April 4, 1950 E. F. CULBREATH 2,503,099

AUTOMATIC SPINNING CONTROL

Filed Jan. 7, 1946 2 Sheets-Sheet 1

Fig. 1.

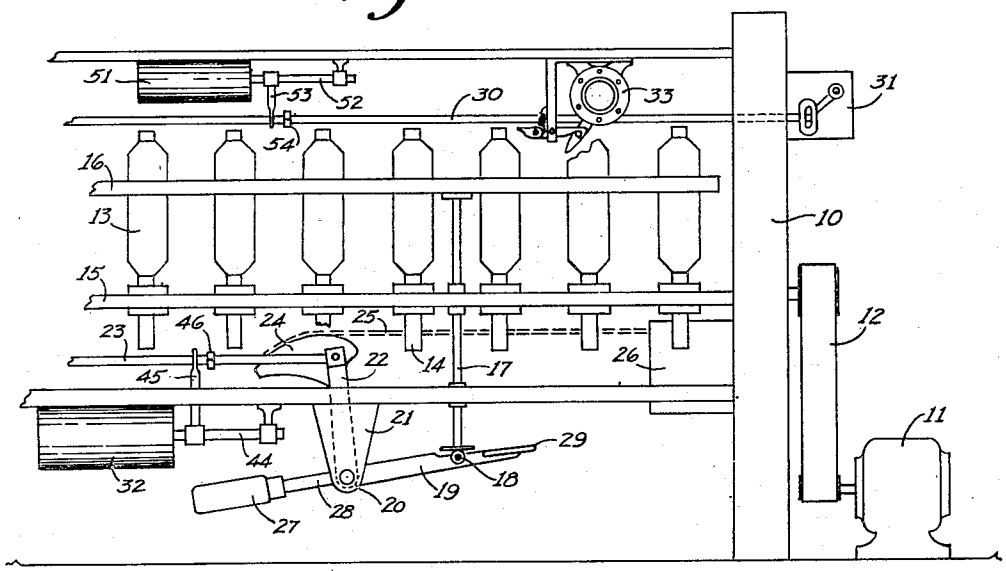



Fig. 3.

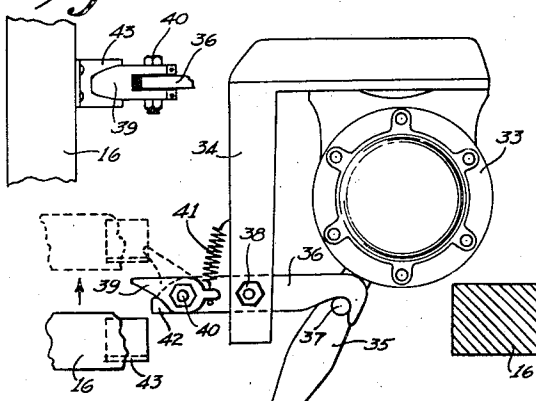



Fig. 2.

Fig. 8.

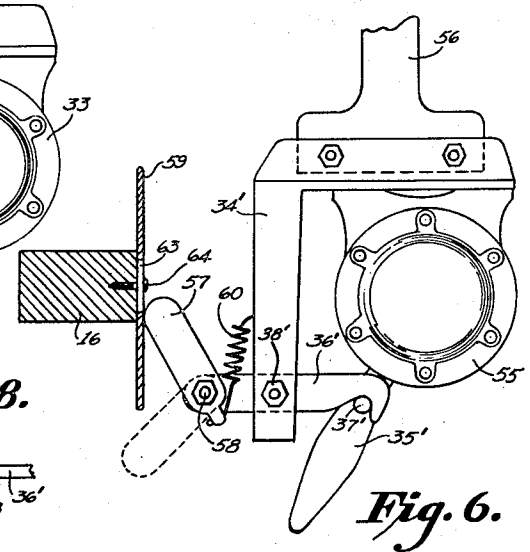
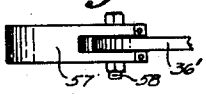



Fig. 6.



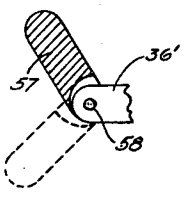




Fig. 7.

