Feb. 15, 1949. A. A. WORTH ET AL 2,461,952

RING SPINNING FRAME

Filed Nov. 19, 1946 3 Sheets-Sheet 1

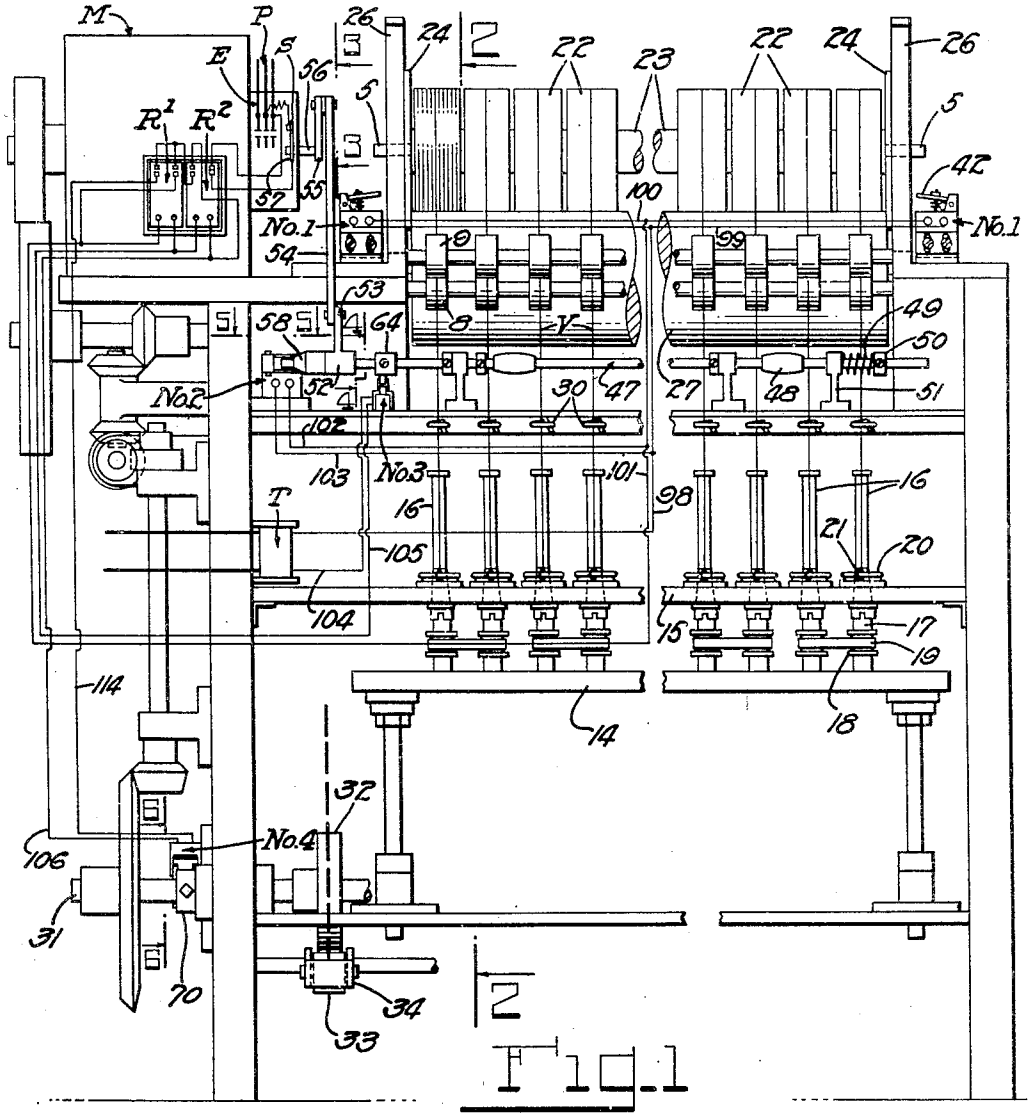


Fig. 1

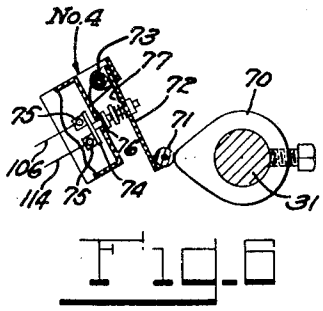


Fig. 6

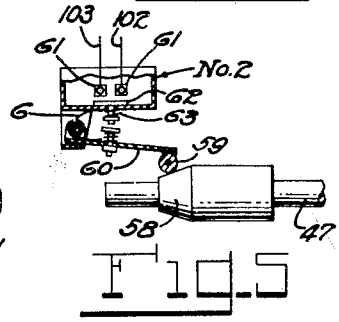


Fig. 5

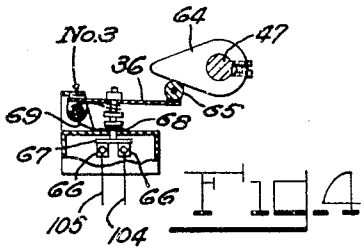


Fig. 4

INVENTORS:
ARTHUR A. WORTH AND
HAROLD S. ADAMS

by Dike, Calvert & Porter
Attys.

