Aug. 22, 1967 G. H. SANDERS ET AL 3,336,739

SPINNING FRAME APPARATUS

Filed March 26, 1965

3 Sheets-Sheet 1

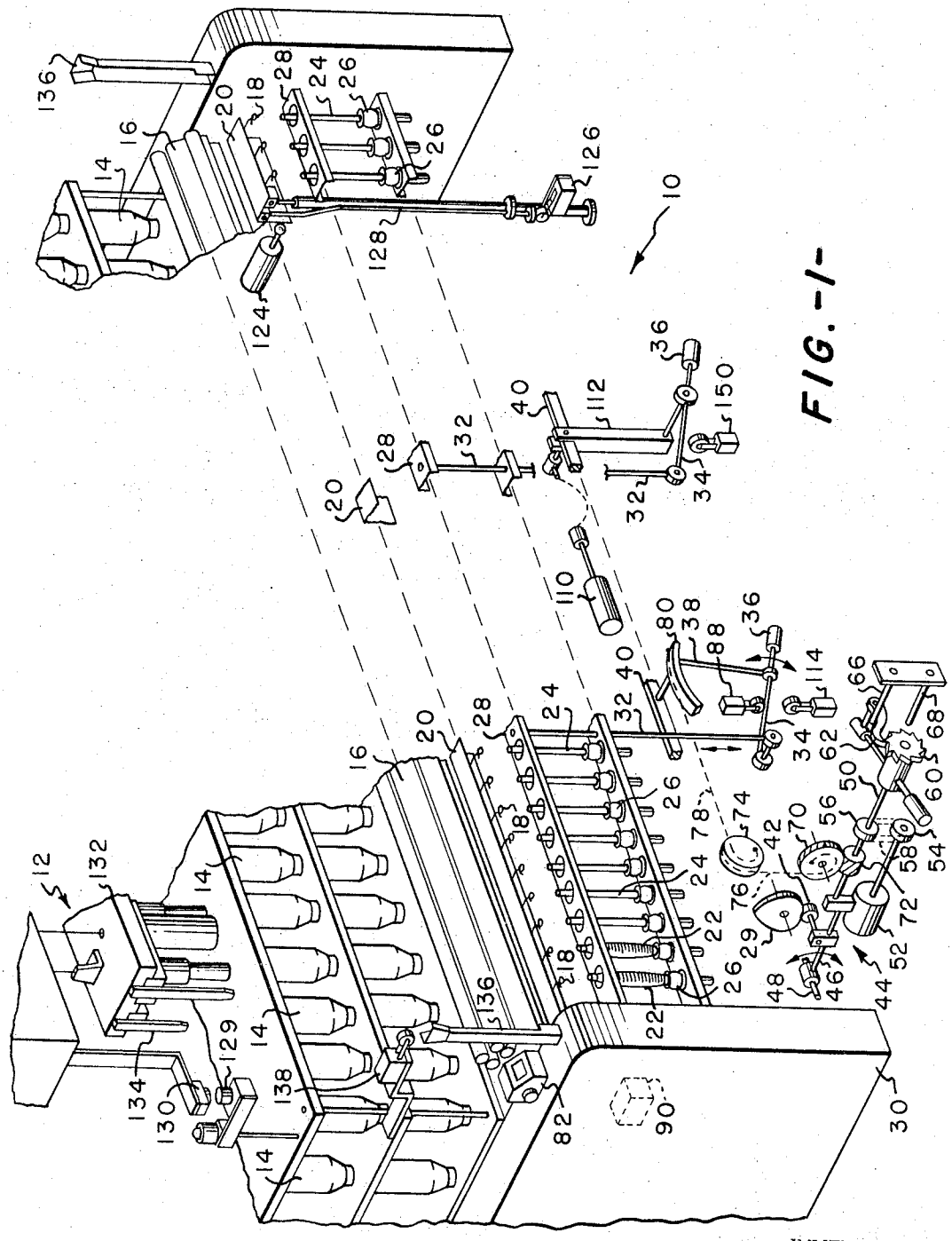

FIG. -1-

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3 Sheets-Sheet 2