Inventor

ERNEST F. CULBREATH

By Warley L. Parrott

Attorney

April 4, 1950 E. F. CULBREATH 2,503,099

AUTOMATIC SPINNING CONTROL

Filed Jan. 7, 1946 2 Sheets-Sheet 2

*Fig. 4.*

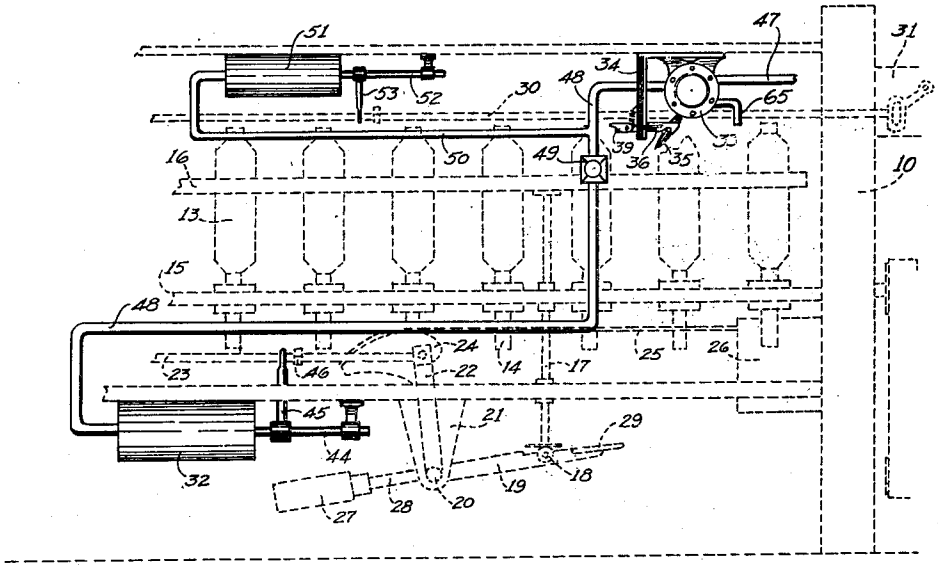
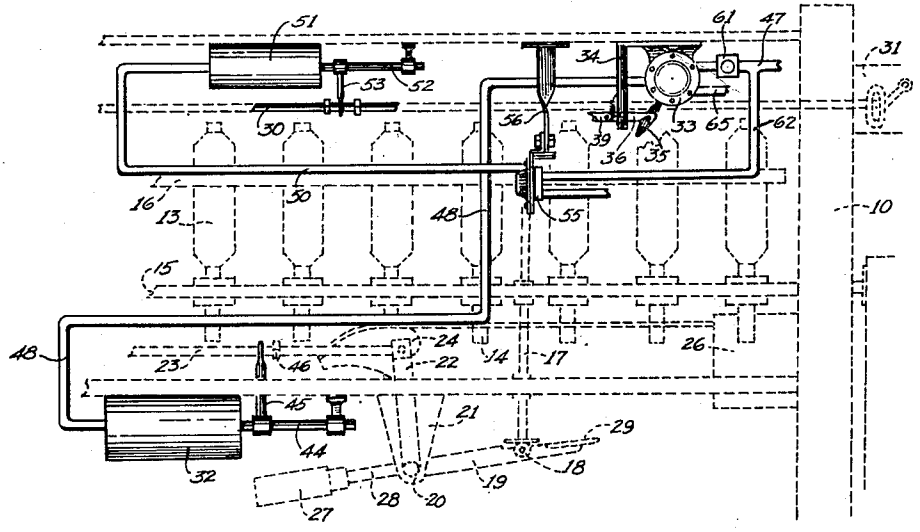



*Fig. 5.*




Inventor

ERNEST F. CULBREATH

By Warley L. Parrott

Attorney

Patented Apr. 4, 1950

2,503,099

# UNITED STATES PATENT OFFICE

2,503,099

## AUTOMATIC SPINNING CONTROL

Ernest F. Culbreath, Charlotte, N. C., assignor to Numo Machine and Engineering Company, a corporation of North Carolina

Application January 7, 1946, Serial No. 639,598

5 Claims. (Cl. 57—79)

1

This invention relates to spinning frames and the like, and more particularly to an automatic spinning control for such equipment.