Feb. 15, 1949. A. A. WORTH ET AL 2,461,952

RING SPINNING FRAME

Filed Nov. 19, 1946 3 Sheets-Sheet 2

Fig. 2

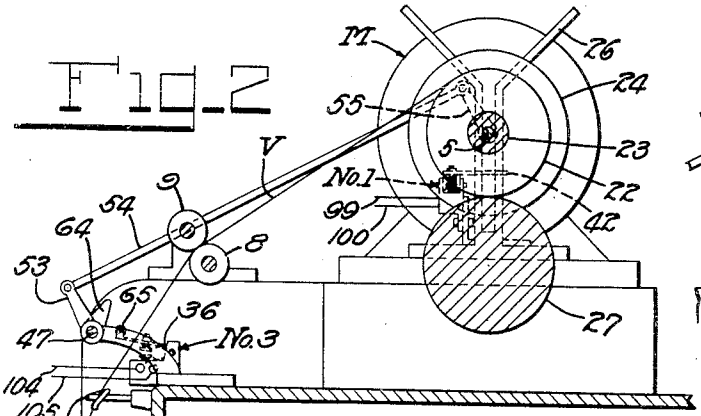
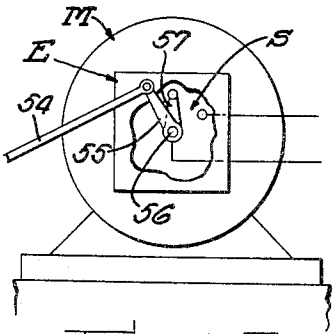


Fig. 3



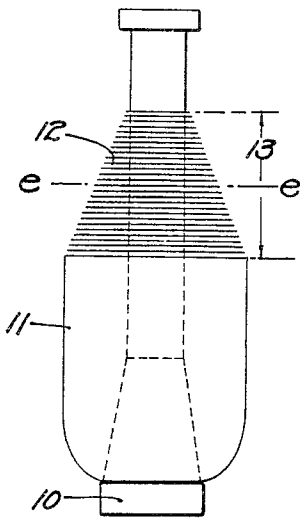
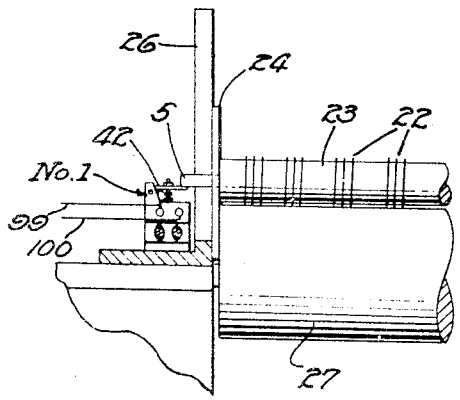


Fig. 9

Fig. 8



INVENTORS:
ARTHUR A. WORTH AND
HAROLD S. ADAMS
by Duke Calver & Porter
Attys.