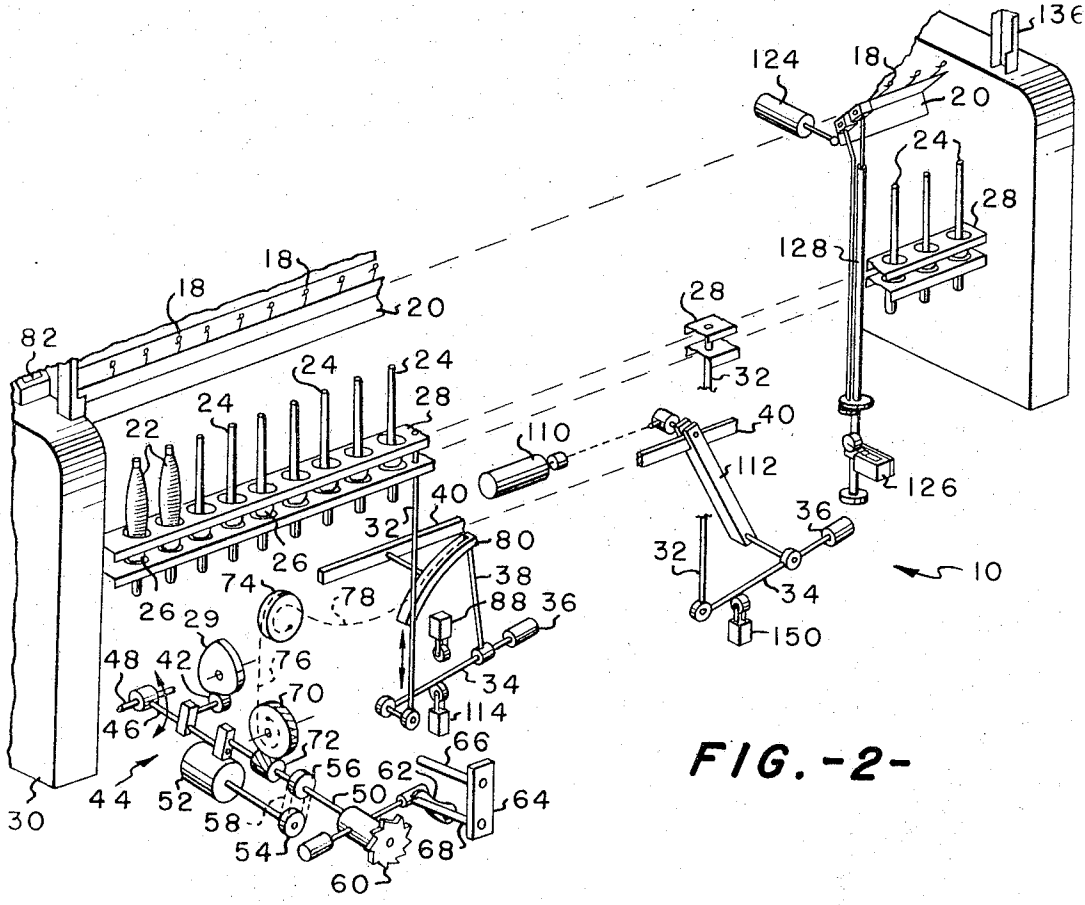

FIG. -2-

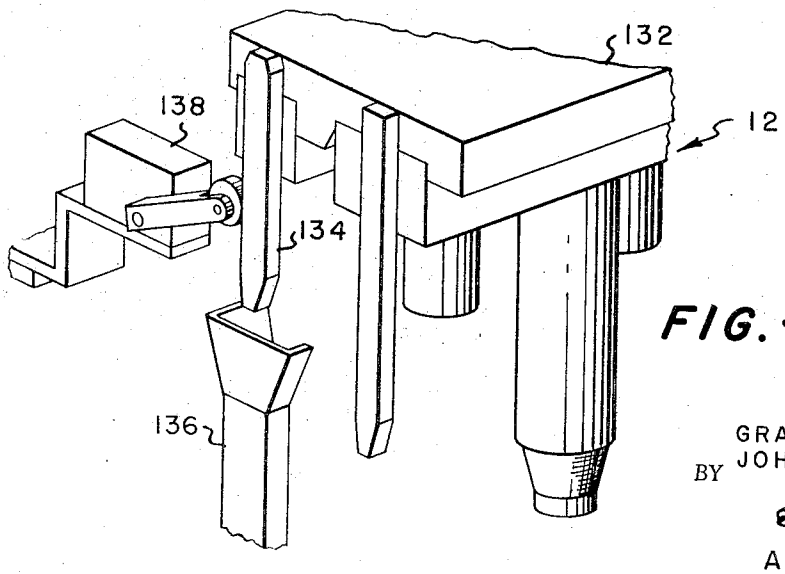

FIG. -3-

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Filed March 26, 1965 3 Sheets-Sheet 3

