April 10, 1945. I. R. ROWE 2,373,263

SPINNING FRAME

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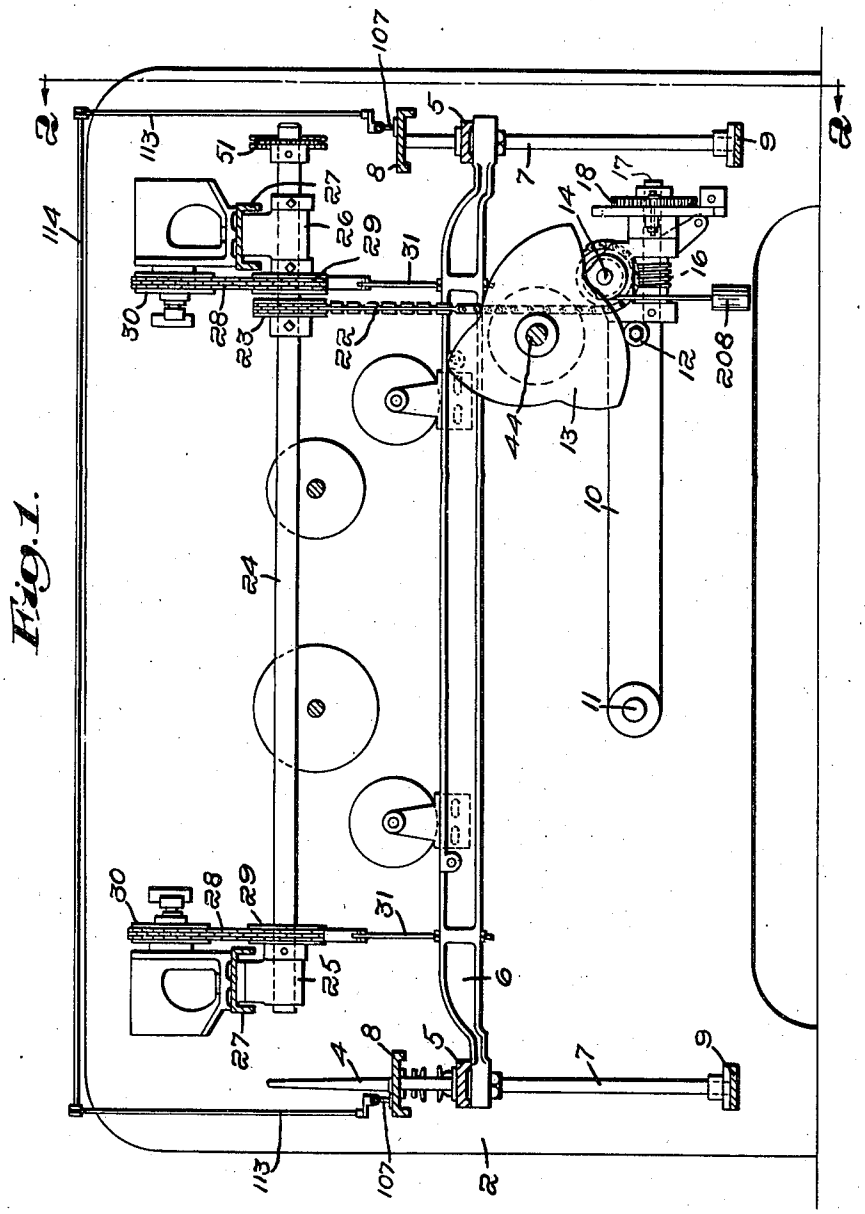


Fig. 1.

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Fig. 2.

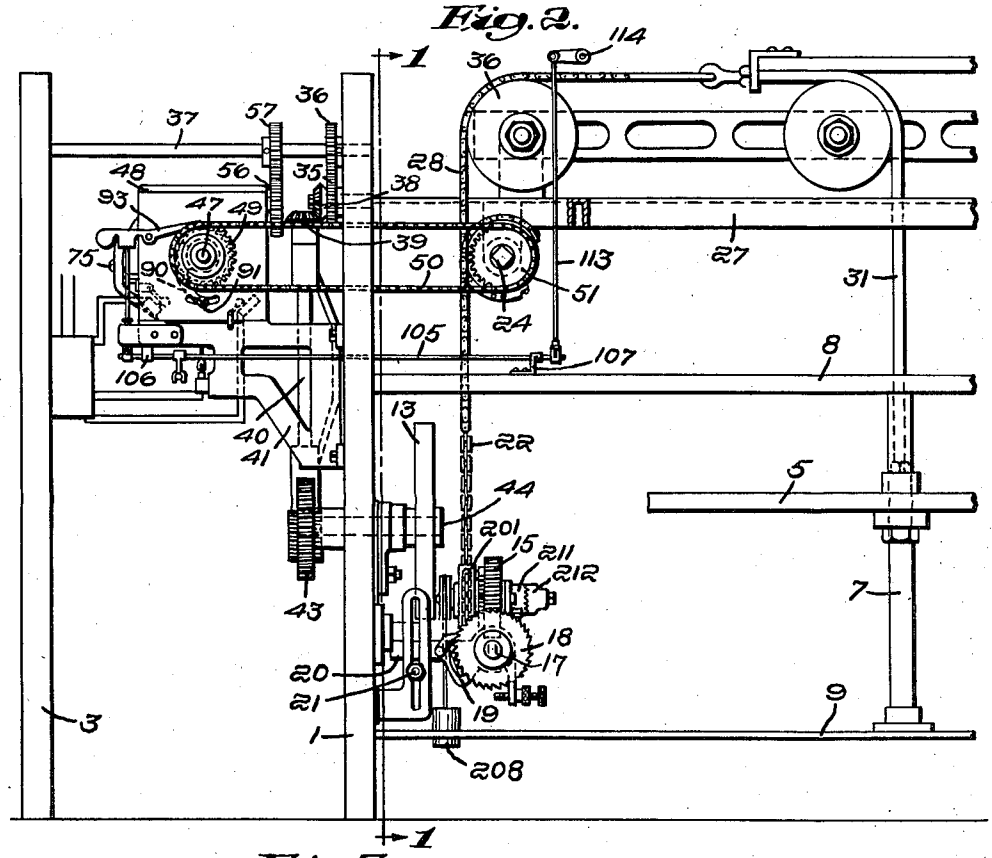
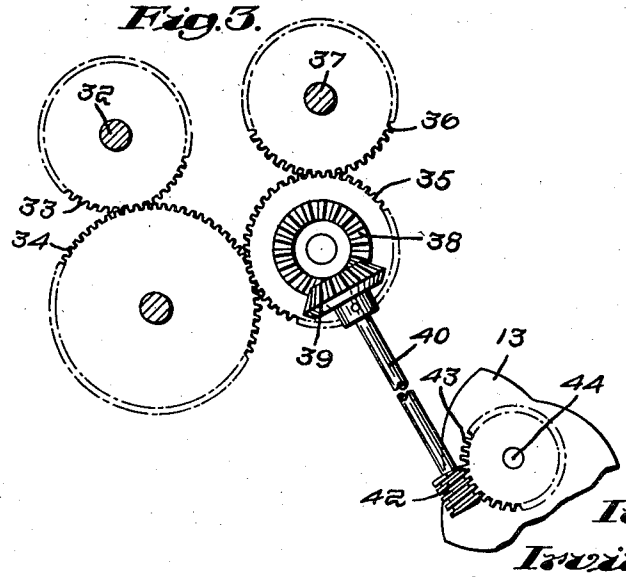


Fig. 3.