As is well known, spinning frames comprise generally a drafting mechanism by which yarn is suitably attenuated, and associated means for twisting the drafted yarn and building it into bobbins. The bobbins are commonly built on wooden cores which are received and rotated during operation by spindles. To lay the yarn on the bobbins according to a given winding pattern, a member is included in the means for building the bobbins which is progressively reciprocated from an initial to full bobbin position. In cotton spinning frames it is usual to impart this reciprocation to the ring rail which directs the yarn on to the bobbins, while in woolen spinning frames the spindle rail on which the bobbins are supported is commonly reciprocated in this manner.

In either case when the reciprocated member reaches full bobbin position, it is necessary to return it to initial or doffing position so that the completed bobbins can be removed or doffed. According to usual mill practice this step is accomplished by hand, the means for building the bobbins being returned to its initial position by means of a hand crank or the like. This method of conditioning the spinning frame for doffing, however, has involved considerable difficulty because the building mechanism is heavily weighted for movement in the building direction, and these weights must be overcome during the return to doffing position.

Also, it is necessary to allow the spinning frame to run during this operation so that the yarn will wrap on the bobbin during the return to doffing position; and, more importantly, so that a certain number of turns will be obtained around the base of the bobbin, commonly referred to as a "tail." This tail provides the necessary length of excess winding on the bobbin, so that when it reaches the weave room the bobbin can be disposed properly in the battery of an automatically replenishing loom, or in the hopper of a winding machine if it is to be used for winding.

Where the spinning frame must be conditioned for doffing by hand there is no way of regulating the length of this tail accurately, and the excess winding must accordingly be adjusted in the

2

weave room or at the winding machine to a substantially uniform length by the operator there. This circumstance not only delays the operator at the loom or winding machine but also frequently results in defective transfer of the bobbins because of the difficulty of adjusting the tail accurately and properly by hand.

Means have heretofore been proposed for automatically returning the building mechanism of the spinning frame from full bobbin to doffing position but none of these proposals insofar as I am aware have proved sufficiently practical for commercial application. There have been various proposals, for example, to reverse the building mechanism at full bobbin position through a worm and gear connection which would wind the spinning frame back to doffing position. Such an arrangement, however, involves complicated mechanism and lacks adequate flexibility.

According to the present invention I have devised an automatic means for returning the building mechanism of a spinning frame from full bobbin to doffing position which entirely eliminates the hand operation heretofore necessary, and also controls the tail formed on the bobbins within close limits. The automatic spinning control of my invention is readily adapted for installation on any of the types of spinning frames now commonly in use and is easily adjustable to meet the varying conditions and requirements of operation.

My invention is illustrated in the accompanying drawing in which:

Fig. 1 is a fragmentary side elevation mainly diagrammatic of a spinning frame incorporating my automatic spinning control;

Fig. 2 is a fragmentary detail of the arrangement of the valve control means at full bobbin position;

Fig. 3 is a fragmentary detail in plan of the trip bracket and trip portion of the valve control at full bobbin position;

Fig. 4 is a diagrammatic layout showing the arrangement of the fluid-pressure responsive means according to the embodiment of my invention illustrated in Fig. 1;

Fig. 5 is a corresponding diagrammatic layout of a modification;

Fig. 6 is a fragmentary detail showing the disposition of a stop motion valve control for use ac-

cording to the arrangement illustrated in Fig. 5;

Fig. 7 is a fragmentary detail, partly in section, further illustrating the stop motion valve control shown in Fig. 6; and,

Fig. 8 is a similar fragmentary detail in plan.

As illustrated in Fig. 1, the end Samson of a spinning frame is shown at 10 with an associated motor 11 and belt drive 12 forming a power source. The disposition of the bobbins built during operation of the spinning frame is indicated at 13. As previously noted, the bobbins 13 are mounted for rotation on spindles 14 supported from a spindle rail 15, the spindles 14 being driven through an arrangement of tapes from a central cylinder (not shown) according to well known procedures.