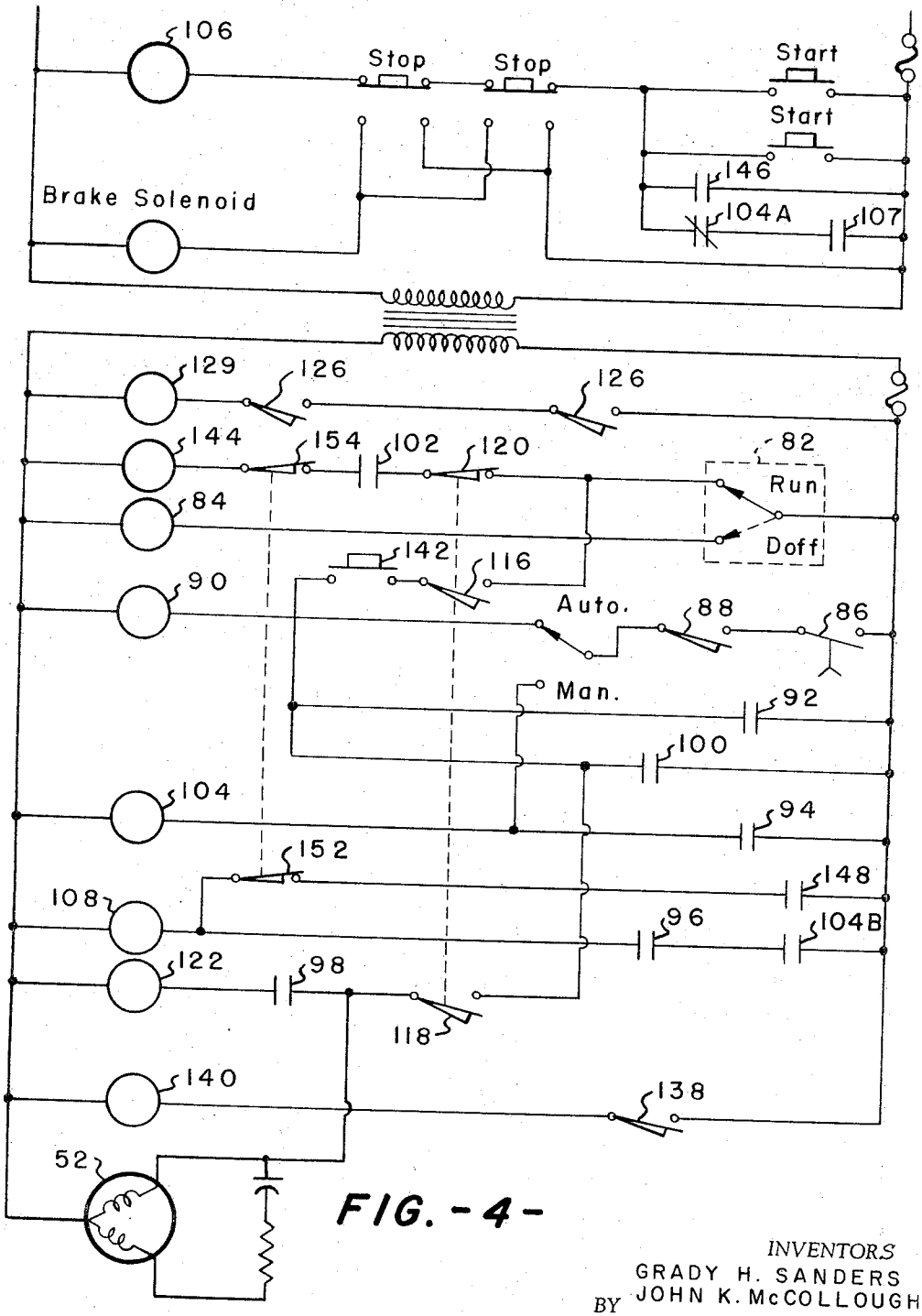

FIG. -4-

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3,336,739

SPINNING FRAME APPARATUS

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7 Claims. (Cl. 57—54)

This invention relates to bobbin using textile processing apparatus and more particularly to spinning, twisting and the like frames which can be automatically doffed.

Prior to this invention spinning, twisting or like frames were doffed manually by an operator. When the bobbins were fully wound the operator had to manually lower the ring rail below the bottom of the bobbins in order to more readily doff the full bobbin and to wind yarn around the spindle between the whorl and the bottom of the bobbin in order to insure that the empty bobbin replacing the doffed full bobbin would wind properly on start-up without the end coming down. The bearing down of the ring rail was a hard and arduous task which required the services of a strong operator. Furthermore, an operator would tend to wrap excess yarn on the spindle to insure that the end would not come down during start-up. This, of course, resulted in a need for more frequent cleaning of the spindles to prevent the manufacture of damaged yarn due to the bobbin sitting too high on the spindle because of excess yarn wound thereon. Further, manual doffing of a spinning, twisting or like frame was a hinderance to the complete automation of the yarn handling operation in a textile mill.

Therefore, it is an object of this invention to provide a system of automatically bearing down a spinning, twisting or like frame in preparation for doffing of full bobbins therefrom.

Another object of the invention is to provide an automatic bear down for a spinning, twisting or like frame which will automatically rewind the builder motion for the next cycle.

A still further object of the invention is to provide an automatic bear down for a spinning, twisting or like frame which will automatically turn the threadboards up and down when necessary.