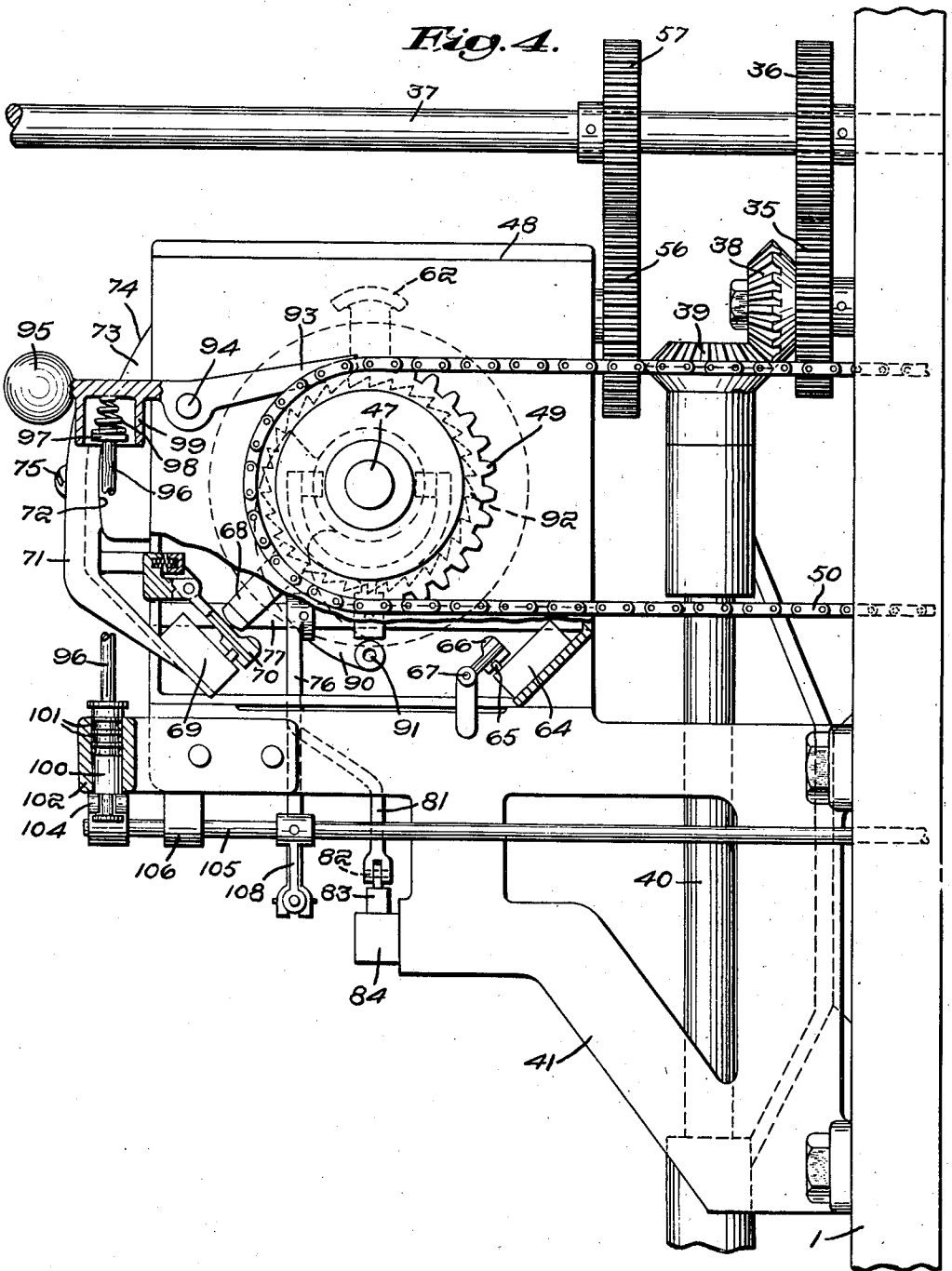
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Fig. 4.



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Fig. 5.

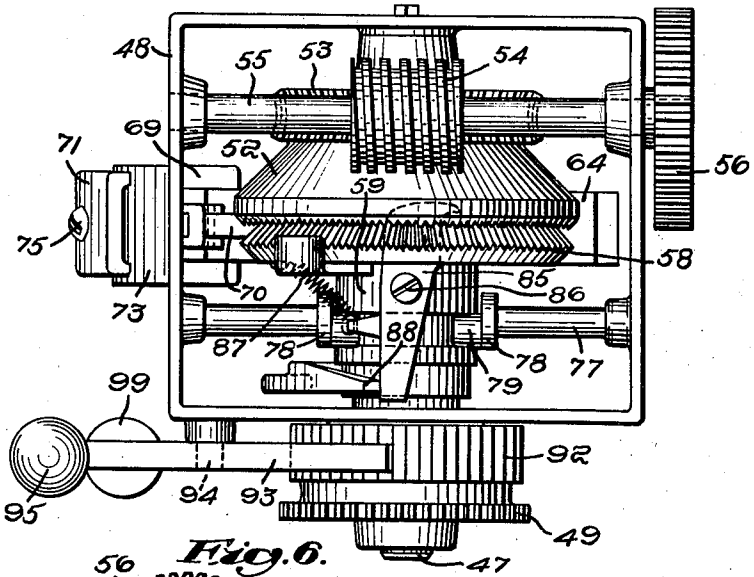
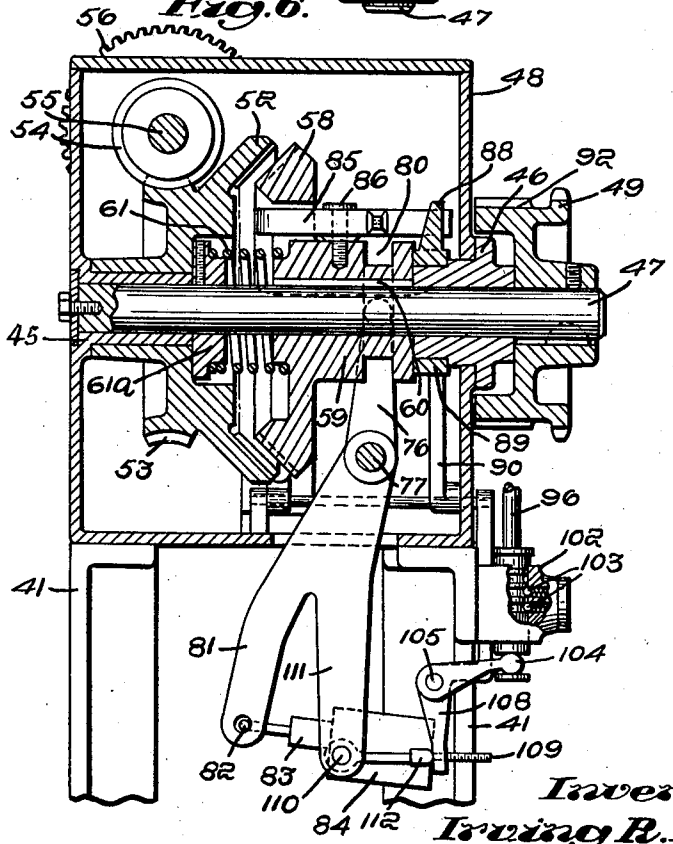


Fig. 6.



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Fig. 7.