Feb. 15, 1949. A. A. WORTH ET AL 2,461,952

RING SPINNING FRAME

Filed Nov. 19, 1946 3 Sheets-Sheet 3

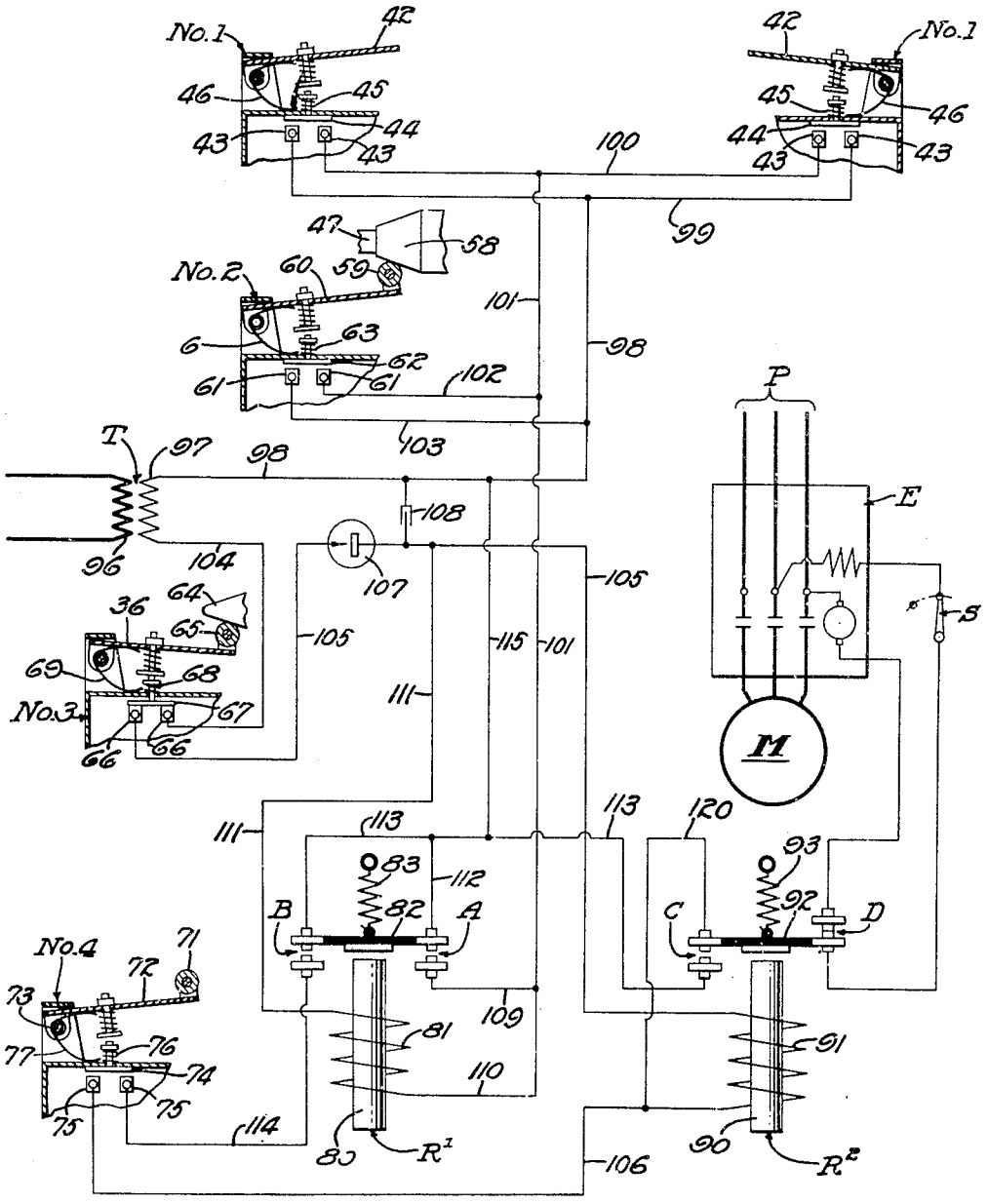


Fig. 7

INVENTORS:
ARTHUR A. WORTH AND
HAROLD S. ADAMS
by Fike Calver & Porter
Attys.

Patented Feb. 15, 1949

2,461,952

UNITED STATES PATENT OFFICE

2,461,952

RING SPINNING FRAME

Arthur A. Worth, Penobscot, and Harold S. Adams, Skowhegan, Maine, assignors to American Woolen Company, New York, N. Y., a corporation of Massachusetts

Application November 19, 1946, Serial No. 710,806

7 Claims. (Cl. 57—79)

1

The present invention relates to stop motions for ring spinning frames which have builder motions which traverse the ring rail and spindle rail with respect to each other and progressively lower the spindle rail after each traverse so that the yarn package is formed by successive layers of yarn. In such machines the ring rail or the spindle rail is moved with respect to the other vertically and the spindle rail is lowered during or after each traverse, this being accomplished by mechanism known as a builder motion which commonly includes a heart-shaped cam to produce the traverse. In such machines the rovings to be spun are frequently drawn from a supply in the form of a large spool or spools and pass from it through draft rolls to the travellers of the several spinning rings.

It has been customary to provide stop motions of various kinds which operate to stop the machine when the roving breaks or the supply is exhausted. Such stop motions shut off the power whether mechanical or electric to stop the machine. It has also been customary to provide stopping mechanism by which the operator may stop the machine whenever it is necessary for instance at the end of the work period, or if she finds it necessary to leave the machine temporarily. Such mechanisms do not stop the machine at any particular point in the traverse.

Experience has shown that it is advantageous to stop the machine in the middle of the traverse rather than at the bottom or top. If the machine is stopped at the bottom of the traverse, kinks are formed in the yarn and defective cloth is produced. If the machine is stopped at the top of the traverse, the tension on the roving is excessive and likely to break the yarn. Since these machines operate at high speed it requires considerable skill, experience and close attention by the operator to stop the machine in the middle of the traverse and it is not always possible for the operator to do this.

Accordingly, it is an object of the present invention to provide a stop motion which, without attention or the exercise of skill by the operator, will always stop the machine at a predetermined point in the traverse usually near the middle of the traverse, whether the stopping is done by the operator or results from exhaustion of the supply. Our novel stop motion is particularly adapted for use on spinning frames for use in mills supplied with electric current and accordingly will be described in connection with an electrically driven spinning frame.