A fourth object of the invention is to provide a bear down system for a spinning, twisting or like frame which will eliminate the necessity for an operator to use brute strength to bear down the frame for doffing.

A still further object of the invention is to provide an automatic bear down for a spinning, twisting or like frame which can be integrated with an automatic doffer to automatically prepare and doff the frame.

Other objects and advantages of our invention will be clearly apparent as the specification proceeds to describe the invention with reference to the accompanying drawings, in which:

FIGURE 1 is a schematic representation of a portion of a spinning frame with an automatic doffer overhead and with the ring rail in the up position;

FIGURE 2 is a further schematic representation of a portion of a spinning frame with the ring rail in the down position;

FIGURE 3 is an enlarged view of the doffer guide rail shown in FIGURE 1; and

FIGURE 4 is a schematic electrical diagram of a control circuit for automatically bearing down a spinning frame.

Looking now to the drawings and especially to FIGURE 1 the herein disclosed invention is shown installed on a spinning frame, generally designated **10**, over which is shown an automatic bobbin doffing and donning apparatus **12** awaiting the bearing down of the frame. In the illustrated form of the invention it is shown in cooperation with a conventional spinning frame but it is within the scope of the invention to apply such invention to other frames such as a twisting frame. The automatic bobbin doffing and donning apparatus **12** is not, per se, part of the invention and can be of many various types such as that illustrated in U. S. Patent No. 3,123,967.

In conventional manner roving is supplied from packages **14** through a conventional drafting system **16** wherein the fibers are aligned and compacted. From the drafting system **16** the compacted fiber strand passes through guides **18** in the threadboard **20** and are twisted and wound onto the bobbins **22** on the spindles **24**. The spindles **24** are rotated in conventional manner by tapes (not shown) which contact the whorls **26** of the spindles.