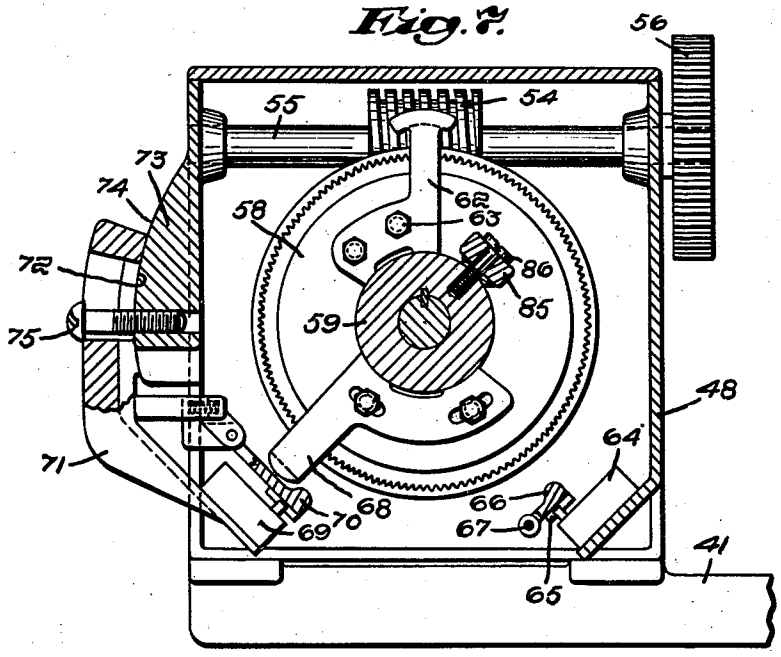


Fig. 8.

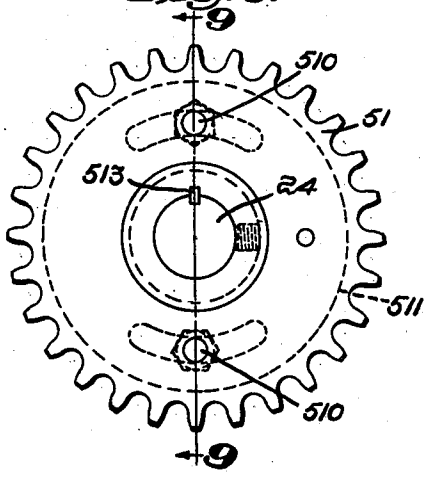
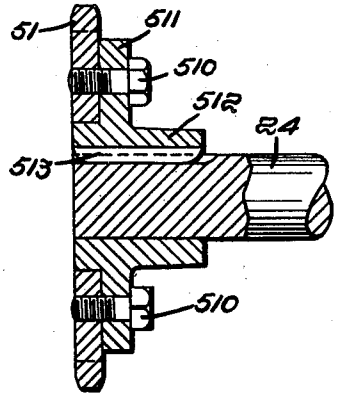


Fig. 9.



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Fig. 11.

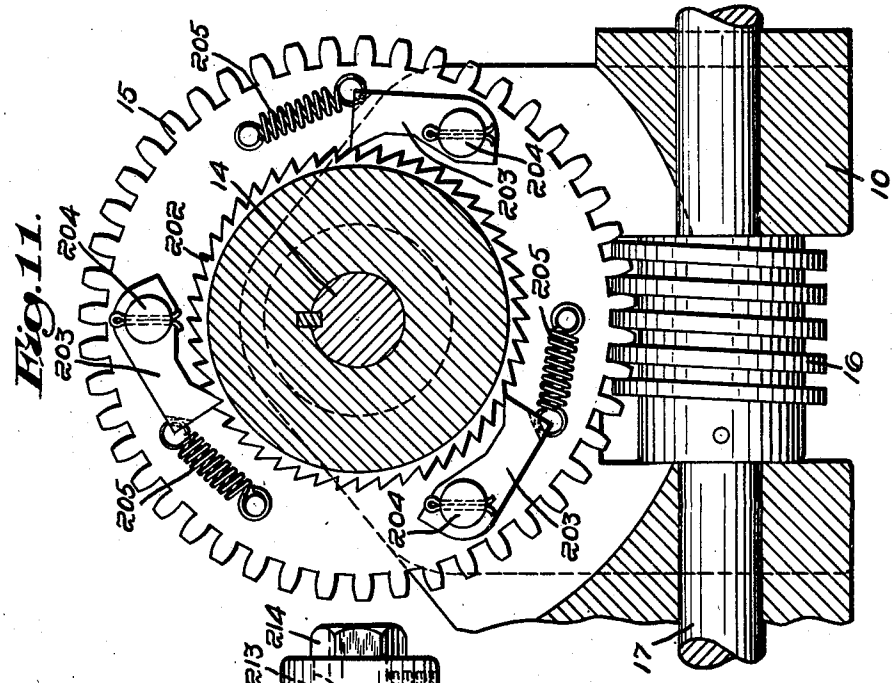
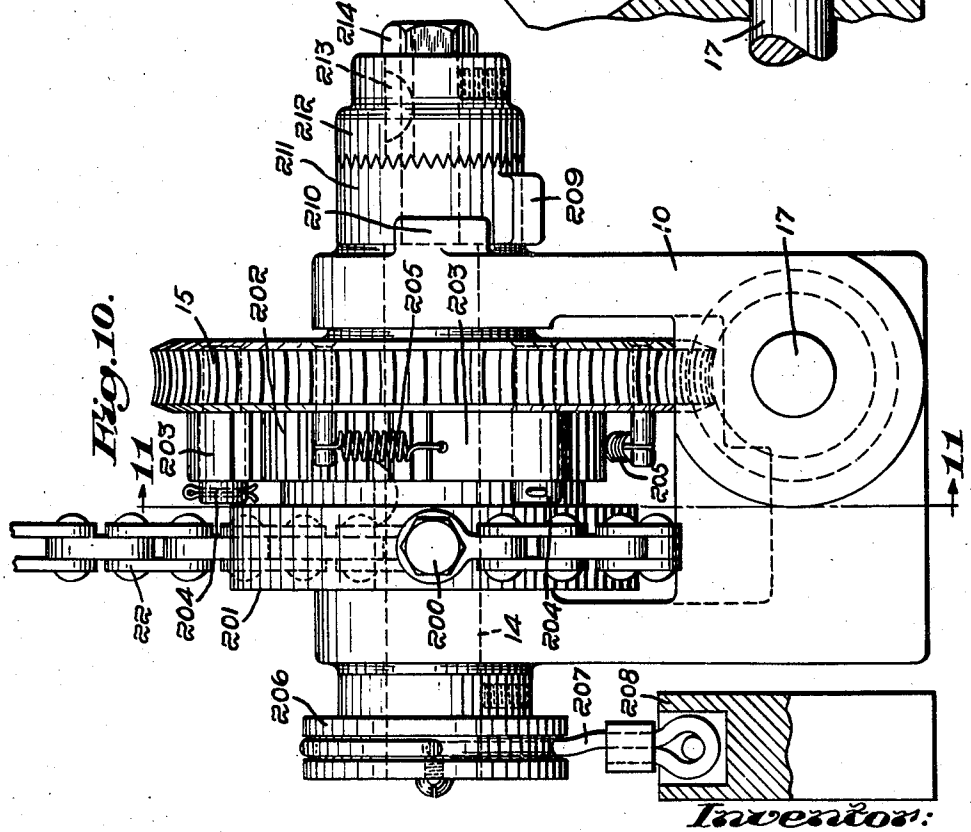


Fig. 10.