The spinning frame in Fig. 1 is shown as adapted for cotton in which case, as mentioned above, the spindle rail is held stationary, and the progressive reciprocation necessary for building the bobbins 13 is imparted to a ring rail 16. Reciprocation of the ring rail 16 is effected through a builder mechanism which includes a lifting rod 17 extending to the ring rail 16 from a rolling support as at 18 on a lifter arm 19. The lifter arm 19 is carried by a rock shaft 20 mounted in a suitable bracket as at 21. The rock shaft 20 also carries an arm 22 which is angularly disposed with respect to the lifter arm 19. This arm 22 extends to a connection with a traverse rod 23 which runs for substantially the entire length of the spinning frame for connection to as many lifting assemblies for the ring rail 16 as are necessary.

The arm 22 also carries an arc element 24 to which a builder chain 25 is fastened. The builder chain 25 runs from this arc element 24 to a builder motion mechanism indicated at 26 from which, as is familiar in the art, the necessary reciprocating motion is imparted for building the bobbins. The chain 25 is held taut by means of a weight 27 carried by the rock shaft 20 on an arm 28, and the reciprocating motion is obtained by taking up and releasing the chain 25 at the builder motion 26. The builder motion 26 is arranged so that while the amplitude obtained through this take up and release of chain 25 is maintained constant the chain 25 is progressively let off so as to provide progressive reciprocation as mentioned above.

As chain 25 is progressively let off in this manner it will be understood that arc element 24 and arm 22 will rock on shaft 20 through a displacement which shifts progressively to the left as shown in Fig. 1. Correspondingly, the rocking action imparted to lifter arm 19 will shift progressively upward and this motion will be transferred to ring rail 16 through lifter rod 17. As the operation of the building mechanism proceeds in this manner the yarn will be directed onto the bobbins 13 from ring rail 16, and the bobbins will be built as the ring rail 16 is raised with respect to the bobbins 13 by virtue of the progressive reciprocation just described. Accordingly, when the ring rail 16 has been raised through the height of the bobbins 13, the bobbins will be completely built; and this fully raised position of ring rail 16 corresponds to full bobbin position.

When full bobbin position has been reached it is necessary as previously mentioned to run the ring rail 16 down to initial or doffing position so that the bobbins 13 can be removed. This result, may, and according to usual practice is, accomplished by exerting manual force on a pedal 29 carried by the lifter arm 19. By exerting sufficient manual force in this manner the weight 27 can be overcome so as to lower lifter arm 19 and allow lifter rod 17 and ring rail 16 to descend to doffing position. At the same time, however, the spinning frame must be allowed to run until this operation is completed so that the yarn will wrap around the bobbins 13 as ring rail 16 descends in order to avoid a loose outer wrap on the bobbins 13. It is also usual to allow the spinning frame to run for a short period after the return to doffing position has been effected in order to wrap a tail on the bobbins 13 to provide a length of yarn or tail, as previously noted, for use in disposing the bobbins in the battery of an automatically replenishing loom or the like.



Considerable manual effort is required to run the ring rail 16 down in this manner, and the results obtained are dependent on the skill of the operator in recognizing when full bobbin position has been reached and in carrying out the rail run down operation smoothly and quickly. At best, however, the operation can only obtain approximate results because the above mentioned factors depend on the judgment of the operator and will vary from one operator to another. Also, as the spinning frame must be allowed to run during the rail run down operation the point at which the spinning frame is stopped after the ring rail 16 is returned to doffing position introduces another approximation.

Stopping of the spinning frame is effected through the usual shipper rod 30 which as shown in Fig. 1 runs to a switch 31 for motor 11; or, where an overhead drive is used, the shipper rod 30 would run to a fork adapted to shift a driving belt from a tight to a loose pulley. After the ring rail 16 has been run down the shipper rod 30 is shifted to effect stopping of the spinning frame when the operator feels that a sufficient tail has been wound on the bobbins 13. It is never possible, however, for the operator to give sufficient attention to the winding of this tail due to the manual effort necessary to run the rail down, with the common result that bobbins 13 are provided with an excessive tail, and moreover, a tail which is apt to vary considerably from group to group of bobbins.