As in a conventional spinning frame the build of yarn on the bobbin **22** is controlled by a builder motion which basically controls the position of vertical movement of the ring rail **28**. The ring rail **28** when the frame is first started up reciprocates up and down adjacent the bottom of the bobbin **22** to wind yarn thereon. Then as the bottom portion of the bobbin is filled with yarn the ring rail is moved up automatically to wind yarn on a larger section of the bobbin. This continues until a desired portion of the bobbin is wound with yarn.

The operation of the builder motion is basically controlled by a cam **29** suitably driven by gears (not shown) within the confines of the head end housing **30** of the spinning frame. The ring rail **28** is moved by a plurality of vertical rods **32** secured to pivot rods **34** through suitable means and is counterweighed toward the up position by a weight **36** connected to the ends of pivot rods **34**. To control the position of the ring rail **28** a rocker shaft **38** is provided and is connected to the draw bar **40** which interconnects all the vertical rods **32** to cause uniform motion of the ring rail.

As previously pointed out the ring rail **28** is incrementally raised as the build on the lower portions of the bobbin reaches a desired diameter. This motion of the ring rail is caused by the rotation of the cam **29** acting on the roller **42** to pivot the builder drive mechanism **44** up and down.

The builder drive mechanism basically consists of rod member **46** secured to rotably mounted shaft **48**, rotably mounted shaft **50**, builder rewind motor **52** which rotates shaft **50** through pulleys **54** and **56** by means of a chain **58**, a ratchet wheel **60** rigidly attached to shaft **50** and cooperates with pawl **62** and support member **64** which is fixed relative to the pivoting builder drive mechanism **44** and has upper and lower stop rods **66** and **68** connected thereto.

To transmit the motion of the cam **29** a gear pulley **70** is rotably fixed to builder motion mechanism **44** in engagement with worm **72** on shaft **50**. Rotatably supported in spaced relation to the gear pulley **70** is a double pulley **74** which is rotated by gear pulley **70** through chain member **76**. A further chain member **78** is connected to double pulley **74** and to rocker arm **80** connected to rocker shaft **38**.

The builder motion operates in the following manner. Rotation of the cam **29** causes the builder motion mechanism **44** to reciprocate up and down as dictated by the action of the cam surface on the roller **42**. On the downward stroke of the builder motion mechanism the chain **76** will rotate the pulley **74** causing the chain **78** to wind up on the pulley **74** to pull the rocker arm **80** toward the pulley **74**. When the rocker arm **80** moves in the above-described direction against the action of counterweight **36** the rods **32** will move downward to pull the ring rail **28** down a certain fixed distance.

Conversely, when the builder motion mechanism **44** moves upward the pulley **74** will rotate in the opposite direction due to the action of the counterweight **36** and the slackening of the chain **76** to allow the rods **32** and the ring rail **28** to move upwardly. It can be seen that extremes of vertical movement of the ring rail are controlled basically by the lengths of the chains **76** and **78**.

As previously discussed the yarn is spun on a narrow area of the bobbin and then the yarn area is incrementally increased by allowing the ring rail **28** to reciprocate over a wider area of the bobbin. Basically this is accomplished by incrementally increasing the length of chain **76** to allow the rocker arm **80** to rotate in a wider arc. The cam **29** is so designed that the builder motion mechanism reciprocates a greater distance than the space between the stops **66** and **68**. Therefore, on each upward motion of the builder motion mechanism the pawl **62** will contact the upper stop **66** and thereby engage and rotate the ratchet wheel **60** a predetermined distance. Rotation of the ratchet wheel **60** causes the shaft **50** and the worm **72** to rotate, thereby rotating the gear pulley **70** in the clockwise direction to slacken the chain **76** in order to allow the ring rail **28** to reciprocate over a greater area of the bobbin.