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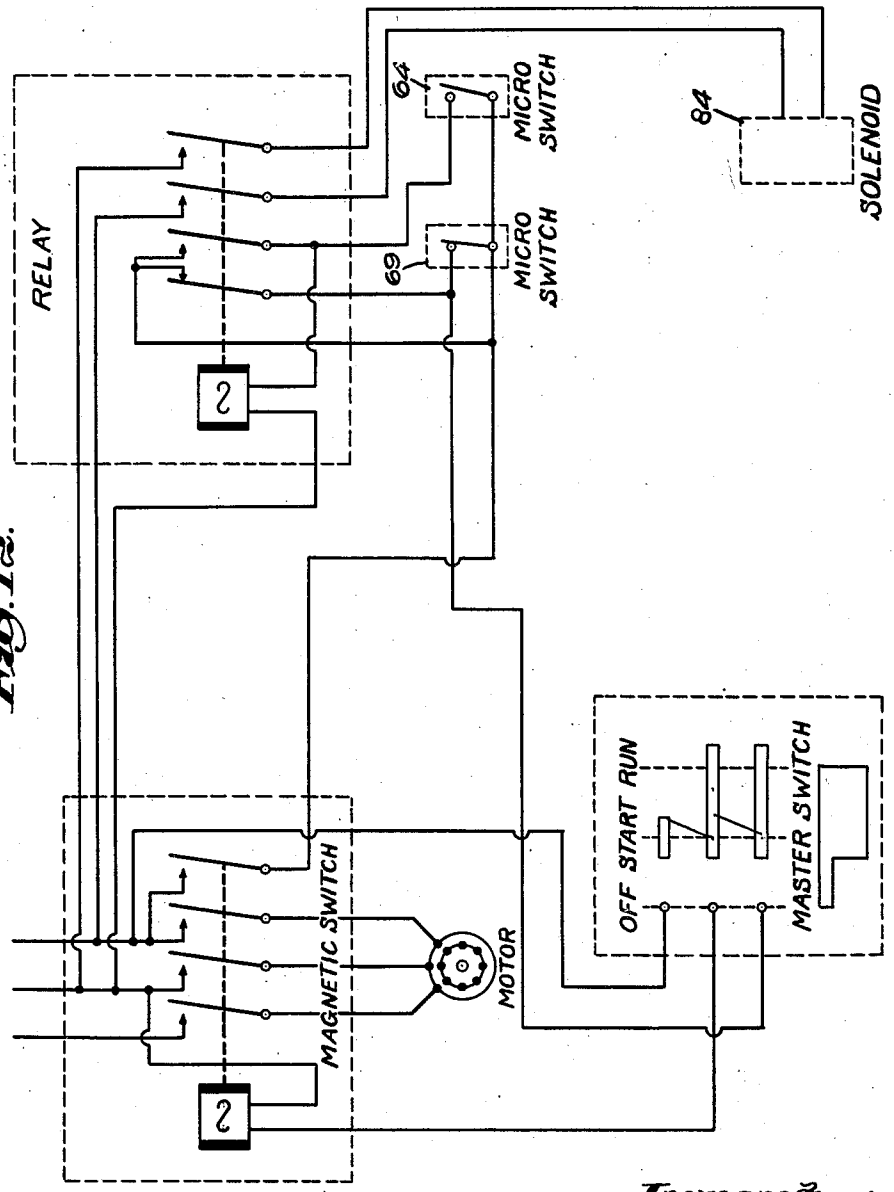


Fig. 12.

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2,373,263

UNITED STATES PATENT OFFICE

2,373,263

SPINNING FRAME

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Application September 11, 1943, Serial No. 501,966

27 Claims. (Cl. 57—54)

This invention relates to a spinning frame of that type in which the spindle rail frame carrying the bobbins moves vertically up and down with respect to the fixed ring rail under the control of the usual builder motion. In these spinning frames the spindle rail frame is reciprocated vertically for the traverse of the yarn and gradually lowered vertically for the gain, so that when the bobbins are filled the spindle rail frame is in the lowermost position. Then the spindle rail frame must be raised to practically the uppermost position where the doffing of the filled bobbins takes place and empty bobbins are replaced. While means have hitherto been employed for raising the spindle rail frame from filled bobbin position to doffing position, such means have never been fully automatic and have only partially met the requirements of modern spinning frames of this type.

The object of the invention is to provide in this type of spinning frame a fully automatic mechanism for raising by power and controlling the movement of the spindle rail frame from filled bobbin to doffing position.

The object of the invention is further to provide an efficient electric control and drive for thus automatically raising by power and controlling the movement of the spindle rail frame.

The object of the invention is further to provide such a mechanism which may be readily embdied in existing spinning frames. A spinning frame of the type here involved is sufficiently illustrated for the purposes of the invention in the patent to Owen No. 1,824,788, Sept. 29, 1931, and as its general construction and operation is familiar to those skilled in the art no extended illustration or description thereof is here necessary except insofar as features concerned with the present invention are involved. Consequently only a portion of the spinning frame is herein illustrated and some of the features are shown diagrammatically.

In the drawings which illustrate a preferred embodiment of the invention,

Fig. 1 is an end elevation chiefly in vertical cross section taken on the line 1—1 of Fig. 2 showing various elements of the spinning frame.

Fig. 2 is a front vertical elevation of a portion of the spinning frame looking toward the left on the line 2—2 of Fig. 1.

Fig. 3 is a detail illustrating the drive to the main elements of the present invention and the drive to the builder motion.

Fig. 4 is a view similar to the left-hand portion of Fig. 2 partially broken away and partially in vertical cross section illustrating more in detail the various elements.

Fig. 5 is a top plan view with the cover removed of the main casing and the main elements contained in and associated therewith.

Fig. 6 is a view chiefly in central vertical cross section taken centrally of Fig. 5.

Fig. 7 is a view in transverse vertical cross section of a portion of the construction shown in Figs. 5 and 6 illustrating the trip fingers and cooperating switches.

Fig. 8 is an enlarged view in end elevation of the sprocket wheel 51 shown in Fig. 1.

Fig. 9 is a view in cross section taken on the line 9—9 of Fig. 8.

Fig. 10 is an enlarged elevation of the main portion of the builder motion shown in Fig. 2.

Fig. 11 is a view in cross section taken on the line 11—11 of Fig. 10.

Fig. 12 is a detail diagrammatic illustration of the electric elements and circuits involved in the electrical control.

The end frames 1 and 2 support the main portions of the usual mechanism of the spinning frame and the main features of the mechanism embodying the present invention are enclosed between and supported by the end frame 1 and the auxiliary end frame 3. The spindles 4 for the bobbins are supported in the usual manner upon the spindle rails 5 extending at the sides of the frame. These spindle rails, connected together by the usual transverse connectors 6, constitute a spindle rail frame guided upon the vertical guide rods 7 extending from the ring rails 8 to girders 9 at the bottom of the machine frame.

The usual builder motion for effecting the movement of the spindle rail frame relatively to the ring rails to lay the mass of yarn on the bobbins is provided. In its main features it is similar to that described in the said Owen Patent No. 1,824,788 wherein the builder cam controls the raising and lowering of the spindle rail frame for the traverse and a pick motion gradually unwinds a chain to secure the required gain in the traverse by the gradual lowering of the spindle rail frame.

