition to said torsion bar for oscillating the ring rail, the improvement comprising an electro-magnetic clutch unit connected with said windlass and wind down mechanism and adapted when active to turn said mechanism in a direction for lowering the ring rail to a bobbin doffing position and overriding the force of said torsion bar, said clutch unit when inactive allowing free oscillation of said mechanism under influence of the torsion bar and said builder motion, gearing connected with said clutch unit and powered by the drafting system of the spinning frame, an electro-mechanical escapement unit connected in said flexible element between the builder motion and said mechanism and adapted when energized to cause lengthening of the flexible element, whereby said torsion bar and mechanism may then raise the ring rail to a tip bunch applying position above the normal upward limit of movement of the ring rail after bobbin building and prior to lowering the ring rail, automatic mechanical lock

means for said windlass and wind down mechanism operable to lock the latter against rotation only when the ring rail is fully lowered, a first switch on said mechanism and opened and closed by operation of said lock means, a second switch on said mechanism, an eccentric cam on said mechanism and turning therewith and engaging the second switch to open and close the same, and control circuit means electrically interconnecting said switches, clutch unit and escapement unit and adapted to coordinate the operation of the same in properly timed relation.

2. In a spinning frame of the type having a movable ring rail and a rotary windlass and wind down mechanism to raise, lower and oscillate said ring rail, said mechanism having a driven shaft, a gear freely rotatably mounted on said shaft and held against axial movement thereon and having clutch teeth, gearing driven by the front draft roll of the spinning frame and engaging said gear and continuously driving the same during spinning frame operation, a clutch head on said shaft and secured thereto to turn therewith and being axially shiftable thereon toward and from said gear and having clutch teeth for coupling engagement with the teeth of said gear, resilient means normally separating the clutch head from said gear, electro-mechanical means operable when energized to couple the clutch head with said gear so that the latter will cause turning of said mechanism in a direction causing lowering of said ring rail to a bobbin doffing position, and electro-mechanical means on said mechanism and spinning frame to cause automatic locking of the ring rail in said bobbin doffing position and also then interrupting the power to the spinning frame motor.

3. The invention as defined by claim 2, and wherein the last-named electro-mechanical means includes a reciprocatory plunger and locking pin on said mechanism, said plunger having a detent recess therein, and a switch on said mechanism having an actuator element adapted to enter said recess and to be elevated therefrom for actuating said switch.

4. In a spinning frame, a stationary spindle rail supporting a plurality of bobbins rotatably, a movable ring rail above the spindle rail to traverse said bobbins for causing building thereof, rotary windlass and wind down mechanism on the spinning frame connected with the ring rail to raise, lower and oscillate the same, torsion bar and builder motion means on the spinning frame and connected with said rotary mechanism and working in opposition to each other to oscillate the mechanism and said ring rail during bobbin building and to cause gradual elevation of the ring rail to a point near the tops of the bobbins when the building of the bobbins is completed, said builder motion means including a flexible element connected with said mechanism, an extensible and retractable device connected in said flexible element, control means for said device to allow extension thereof for producing added length in the flexible element allowing said

mechanism to turn somewhat in a direction to elevate the ring rail to a tip bunch applying position after the completion of bobbin building, clutch means connected directly with said rotary mechanism and powered by the spinning frame and adapted when active to rotate said mechanism in a direction for completely lowering the ring rail to the doffing position after application of tip bunches to the bobbins, control means to render the clutch means active and inactive, and automatic means to lock said mechanism against rotation when the ring rail is lowered to said doffing position and to then interrupt the power to the spinning frame.

5. The invention as defined by claim 4, and wherein said first-named control means for said device includes a solenoid operated bolt and a spring, said control means for the clutch means including a solenoid which when energized renders the clutch means active, and said automatic means to lock said mechanism includes a locking pin, a plunger shiftable with said pin and having a detent, and a control switch operated by movement of said detent.

6. In a spinning frame of the type having a rotary windlass and wind down mechanism for operating the movable ring rail of the spinning frame and torsion bar and builder cam means for operating said mechanism and working in opposed counterbalancing relation on said mechanism, automation means for the spinning frame comprising a clutch unit on said mechanism and idling during the normal operation of the mechanism for building bobbins, means to render the clutch unit active after the completion of bobbin building to drive said mechanism in a direction for winding down the ring rail to a bobbin doffing position, said clutch unit having a freely rotatable part and a part secured to said mechanism to turn therewith and shiftable toward and from said rotatable part, gearing connected with said rotatable part to continuously drive the same, and means to automatically lock said mechanism against further rotation when the ring rail is at said doffing position thereby locking the ring rail at such position, said last-named means including electrical circuitry operable to shut off the power to the spinning frame simultaneously with said locking of the ring rail in said doffing position.

7. The invention as defined by claim 6, and additional means connected with said mechanism and operable automatically upon completion of bobbin building to cause turning of said mechanism in a direction and by an amount sufficient to elevate the ring rail to a tip bunch applying position prior to lowering and locking of the ring rail.

No references cited.

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