As will be explained hereinafter in conjunction with the control circuit shown in FIGURE 3 the builder motion mechanism **44** is automatically rewound. In other words the chain **76** is rewound on the gear pulley **70** in anticipation of the next spinning cycle after the full bobbins have been doffed. As previously explained the ring rail **28** is placed in its lowest position (FIGURE 2) when the frame is doffed. In this position the builder motion mechanism **44** is also in its lowest position and the pawl **62** is disengaged from the ratchet wheel **60** by the lower stop **68**. Then to rewind the chain **76** rewind motor **52** is energized to rotate the shaft **50** in the counterclockwise position to wind the chain **76** back into the gear pulley **70**.

Looking now to FIGURES 1 and 2 in conjunction with the control circuit shown in FIGURE 3 the operation of the automatic bear down of the spinning frame will be explained. Approximately ten minutes before the spinning frame is ready to be doffed, the predetermining counter **82**, which counts the yardage of spun yarn, will switch to the doff position as shown in dotted lines in FIGURE 4. This energizes the time delay coil **84** and simultaneously signals the doffer **12** in a manner (not shown) to be sure that the doffer is in position when the frame is ready to be doffed. After the above approximate ten minute period has passed time delay switch **86** will close so that line switch **88** will energize the time motor **90** the next time the ring rail **28** reaches the top position. In FIGURES 1 and 2 the line switch **88** is located in such a position that the pivot rod **34** will close the line switch **88** when the ring rail **28** reaches the top position.

The timer motor **90** (not shown in detail) is a cam timer with six operated switches (namely **92, 94, 96, 98, 100** and **102**) which act sequentially as hereinafter explained. First the cam timer closes switch **92** to maintain power to the timer motor **90** to allow line switch **88** to open as the ring rail **28** descends to the lowest position. Then the cam timer closes switch **94** to energize relay coil **104** to open switch **104A** to deenergize the spining frame drive motor **106** and to close switch **104B**. Then the cam timer closes switch **96** to energize the solenoid **108** to supply air to double acting pneumatic cylinder **110** to pivot the actuating arm **112** (FIGURE 2) to pivot the pivot rods **34** upwardly against the bias of counterweights **36** to lower the ring rail **28** to the position shown in FIGURE 2. As the ring rail descends toward the lowest position and the spinning frame is coasting to a stop, four to six wraps of yarn will be placed on the spindle to tie the yarn end down for the next spinning cycle. In manual operation the operator will normally wrap considerably more yarn on the spindle just to be sure the end is tied down necessitating cleaning of the spindle at more frequent intervals. When the ring rail **28** is lowered to the position shown in FIGURE 2 the pivot rod **34** actuates line switch **114** to close switches **116** and **118** and open switch **120**. Closing of switch **118** energizes the builder motion rewind motor **52**, since switch **92** has previously been closed, to wind up the chain **76** on the gear pulley **70** in the manner previously described. Then the cam timer closes switch **98** to energize solenoid **122** to supply air to pneumatically operated piston **124** which pivots the threadboard **20** to the up position out of the automatic bobbin doffing and donning apparatus **12** and closes switches **126**, only one being shown for the sake of illustration, which are operably associated with the threadboard actuating mechanism **128** on both sides of the frame. The closing of switches **126** energizes light **129** which is picked up by photocell **130** which actuates the doffer control circuit (not shown) to automatically begin doffing of full bobbins from the spindles and replacing them with empty bobbins for the next spinning cycle. A short predetermined time thereafter cycle timer motor opens line switch **92** to stop cycle time motor **90**, deenergize the rewind motor **52** and deenergize solenoid **122** to cut off the air to piston **124**.

After the spinning frame has been doffed and empty bobbins replaced on the spindles the carrier members **132** of the doffer **12** are raised with the doffer grasper rails **134** being guided upward in the frame guides **136**. As the grasper rails **134** clear the frame guides **136** they close one way actuator switch **138** to energize solenoid **140** to supply air to piston **124** to cause the threadboards to be turned down to the run position as shown in FIGURE 1. The operator then resets the yardage counter **82** to the run position and the spinning frame **10** is now ready for a controlled start-up.