But in addition to the type of mechanism disclosed in this Owen patent there is here provided a mechanism for automatically winding up or retrieving the chain so that it is maintained substantially taut whenever the spindle rail frame rises and the chain would normally slacken. The preferred construction is illustrated in detail in Figs. 10 and 11. The arm 10, see Fig. 1, is piv-

oted at 11 to the frame and carries the follower 12 co-operating with the builder cam 13. In the arm 10 which is forked at its free end is journaled the shaft 14. A worm wheel 15 is journaled on this shaft 14 and is driven by a worm 16 secured to the transverse shaft 17 journaled in the arm 10. To the shaft 17 is secured a ratchet wheel 18. A pawl 19 is pivoted on an arm 20 loosely mounted on the shaft 17, and this arm co-operates with a stop 21 vertically adjustable on the end frame 1. Thus at each downward movement of the arm 10 the pawl 19 actuates the ratchet wheel 18 in an amount determined by the position of the stop 21 and thus turns the worm wheel 15 as described in the said Owen patent. The usual builder chain 22 in the present construction winds around and is secured at 200 to a drum 201 keyed to the shaft 14. Secured to the drum 201 is a ratchet wheel 202 engaged by pawls carried on the worm wheel 15 and so arranged that as the worm wheel is rotated the pawls engaging the ratchet wheel will rotate the drum 201 to unwind the chain through but will allow the drum to rotate freely in the wind-up direction whenever the chain slackens. A plurality of pawls, herein three, are provided on the worm wheel. Each of these pawls 203 is pivoted on a stud 204 projecting from the face of the worm wheel and held in engagement with the ratchet wheel by a spring 205. These pawls are arranged to act in sequence so that an angular rotation of the worm wheel substantially equal to the angle subtended by a tooth of the ratchet wheel divided by the number of the pawls will rotate the ratchet wheel that distance. Thus with a relatively coarse toothed ratchet wheel and with sturdy pawls a small degree of step by step motion is secured. A pulley 206 is secured to the end of the shaft 14, and a cable 207 attached at one end to this pulley is wound thereabout and has suspended on its free end a weight 208 acting to rotate the shaft and consequently the drum 201 and the ratchet wheel 202 in a direction to wind up the chain 22, the pawls 203 yielding to permit such rotation. Thus it will be seen that any slackening of the builder chain 22 is at once taken up by the action of the weight 208 turning the drum 201 to wind up or retrieve the chain and so the chain 22 is always maintained substantially taut. The winding-up action of the drum 201 is adjustably limited by means of a stop 209 rotarily adjustable on the shaft 14 coming into engagement with a fixed stop 210 on the arm 10. As illustrated the stop 209 projects from a sleeve 211 journaled on the shouldered end of the shaft 14 and having a toothed face engaging a similar toothed face of a sleeve 212 keyed at 213 to and slidable longitudinally on the shouldered end of the shaft 14. A nut 214 threaded to the end of the shaft locks the parts in adjusted position.

The chain 22 is secured to and extends around a sprocket wheel 23 on the usual transverse shaft 24 journaled in suitable bearings 25 and 26 carried by the girts 27 connecting the end frames. Flexible connectors such as the chains 28 are secured to and extend around sprocket wheels 29 mounted on the transverse shaft 24 and these chains 28 extend over idler sprockets 30 and are connected to a series of suitable flexible connectors 31 extending to the spindle rail frame, all as described in the said Owen Patent No. 1,824,788, so that as the transverse shaft 24 is rotated either by the builder motion, by the weight of the spindle rail frame suitably counterbalanced as usual, or otherwise, and in either direction, the spindle rail frame moves upward or downward.

The spinning frame is driven from a suitable source of power in the usual manner and the elements of the mechanism with which the present invention is concerned are illustrated as receiving their power from the shaft 32 which may be the shaft of the driven rolls of the drafting mechanism, (see Fig. 3). This shaft extends through the end frame 1 and has secured thereto a gear 33 engaging an intermediate gear 34 journaled on the end frame 1 which in turn engages a gear 35 also journaled on the end frame 1 and this gear 35 engages a gear 36 secured to a shaft 37 extending between and journaled in the end frames 1 and 3. The gear 35 has secured thereto or rotatable therewith the beveled gear 38 cooperating with the beveled gear 39 secured to the shaft 40 journaled in a bracket 41 and carrying at its lower end a worm 42 engaging a worm wheel 43 secured to the shaft 44 for rotating the builder cam. This shaft is journaled in the end frame 1 and to it is secured the builder cam 13.

The bracket 41 supports between the end frames 1 and 3 a box-like casing in which is journaled in bearings 45 and 46 a short shaft 47 extending parallel to the transverse shaft 24. Outside the box-like casing 48 the shaft 47 has secured thereto a sprocket wheel 49 and a chain 50 engaging the sprocket wheel 49 extends to and engages a sprocket wheel 51 secured to the transverse shaft 24 so that the shaft 47 moves in unison with the shaft 24. This sprocket wheel 51 is rotarily adjustable on the shaft 24 and for that purpose, see Figs. 8 and 9, the toothed portion is an annular disk adjustably secured by set screws 510 passing through arcuate slots to the flange 511 of the hub 512 keyed at 513 to the shaft.

Inside the casing 48 there is located a clutch by means of which the shaft 47 may be connected to the power driven element of the machine, such as the shaft 32. The clutch member 52 is journaled freely on the bearing 45 concentrically of the shaft and has formed thereon or secured thereto a worm wheel 53 co-operating with a worm 54 mounted on a shaft 55 journaled in the casing 48 and provided at its outer end with a gear 56 engaging and driven by a gear 57 secured to the shaft 37. Thus the clutch member 52 is constantly rotated when the spinning frame is in operation, and when clutched to the shaft 47 acts to turn this shaft, and consequently the transverse shaft 24, counterclockwise, viewing Figs. 2 and 4, and thus to raise the spindle rail frame. The other clutch member 58 has its hub 59 keyed at 60 to the shaft 47 and is normally held separated from the clutch member 52 and against the fixed bearing 46 by the helical spring 61 abutting the hub 59 and a collar 61*a* secured to the shaft 47. When, therefore, the clutch member 58 is slid into engagement with the clutch member 52 the shaft 47 will be rotated to raise the spindle rail frame.

It will be understood that the spinning operation begins with the spindle rail frame in its uppermost position and as the spinning proceeds and the yarn mass is laid upon the bobbins the transverse shaft 24, the shaft 47, and the clutch member 58 rotate in unison under the control of the builder motion. Consequently, the clutch member 58 is constantly oscillated by the builder cam 13 and progressively rotated step by step clockwise, viewing Figs. 2 and 4, under the con-

trol of the pick motion. These movements of the clutch member 58 thus continue until the spindle rail frame has reached a predetermined lowermost position where the bobbins are filled with the desired mass of yarn. When this position has been reached the entire spindle rail frame carrying all the bobbins filled with yarn must now be raised to the upper doffing position to enable the filled bobbins to be doffed and empty bobbins placed upon the spindles and the spinning operation resumed. In this invention the raising of the spindle rail frame to doffing position takes place automatically and the spindle rail frame is released and held automatically in its doffing position, all under electric control, and for this purpose a preferred form of mechanism such as illustrated is employed.

A trip finger 62 extends radially of the clutch member 58 and is secured thereon at 63. This trip finger at the proper time operates a micro switch 64 mounted in the casing 48. To insure a smooth and positive operation of the micro switch plunger 65 a small lever 66 is pivoted at 67 on the casing and is engaged by the trip finger 62 to depress the plunger and thus operate the switch. A second trip finger 68 is adjustably secured to and projects radially from the clutch member 58 and co-operates with a second micro switch 69 also provided with an actuating lever 70. In this case further to permit the required accurate adjustment or timing of the action of the trip finger 68 and its micro switch, the micro switch itself is bodily adjustable angularly with respect to the clutch. For this purpose the microswitch 69 and the co-operating pivoted lever 70 are carried by a frame 71 the face 72 of which is formed on an arc concentric with the shaft 47 and rests against a boss 73 formed on the casing 48 and having its surface 74 concentric with the shaft 47. Thus by means of the set screw 75 the micro switch is angularly adjustable with respect to its co-operating trip finger 68.