The automatic spinning control of my invention performs this entire rail run down operation automatically. The return of the ring rail 16 to doffing position is effected through a fluid-presure responsive means 32 controlled through a valve member 33. The disposition of valve member 33 is shown more in detail in Fig. 2. Valve 33 is mounted from a suitable bracket 34, a valve operating lever extending from the valve body proper as at 35. As shown in Fig. 2, operating lever 35 is in off position and is held in this position by a retaining member 36 which is formed with a hook-like portion engaging a pin 37 on lever 35. Retaining member 36 is pivoted on bracket 34 as at 38 and extends beyond this pivot point to carry a spring positioned tip element 39. The tip element 39 is pivoted on retaining member 36 by a spring 41. The mounting of tip element 39 on retaining member 36 is such that it will bottom in alignment with retaining member 36 on a stop projection 42 but may be raised around pivot point 40 against the pressure of spring 41 as indicated by the dotted lines in Fig. 2.

The tip element 39 arranged in this manner is disposed in relation to a trip bracket 43 carried by ring rail 16 as shown in Figs. 2 and 3. It will be remembered that during operation the ring rail 16 is actuated with a progressive reciproca-

tion which while constant in amplitude shifts to effect raising of the ring rail. As the ring rail thus progresses upwardly, it will force the tip member 39 out of its way as it approaches full bobbin position, as illustrated by the dotted lines in Fig. 2. The valve member 33 may be positioned, however, so that when full bobbin position is reached the reciprocating stroke of the ring rail 16 will overtravel and allow tip member 39 to drop below it under pressure from spring 41. When this happens bracket 43 on ring rail 16 will contact the upper side of tip member 39 on the next downward stroke, and, as tip member 39 will be bottomed on stop projection 42, retaining member 36 will be pivoted to release operating lever 35 to on position for valve member 33.

With valve member 33 in on position fluid pressure will be delivered to pressure means 32 to render it operative. Pressure means 32 may conveniently comprise a cylinder containing a piston (not shown) associated with an extending piston rod 44. A cross arm 45 is carried by piston rod 44 having a bifurcated extending end disposed in relation to a collar 46 fixed on traverse rod 33. As fluid pressure is delivered to pressure means 32, piston rod 44 will be forced to the right, as shown in Fig. 1, so that cross arm 45 will contact collar 46 and move traverse rod 33 with the result that the builder mechanism will be returned to initial position and the ring rail 16 will be lowered as required.

The arrangement of the pressure means 32 and valve member 33 are shown more in detail in Fig. 4. A line 47 is provided for the fluid pressure supply to valve member 33. This line may run from the air system with which textile mills are commonly equipped, or a separate compressor unit may be installed if desired. The capacity requirements on any air system used are relatively small, but it is important to have a reliable air pressure supply at a given level. It will be apparent that other fluid pressure systems than air may be used if desired.

The pressure supply is released through valve member 33 to a line 48 which runs through a reduction valve 49 to pressure means 32. Branching from line 48 is a second line 50 running to a second pressure means 51 which is substantially similar to pressure means 32 and has an extending piston rod 52 carrying a cross arm 53 disposed in relation to a collar 54 carried by shipper rod 30. With the release of pressure through valve 33 to line 48, pressure will also be delivered through line 50 to this second pressure means 51, and when pressure means 51 is rendered operative in this manner piston rod 52 will be shifted to move cross arm 53 to the right, as shown in Fig. 1, so that it will contact collar 54 on shipper rod 30 and actuate switch element 31 to disconnect motor 11. Consequently, when valve 33 is released to on position at the time ring rail 16 reaches full bobbin position, pressure means 51 will be actuated as a stop motion for the spinning frame and pressure means 32 will be actuated to run the rail down.

This arrangement is well adapted to the modern types of spinning frames which are equipped with individual motor drives and provided with frictionless bearings so that a substantial coasting effect so to speak is obtained after the motor drive is disconnected. Because of this coasting effect it is possible to disconnect the motor drive at full bobbin position and still return the ring rail 16 to initial or doffing position before the spinning frame has stopped running. Under



these circumstances it will be recognized that the amount of tail obtained on the bobbins will be determined and can be adjusted in terms of the rate at which the ring rail 16 is returned to doffing position. The reduction valve 49 provides an adjustment for this purpose. By varying the pressure supply in line 48 beyond the reduction valve 49 the force exerted through pressure means 32 and consequently the rate at which the building mechanism will be returned to initial position can be varied to control the amount of tail obtained within very close limits.