To start the frame up the operator pushes start button **142** which energizes the cycle timer motor **90** since switch **116** is now closed. Switch **100** then closes to maintain the cycle time motor energized when the start button **142** is released. Then switch **96** of the cam timer opens to deenergize solenoid **108** to cut the air off bear down piston **110** to allow the counterweight **36** to cause the ring rail to move up. After the ring rail starts up switch **102** of the cam timer closes to actuate relay **144** which closes switches **146** and **148** to start the frame motor **106** and close switch **107** to lock out switch **146** and to energize the solenoid **108** to put air on the piston **110** to start the ring rail down. When the ring rail **28** drops a predetermined distance the pivot rod **34** will engage switch **150** to open contacts **152** and **154** to once again deenergize the solenoid **108** to cut off air to the piston **110** and allow the ring rail to rise. This up and down motion of the ring rail continues until the switch **102** of the cam timer phases. This motion is necessary on start-up to secure the end of the yarn on the bobbin to prevent long tails on the next doffing cycle. Finally, switch **100** opens shutting off the power to cycle timer motor **90** and take up slack in the yarn. At this time cycle timer motor **90** will be at the zero position ready for another doff cycle.

The herein disclosed automatic bear down system for spinning or like frame eliminates the necessity of an operator struggling to manually bear the ring rail down to doff full bobbins from the frame and replace them with empty bobbins. Furthermore, the herein disclosed system is designed to work automatically with an overhead doffing and donning apparatus to provide a complete automatic spinning frame doffing system.

Although we have described in detail the preferred embodiment of our invention, it is contemplated that many changes may be made without departing from the scope or spirit of our invention and we desire to be limited only by the claims.

That which is claimed is:

1. A textile handling arrangement comprising an automatic bobbin doffing and donning apparatus, a yarn handling frame operably associated therewith, a plurality of spindles on said frame, bobbins on said spindles, said

spinning frame having a ring rail, a builder motion operably associated with said ring rail to control the build of yarn on said bobbins, means to automatically bear down said ring rail when said bobbins are ready to be doffed, means to automatically rewind the builder motion, signal means to actuate said automatic bobbin doffing and donning apparatus to doff full bobbins from said spindles when said ring rail has been lowered, said frame including pivotally mounted threadboards and means to automatically pivot said threadboards up before the doffing of the bobbins and down after the doffing of the spindles, said signal means being actuated by the movement of said threadboards into the up position.

2. A textile handling arrangement comprising an automatic bobbin doffing and donning apparatus, a yarn handling frame operably associated therewith, a plurality of spindles on said frame, bobbins on said spindles, said spinning frame having a ring rail, a builder motion operably associated with said ring rail to control the build of yarn on said bobbins, a threadboard pivotally secured to said frame, means to automatically pivot said threadboard up and to automatically bear down said ring rail when said bobbins are ready to be doffed, signal means operably associated with said frame to cause said automatic bobbin doffing and donning apparatus to doff full bobbins from said spindles when said threadboards are pivoted up and the ring rail has been lowered, and replace said full bobbins with empty bobbins and automatic means to jog said ring rail up and down to securely wrap several wraps of yarn on said bobbins when said frame has been started up after doffing, said means to automatically pivot said threadboards up including means to actuate said signal means when said threadboards are pivoted to the up position.

3. A spinning frame comprising: a plurality of spindles mounted thereon, bobbins on said spindles, a ring rail operably associated with said spindles, a pivotally mounted threadboard, a bobbin doffing and donning apparatus, means to pivot said threadboard away from said spindles and signal means responsive to the pivotal movement of said threadboard away from spindles to actuate said bobbin doffing and donning apparatus.

4. The structure of claim 3 wherein said threadboards are pivoted in an upward direction when said bobbin doffing and donning apparatus is actuated.

5. The structure of claim 3 wherein said means are provided to automatically lower said ring rail prior to actuating said doffing and donning apparatus.

6. The structure of claim 3 wherein said frame includes a builder motion to control the build of yarn on said bobbins and means to automatically rewind said builder motion before each spinning cycle.

7. The structure of claim 6 wherein said means to automatically rewind said builder motion includes a ratchet wheel and pawl and means to disengage said pawl from said ratchet wheel prior to rewinding said builder motion.

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