A clutch-operating lever 76 extends through the bottom of the casing 48 and is journaled on a shaft 77 mounted therein. This lever is forked at its upper end 78 and provided with antifriction rolls 79 engaging an annular groove 80 in the hub 59 and at its lower end presents an arm 81 pivoted at 82 to the core 83 of a solenoid 84 mounted on the bracket 41.

A knockoff lever 85 for positively separating or unclutching the clutch members is pivotally mounted at 86 on the hub 59 of the clutch member 58 and normally held in inoperative position by the spring 87. A stop 88 for effecting the actuation of the knockoff lever 85 is shown projecting radially from a hub 89 journaled on the bearing 46 and having a depending arm 90 adjustably connected at 91 to the casing wall to enable the stop 88 to be adjusted angularly with respect to the clutch.

It will thus be seen that the spinning operation proceeds with the clutch in open position as illustrated. When the spindle rail frame has reached its predetermined lowermost position and the spindle rail frame is to be raised to doffing position, the trip finger 62 will be timed to be rotated by the clutch member 58 to a position where on the oscillation of the clutch member 58 by the builder cam the trip finger will engage and operate the micro switch 64. The closing of this switch is arranged to energize the solenoid 84 and thereby rock the clutch-operating lever 76, thus causing the clutch member 58 to engage the positively power driven clutch member 52. While the switch 64 is preferably actuated by a trip finger carried by the clutch member 58 it will be recognized that any suitable means may be employed which is controlled by the movement of the spindle rail frame or the elements moving in unison therewith to act when the spindle rail frame reaches the predetermined low position. The shaft 47 is then rotated to raise the spindle rail frame. When this operation has proceeded and the spindle rail frame has been raised to its doffing position the trip finger 68 is timed to come into engagement with and operate the micro switch 69. The operation of this switch acts to de-energize the solenoid 84 and enable the clutch members to separate. The clutch members, however, remain in engagement until positively separated due to the coasting or overrunning of the machine for a brief period. To enable this to take place these clutch members are formed with co-operating conical radial toothed faces with the included angle of the teeth such as to maintain the clutch members locked for the required period. With a standard spinning frame of 120 spindles this included angle is on the order of 115 degrees. The positive separation of the clutch members is effected by the knockoff lever 85 which, at the required time, comes into engagement with and is actuated by the stop 88.

The spindle rail frame must be prevented from dropping and must be held in its raised position when the clutch is released and until the builder cam has resumed control and the spinning operation is resumed. For this purpose a ratchet wheel 92 is secured to or formed on the hub of the sprocket wheel 49 and a co-operating pawl 93 is pivoted at 94 on the casing and weighted at 95 at its free end. Normally the pawl is held out of engagement with the ratchet wheel by gravity. A pawl positioner in the form of a vertical plunger rod 96 is provided at its upper end with a head 97 upon which is seated a light spring 98 enclosed in a hollow boss 99 projecting downward from the pawl 93. At its lower end the plunger rod 96 has an enlarged portion 100 provided with grooves 101 and slides in a boss 102 secured to the bracket 41 while spring-pressed balls 103 in the boss co-operate with the grooves. At its extreme lower end this plunger rod fits over an arm 104 secured to a shaft 105 journaled in a bearing 106 and extending conveniently through a bearing 107 on the ring rail. An arm 108 secured to the shaft 105 projects downwardly therefrom over a small rod 109 pivoted at 110 to an arm 111 of the clutch-operating lever 76 and carrying an adjustable abutment 112. When, therefore, the solenoid 84 has been energized to move the clutch member 58 into clutching position, the abutment 112, acting against the arm 108, rocks the shaft 105, raising the plunger rod 96 into its uppermost position where it is held by the balls 103. This acts to rock the pawl 93 into operative position but the spring 98 still allows the required yielding movement of the pawl in co-operating with the ratchet. The plunger rod remains in this position when the clutch is released and the clutch-operating lever 76 moves to unclutching position and is not moved downward until the shaft 105 is rocked. This is preferably done by a connection 113 extending to the shipper mechanism 114 for starting and stopping the spinning frame. Thus the pawl positioner is retained in position to hold the pawl in position to co-operate with the ratchet wheel after clutch disengagement and until it is positively moved to inactive position.

The operation of the spinning frame and particularly the raising of the spindle rail frame from a predetermined lowermost position to the doffing position is controlled electrically and for that purpose a master switch, a magnetic switch and a relay designed for a three-wire circuit are provided and illustrated diagrammatically in Fig. 12. These devices are in general standard construction, and, therefore, diagrammatic illustrations are sufficient.

The trip finger 62 and the micro switch 64 are installed at approximately the position for the actuation of the switch when the spindle rail frame is at the desired lowermost position. The spindle rail frame is first lowered to this position, and the sprocket wheel 52 is then adjusted on the transverse shaft 24 until the trip finger 62 is in position to actuate the micro switch 64. The other trip finger 58 and micro switch 59, both of which are adjustable, are then adjusted as required to allow for the "coasting" or overrunning of the spinning frame when the power is cut off.

The spinning frame is started by throwing on the master switch preferably by turning the shipper rod connected to the switch. When the spindle rail frame reaches the required lowermost position, the trip finger 62 actuates the micro switch 64 and the solenoid 84 is energized causing the clutch member 58 to engage the power-driven clutch member 52 and thus causing the spindle rail frame to be raised. When the spindle rail frame reaches doffing position the trip finger 68 actuates the micro switch 69, the solenoid 84 is deenergized, the master switch is left in "on" position and the power is cut off. The machine now coasts or overruns a little until the knockoff lever 85 engages the stop 88 opening the clutch but leaving the spindle rail frame held in raised position by the pawl 93 and ratchet 92. The wind-up or retriever mechanism of the builder motion has wound up the builder chain until the stop 210 has been engaged but the spindle rail frame is below the extreme high position of the first traverse. The doffing of the filled bobbins and the replacement with empty bobbins now takes place with the spindle rail frame thus located somewhat below its topmost position. After the bobbins have been replaced the shipper rod is then moved to "off" then forward to "on" position resetting the pawl lifter 96 and throwing the master switch to start the spinning frame. The spindles then are rotated without movement of the spindle rail frame and winding the required yarn for the tail on the base of the bobbins for a period determined by the time it takes for the high point of the builder cam to engage and raise the spindle rail frame to topmost position. When this movement occurs the ratchet 92 releases the pawl 93, and the spinning operation proceeds.

The arrangement of the electric elements as shown in Fig. 12 will now readily be understood. When the spindle rail frame reaches its lowermost position the micro switch 64 closes energizing the coil circuit in the relay. A holding-in circuit is provided in this relay whereby it remains latched in electrically. The main contacts of this relay energize the circuit of the solenoid 84 for moving the lever 76 to operate the clutch and an additional contact in the relay opens the circuit across the mirco switch 69. Hence, when the spindle rail frame is raised to doffing position, the micro switch 69 opens and becomes effective in the circuit. The opening of the micro switch 69 breaks the coil circuit of the magnetic switch causing it to drop out. When the magnetic switch drops out its holding interlock also opens which clears the entire control circuit and de-energizes everything and the electric mechanism becomes inoperative until the master switch is first thrown to "off" position and then to "on" position when the spinning frame is to resume operation. In starting, the master switch takes precedence over both micro switches so that the spinning frame can always be started whether the micro switches are open or closed.

It will be seen that the preferred form of mechanism illustrated may readily be embodied in existing spinning frames of this type. The main elements are connected to and contained in the casing 48 and the various connections and alterations required apart from these elements are of a simple and obvious nature.