Where older types of spinning frames are used which do not have sufficient momentum after disconnection of the driving means to continue running until the rail run down operation has been completed, the arrangement illustrated in Fig. 5 may be used to delay disconnection of the driving means until the ring rail 16 has been lowered sufficiently. In this instance, the second pressure means 51 is controlled through a second valve member 55 the disposition of which is best illustrated in Fig. 6. The valve 55 may be arranged on a bracket assembly 56 substantially midway of the travel of the ring rail 16, and a valve bracket 34', operating lever 35', retaining member 36' and associated pin 37' and pivot point 38' are arranged as was described above in connection with valve 33.

At the extending end of retaining member 36' in this case, however, a tip portion 57 pivoted as at 58 is provided which is fully pivotable in an upward direction and pivotable to an extent of about 45° in a downward direction (see Fig. 7). Also, for a purpose which will be described presently, the tip portion 57 has a pivoted extent from pivot point 58 in excess of the amplitude of the reciprocation imparted to ring rail 16. This tip portion 57 is disposed in relation to a plate member 59 carried by ring rail 16. As ring rail 16 moves upwardly the plate member 59 will force tip portion 57 out of the way against the pressure of a spring 60, and as tip portion 57 is fully pivotable in an upward direction it will be freely shifted in this manner. With continued upward movement of ring rail 16, tip portion 57 will ride plate 59 and remain disposed with an upward inclination until the lower end of plate 59 overtravels. When this happens spring 60 will move tip portion 57 to a downward position as indicated by the dotted lines in Fig. 6, but as the pivoted extent of tip portion 57 is greater than the amplitude of the reciprocating motion of ring rail 16, the next downward stroke of the ring rail will not carry far enough to trip retaining member 36' and release valve 55 to on position. Accordingly, upward travel of ring rail 16 will be effected without opening valve 55. After ring rail 16 reaches full bobbin position, however, and valve 33 is tripped to deliver pressure for running the rail down plate 59 will contact tip portion 57 in a bottomed downward position as ring rail 16 moves down, and accordingly pivot retaining member 36' to release valve 55 to open position and deliver pressure to pressure means 51 to effect disconnection of the driving means for the spinning frame.

The pressure supply line 47 is shown in Fig. 5 running through a reduction valve 61 to valve 33. Branching from line 47 ahead of reduction valve 61 is a line 62 connected to deliver supply pressure to valve 55. From valve 55 line 50 runs as before to pressure means 51. Line 48 is also arranged as before from valve 33 to pressure means 32. With this arrangement it will be seen that

disconnection of the driving means from the spinning frame can be delayed in relation to the rail run down operation as is necessary. In operation, the valve 33 will be tripped at full bobbin position just as previously described, but in this case pressure will be delivered from valve 33 only to pressure means 32 with the result that the driving means for the spinning frame will continue to run while the rail run down operation is initiated. As the ring rail 16 proceeds downwardly however, under the control of pressure means 32, valve 55 will be tripped at the point selected and release pressure to pressure means 51 to effect disconnection of the driving means and from this point on the spinning frame will run through momentum until doffing position is reached.

To provide an adjustment for the point at which valve 55 is tripped plate member 59 may be provided with elongated slots as indicated at 63 so that its position on mounting screws 64 may be varied to adjust the lower end of plate 59 and thus adjust the timing of the trip for valve 55. With this arrangement the valves 55 and 33 are mutually adjustable in controlling the rail run down operation. Adjustment of the pressure supplied to valve 33 through reduction valve 31 will control the rate at which the rail is run down and adjustment of plate 59 on ring rail 16 will determine the point at which the driving means for the spinning frame are disconnected. These adjustments can accordingly be fixed to effect the rail run down operation in proper relation to stopping of the spinning frame and consequently in relation to a desired tail on the bobbins.

After the rail run down operation has been completed it is only necessary for the operator to return the operating lever 35' for valve 33, and for valve 55 if the system shown in Fig. 5 is being used, so that retaining member 36 or 36' will engage the pin 37 or 37' on operating lever 35 or 35' and hold the valves in closed position. When the valves are closed in this manner exhaust ports 65 will be opened thus releasing the pressure from pressure means 32 and 51 and allowing the next spinning operation to proceed in the usual manner.