Having thus described the invention, what is claimed as new, and desired to be secured by Letters Patent, is:

1. In a spinning frame of that type having a spindle rail frame reciprocated vertically for the yarn traverse and moving vertically downward from doffing position to filled bobbin position, a driven element rotating when the spinning frame is running, electrically operated means for connecting the spindle rail frame to the said element to cause the said element to raise the spindle rail frame to doffing position, a switch actuatable to cause the electrically operated means to effect the connecting operation, and means actuating the switch when the spindle rail frame has reached a predetermined low position.

2. In a spinning frame of that type having a spindle rail frame reciprocated vertically for the yarn traverse and moving vertically downward from doffing position to filled bobbin position, a driven element rotating when the spinning frame is running, means acting when rendered operative for preventing downward movement of the spindle rail frame, electrically operated means for connecting the spindle rail frame to the said element to raise the spindle rail frame to doffing position and for rendering operative the said means for preventing downward movement, a switch actuatable to cause the said electrically operated means to effect said connecting and rendering functions, and means actuating said switch when the spindle rail frame has reached a predetermined low position.

3. In a spinning frame of that type having a spindle rail frame reciprocated vertically for the yarn traverse and moving vertically downward from doffing position to filled bobbin position, a driven element rotating when the spinning frame is running, means acting when rendered operative for preventing downward movement of the spindle rail frame, electrically operated means for connecting the spindle rail frame to the said element to raise the spindle rail frame to doffing position and for rendering operative the said means for preventing downward movement, a switch actuatable to cause the said electrically operated means to effect said connecting and rendering functions, means actuating said switch when the spindle rail frame has reached a predetermined low position, and a second switch actuated when the spindle rail frame has been raised to doffing position to cause said electrically operated means to release the connection between the spindle rail frame and the said element.

4. In a spinning frame of that type having a spindle rail frame reciprocated vertically for the yarn traverse and moving vertically downward from doffing position to filled bobbin position, a

driven element rotating when the spinning frame is running, means acting when connected to said driven element to raise the spindle rail frame to doffing position, means actuated when the spindle rail frame has reached a predetermined lower position to connect the said raising means to the driven element and means actuated when the spindle rail frame has been raised to doffing position to release the means actuating the said connection.

5. In a spinning frame of that type having a spindle rail frame reciprocated vertically for the yarn traverse and moving vertically downward from doffing position to filled bobbin position, a driven element rotating when the spinning frame is running, means acting when connected to said driven element to raise the spindle rail frame to doffing position, means actuated when the spindle rail frame has reached a predetermined lower position to connect the said raising means to the driven element, means acting when rendered operative for preventing downward movement of the spindle rail frame, and means actuated when the spindle rail frame has been raised to doffing position to release the means actuating the said connection and render operative the means for preventing downward movement of the spindle rail frame.

6. In a spinning frame of that type having a spindle rail frame reciprocated vertically for the yarn traverse and moving vertically downward from doffing position to filled bobbin position, a driven element rotating when the spinning frame is running, means acting when connected to said driven element to raise the spindle rail frame to doffing position, means actuated when the spindle rail frame has reached a predetermined lower position to connect the said raising means to the driven element, means acting when rendered operative for preventing downward movement of the spindle rail frame, and means actuated when the spindle rail frame has been raised to doffing position to release the means actuating the said connection and to render operative the means for preventing downward movement of the spindle rail frame and to cut off the power for driving the spinning frame.

7. In a spinning frame of that type having a spindle rail frame reciprocated vertically for the yarn traverse and moving vertically downward from doffing to filled bobbin position, a main rotary clutch member positively driven when the spinning frame is in operation, a complementary clutch member connected to the spindle rail frame to rotate in unison with the rise and fall of the spindle rail frame, movable into and out of engagement with the main clutch member and acting when in engagement therewith to raise the spindle rail frame, a clutch actuator for the complementary clutch member, electrically operated means for moving the clutch actuator to cause the complementary clutch member to engage the main clutch member, a switch actuatable to cause the electrically operated means to effect the clutching operation, and means actuating the switch when the spindle rail frame has reached a predetermined low position.

8. In a spinning frame of that type having a spindle rail frame reciprocated vertically for the yarn traverse and moving vertically downward from doffing to filled bobbin position, a main rotary clutch member positively driven when the spinning frame is in operation, a complementary clutch member connected to the spindle rail frame to rotate in unison with the rise and fall of the spindle rail frame, movable into and out of engagement with the main clutch member and acting when in engagement therewith to raise the spindle rail frame, a clutch actuator for the complementary clutch member, electrically operated means for moving the clutch actuator to cause the complementary clutch member to engage the main clutch member, a switch actuatable to cause the electrically operated means to effect the clutching operation, means for actuating the switch when the spindle rail frame has reached a predetermined low position, a second switch actuatable to render the electrically operated means inactive, a trip finger rotatable with the complementary clutch member and acting when the spindle rail frame has been raised to doffing position to actuate the second switch.

9. In a spinning frame of the type specified and having the construction and operation set forth in claim 8, means normally inoperative and rendered operative upon the actuation of the second switch to prevent downward movement of the spindle rail frame.

10. In a spinning frame of that type having a spindle rail frame reciprocated vertically for the yarn traverse and moving vertically downward from doffing to filled bobbin position, a main rotary clutch member positively driven when the spinning frame is in operation, a complementary clutch member connected to the spindle rail frame to rotate in unison with the rise and fall of the spindle rail frame, movable into and out of engagement with the main clutch member and acting when in engagement therewith to raise the spindle rail frame, two trip fingers carried by the complementary clutch member, two electric switches for actuation by the respective trip fingers, and electrically operated means controlled by said switches acting to effect engagement of the clutch members when downward movement of the spindle rail frame has caused the first trip finger to actuate its co-operating switch and acting to permit disengagement of the clutch members when rotation of the engaged clutch members has caused the second trip finger to actuate its switch.

11. In a spinning frame of that type having a spindle rail frame reciprocated vertically for the yarn traverse and moving vertically downward from doffing to filled bobbin position, a main rotary clutch member positively driven when the spinning frame is in operation, a complementary clutch member connected to the spindle rail frame to rotate in unison with the rise and fall of the spindle rail frame, movable into and out of engagement with the main clutch member and acting when in engagement therewith to raise the spindle rail frame, and electrically operated means acting to effect engagement of the clutch members when the spindle rail frame has reached a predetermined low position and acting to permit disengagement of the clutch members when thereafter the spindle rail frame has been raised to doffing position.

12. In a spinning frame of the type specified and having the construction and operation set forth in claim 10 the provision of means normally inoperative and rendered operative upon the actuation of the second switch to prevent downward movement of the spindle rail frame.

13. In a spinning frame of the type specified and having the construction and operation set forth in claim 10 the provision of means acting positively to disengage the clutch members in a

predetermined period after actuation of the second switch.

14. In a spinning frame of that type having a spindle rail frame reciprocated vertically for the yarn traverse and moving vertically downward from doffing to filled bobbin position, a main rotary clutch member positively driven when the spinning frame is in operation, a complementary clutch member connected to the spindle rail frame to rotate in unison with the rise and fall of the spindle rail frame, movable into and out of engagement with the main clutch member and acting when in engagement therewith to raise the spindle rail frame, a clutch actuator for the complementary clutch member, means actuated when the spindle rail frame has reached a predetermined low position to move the clutch actuator to effect the clutching action, means acting when the spindle rail frame has thereafter been raised to doffing position to release the clutch actuator and cut off the power driving the spinning frame, a fixed stop, and a knockoff member carried by the complementary clutch member acting upon overrunning of the clutch members after the power is cut off to engage the stop and be moved thereby positively to disengage the clutch members.

15. In a spinning frame of that type having a spindle rail frame reciprocated vertically for the yarn traverse and moving vertically downward from doffing to filled bobbin position, a main rotary clutch member positively driven when the spinning frame is in operation, a shaft, a complementary clutch member keyed to the shaft and slideable into and out of engagement with the main clutch member, two trip fingers and a knockoff arm carried by the complementary clutch member, two switches mounted on the frame co-operating respectively with the trip fingers, and a stop on the frame for co-operating with the knockoff arm.

16. In a spinning frame of that type having a spindle rail frame reciprocated vertically for the yarn traverse and moving vertically downward from doffing to filled bobbin position, a main rotary clutch member positively driven when the spinning frame is in operation, a shaft, a complementary clutch member keyed to the shaft and slideable into and out of engagement with the main clutch member, two trip fingers and a knockoff arm carried by the complementary clutch member, two switches mounted on the frame co-operating respectively with the trip fingers, a stop on the frame for co-operating with the knockoff arm, electrically controlled means acting when the shaft rotates in a direction opposite to that of the main clutch member and actuates the one switch by its trip finger to slide the complementary clutch member into clutching engagement and thereafter when the shaft rotates in the reverse direction and actuates the other switch by its finger acting to permit the release of the complementary clutch member, the said knockoff arm upon a further reverse rotation of the shaft engaging the stop and acting positively to disengage the clutch members.

17. In a spinning frame of the type specified and having the construction and operation set forth in claim 16, means for relatively adjusting the stop and co-operating knock-off arm.

18. In a spinning frame of that type having a spindle rail reciprocated vertically for the yarn traverse and moving vertically downward from doffing to filled bobbin position, a main rotary clutch member positively driven when the spinning frame is in operation, a complementary clutch member connected to the spindle rail frame to rotate in unison with the rise and fall of the spindle rail frame, movable into and out of engagement with the main clutch member and acting when in engagement therewith to raise the spindle rail frame, a clutch actuator for the complementary clutch member, a pawl and ratchet acting when co-operating to prevent downward movement of the spindle rail frame, a pawl positioner for moving the pawl into position to co-operate with the ratchet wheel, and means acting when the clutch actuator is moved to effect clutching engagement to move the pawl positioner to position the pawl to co-operate with the ratchet wheel.

19. In a spinning frame of the type specified and having the construction and operation defined in claim 18, the provision of a shipper movable to effect the starting and stopping of the spinning frame, and means operated by the shipper when moved to effect starting to move the pawl positioner to inactive position.

20. A mechanism for controlling the movement of the spindle rail frame in a spinning frame which comprises a shaft, an element connected to the shaft and to the spindle rail frame to rotate in unison with the vertical movement of the spindle rail frame, a main clutch member journaled concentrically of the shaft and positively driven when the spinning frame is in operation, a complementary clutch member keyed to the shaft and slideable into and out of engagement with the main clutch member, a spring normally acting to separate the clutch members, means for sliding the complementary clutch member into clutching engagement, a knockoff lever mounted on the complementary clutch member, a fixed stop acting when engaged by the knockoff lever positively to disengage the clutch members.

21. A mechanism for controlling the movement of the spindle rail frame in a spinning frame which comprises a shaft, an element connected to the shaft and to the spindle rail frame to rotate in unison with the vertical movement of the spindle rail frame, a main clutch member journaled concentrically of the shaft and positively driven when the spinning frame is in operation, a complementary clutch member keyed to the shaft and slideable into and out of engagement with the main clutch member, a clutch actuating lever engaging the complementary clutch member, a ratchet wheel secured to the shaft, a pawl for co-operation with the ratchet wheel to prevent rotation of the shaft corresponding to downward movement of the spindle rail frame, a pawl positioner for moving the pawl into position to co-operate with the ratchet wheel, and means acting upon clutch-engaging movement of the clutch actuating lever to move the pawl positioner to position the pawl to co-operate with the ratchet wheel.

22. A mechanism for controlling the movement of the spindle rail frame in a spinning frame as defined in claim 21 in which is embodied a spring between the pawl and the pawl positioner together with means acting to retain the pawl positioner in said position after clutch disengagement and until positively moved to inactive position.

23. A mechanism for controlling the movement of the spindle rail frame in a spinning frame which comprises a shaft, an element connected to the shaft and to the spindle rail frame to rotate in unison with the vertical movement of the

spindle rail frame, a main clutch member journaled concentrically of the shaft and positively driven when the spinning frame is in operation, a complementary clutch member keyed to the shaft and slideable into and out of engagement with the main clutch member, a clutch actuating lever engaging the complementary clutch member, and a pair of trip fingers carried by the complementary clutch member one for controlling the movement of the clutch actuating lever to effect clutch engagement and the other for controlling the release of the clutch actuating lever.

24. A mechanism for controlling the movement of the spindle rail frame in a spinning frame which comprises a shaft, an element connected to the shaft and to the spindle rail frame to rotate in unison with the vertical movement of the spindle rail frame, a main clutch member journaled concentrically of the shaft and positively driven when the spinning frame is in operation, a complementary clutch member keyed to the shaft and slideable into and out of engagement with the main clutch member, a clutch actuator acting to move the complementary clutch member into clutching engagement and thus cause the spindle rail frame to be raised, the said clutch members having co-operating conical radial toothed faces with the included angle of the teeth such as to maintain the clutch members locked for a predetermined period after the power is cut off and the clutch actuator released thus to provide for the overrunning of the spinning frame and avoid sudden stopping thereof.

25. A mechanism for controlling the movement of the spindle rail frame in a spinning frame as defined in claim 24 together with means acting positively to disengage the clutch members at the end of said predetermined period.

26. In a spinning frame of that type having a spindle rail frame reciprocated vertically for the yarn traverse and moving vertically downward from doffing to filled bobbin position, a main rotary clutch member positively driven when the spinning frame is in operation, a complementary clutch member connected to the spindle rail frame to rotate in unison with the rise and fall of the spindle rail frame, movable into and out of engagement with the main clutch member and acting when in engagement therewith to raise the spindle rail frame, an electric power control and drive for the spinning frame embodying a master switch, a magnetic switch, a relay, a solenoid for actuating the clutch engaging movement of the complementary clutch member, a switch actuated when the spindle rail frame reaches full bobbin position, a second switch actuated when the spindle rail frame is raised to doffing position, the said control acting, when the master switch is "on" and the first switch has been actuated, to energize the solenoid and acting, when thereafter the second switch is actuated, to cut off the power thus de-energizing the solenoid with the master switch in "on" position and requiring the master switch to be moved first to "off" and then to "on" position to restart the spinning frame.

27. In a spinning frame of that type having a spindle rail frame reciprocated vertically for the yarn traverse and moving vertically downward from doffing position to filled bobbin position under the control of a builder motion, a rewind mechanism for the said builder motion comprising a shaft journaled in the builder arm of the builder motion, a drum secured to the shaft and having the builder chain wound around and secured thereto, a ratchet wheel secured to the shaft, a pulley secured to the shaft, a rewind weight, a cable wound around and secured to the pulley and connected to the weight, a worm wheel journaled on the shaft, a plurality of pawls pivoted to the worm wheel and co-operating with the ratchet wheel to rotate the shaft to unwind the builder chain, the said pawls acting in sequence to rotate the ratchet wheel upon an angular rotation of the worm wheel substantially equal to the angle subtended by a tooth of the ratchet wheel divided by the number of pawls.

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