Where the application of my automatic spinning control is to be made on woolen spinning frames rather than those adapted for cotton, the operation is exactly the same except that the spindle rail is moved during the spinning operation and it is accordingly necessary to raise the spindle rail from full bobbin to doffing position rather than run the ring rail down. My automatic spinning control is fully applicable in either case, however, and it may be arranged for either application by appropriate arrangement of the valve members 33 and 55.

It will also be recognized that while my automatic spinning control has been illustrated and described in terms of actuation from the ring rail that this actuation may be supplied from any other element of the spinning frame which reflects the motion of the ring rail during the spinning operation. That is, any element of the building mechanism which is associated with the builder motion to impart the necessary progressive reciprocation to the ring rail may be used for this purpose, and such use is contemplated by the present invention and the appended claims

I claim:

1. In a spinning frame or the like having means for building bobbins including a member progressively reciprocated during travel from initial to full bobbin position, and means for driving said spinning frame: a stop motion associated with the driving means for said spinning frame; and means automatically operative when full bobbin position is reached for returning said reciprocated member to initial or doffing position comprising, a fluid-pressure responsive means disposed for returning said reciprocated member from full bobbin to doffing position, a valve control means actuated in relation to the motion of said reciprocated member to render said fluid-pressure means operative when full bobbin position is reached, and means for actuating said stop motion in relation to the motion of said reciprocated member during its return from full bobbin to doffing position to disconnect said driving means so that stopping will be effected as desired in relation to the return of said reciprocated member to doffing position.

2. In a spinning frame or the like having means for building bobbins including a ring rail progressively reciprocated during travel from initial to full bobbin position, and means for driving said spinning frame: a stop motion associated with the driving means for said spinning frame; and means automatically operative when full bobbin position is reached for running said ring rail down to initial or doffing position comprising, a fluid-pressure responsive means disposed for returning said ring rail from full bobbin to doffing position, a valve control means actuated in relation to the motion of said ring rail to render said fluid-pressure means operative when full bobbin position is reached, and means for actuating said stop motion in relation to the motion of said ring rail during its return from full bobbin to doffing position to disconnect said driving means so that stopping will be effected as desired in relation to the return to doffing position.

3. An automatic spinning control for spinning frames and the like, in which bobbins are built by means including a member which is progressively reciprocated during travel from initial to full bobbin position, comprising a fluid-pressure responsive means disposed for returning said reciprocated member from full bobbin to initial or doffing position, a valve control means actuated at full bobbin position to render said fluid-pressure means operative, means for disconnecting the driving means for said spinning frame during the return from full bobbin to doffing position, and means for mutually adjusting said valve control means and said disconnecting means so that stopping is effected as desired in relation to the return of said reciprocated member to doffing position.

4. An automatic spinning control for spinning frames and the like, in which bobbins are built by means including a ring rail which is progressively reciprocated during travel from initial to full bobbin position, comprising a fluid-pressure responsive means disposed for running said ring rail down from full bobbin to initial or doffing position, a valve control means actuated at full bobbin position to render said fluid-pressure means operative, means for disconnecting the driving means for said spinning frame during the return from full bobbin to doffing position, and means for mutually adjusting said valve control means and said disconnecting means so that stopping is effected as desired in relation to the return of said ring rail to doffing position.

5. In a spinning frame or the like having means for building bobbins including a member progres-

sively reciprocated during travel from initial to full bobbin position, means for returning said reciprocated member from full bobbin to initial or doffing position, and means for driving said spinning frame: a stop motion associated with said driving means, and means for actuating said stop motion during return of said reciprocated member to doffing position comprising a pivoted lever member disposed for actuating contact with an element of said spinning frame operating in accordance with the progressive reciprocation of said reciprocated member, said lever member having a pivoted extent to said actuating contact in excess of the amplitude of said progressive reciprocation.



ERNEST F. CULBREATH.

## REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS


| Number | Name | Date |
|---|---|---|
| 1,455,171 | Pearce | May 15, 1923 |
| 1,926,390 | Kooistra | Sept. 12, 1933 |
| 2,373,263 | Rowe | Apr. 10, 1945 |