When the stop motion is constructed to operate

2

electrically, a control circuit is provided in addition to the power circuit and the switches and relays in the control circuit are arranged so that two switches must be closed to complete the circuit and open the switch in the power circuit, the first of the switches being operated preliminarily by hand, by exhaustion of the supply or otherwise, and the second of said switches, conveniently called the builder motion switch, being operated in time with the builder motion so that the power circuit will not be broken until a certain point in the traverse has been reached.

The drawings show only such parts of the spinning frame as are necessary for a comprehension of the invention. The particular spinning frame shown is of the type having a builder motion employing a heart-shaped cam.

In the drawings:

Fig. 1 is a front elevation of a spinning frame equipped with an electric stop motion embodying the invention;

Figs. 2 and 3 are transverse sections taken on lines 2—2 and 3—3 of Fig. 1, respectively;

Fig. 4 is a section taken on the line 4—4 of Fig. 1, and showing the starting switch closed.

Figs. 5 and 6 are sections taken on lines 5—5 and 6—6 of Fig. 1, respectively;

Fig. 7 is a wiring diagram;

Fig. 8 is a fragmentary view showing one end of the spool stand, spool barrel and one of the switches which operate to stop the machine when the supply is exhausted; and

Fig. 9 shows a partly wound bobbin.

Referring to the drawings and particularly to Fig. 9 there is shown a partly filled bobbin 10 having wound thereon yarn 11. At 12 is shown the layer of yarn which was wound during the last traverse, the length of the traverse being the distance indicated at 13. As already explained, it is important that the machine shall stop with the winding at a pre-determined point in the traverse, preferably at about the middle of the traverse, i. e. at about the horizontal line *e—e*, but the machine can be adjusted to stop at any desired point.

Referring now to Figs. 1 and 2 the spindle rail is designated 14, the ring rail 15, the bobbins 16 and the spindles 17. The spindles may be rotated by pulleys 18 and belts 19. On the ring rail are located the spinning rings 20 each of which is provided with the usual traveller 21.

The roving, which is to be spun into yarn, is wound in packages 22 on a suitable spool or series of spools, having the usual barrel 23 and flanges 24. The spool rotates on a shaft or spindle

6 which is slidable vertically in flared spaced guides forming spool stands 26 of conventional type. The yarn mass on the spool rests on a drum 27 and, therefore, the spool and its packages of roving are gradually lowered as the supply is used. From the supply package, the roving V leads to the draft rolls 8 and 9, thence to the thread guide 30 and thence to the traveller 21.

The machine shown in the drawings is driven by an electric motor M which in turn drives the builder motion shaft 31 through connections therewith not necessary to be described. On the shaft 31 is a builder cam 32 of conventional heart-shape which acts on a cam roll 33 carried by a lever 34. Suitable operating mechanism is provided to give to the spindle rail the necessary relative movement with respect to the ring rail and produce the successive traverses to wind the successive conical layers of yarn on the bobbin. During the winding the spindle rail is also lowered progressively in the well known manner. Since there are many well known mechanisms for this purpose, any of which may be employed, and since the particular mechanism forms no part of the present invention, it has not been thought necessary to show or describe the mechanism in detail.

The electric motor M which drives the machine is in a power circuit P together with the usual starting box E and a main control switch S which is operated by hand as will be described. In addition to the power circuit there is a control circuit (see Fig. 7) supplied with current from a transformer T. In this control circuit are a series of normally open switches viz. one or more switches conveniently called "roving supply" switches and designated No. 1 in the drawings; a hand-operated preliminary stopping switch designated No. 2 in the drawings; a hand-operated starting switch designated No. 3 in the drawings; and a builder-motion switch actuated by or in time with the builder motion, and being designated No. 4 in the drawings. In the control circuit are also two relays R^1 and R^2. The relay R^1 has two pairs of contacts A and B both of which are in the control circuit and are normally open while the other relay R^2 has one pair of contacts C which are in the control circuit and are normally open and another pair of contacts D which are in the power circuit and are normally closed. The windings 81 and 91 of both relays are in the control circuit.

The roving supply switches No. 1 are mounted on the spool stands 26 in such position that the switch arms 42 will be depressed by the ends of the spool spindle when the roving is about to be exhausted as shown in Fig. 8. Each switch is provided with two fixed contacts 43 and a movable contact 44 which bridges the two fixed contacts to close the switch when the arm 42 is depressed as described. The switch is held normally open by a spring 45 and the switch arm 42, which is adapted to engage the movable contact 44, is held normally out of contact with the movable contact 44 by a spring 46.

A switch No. 1 may be provided at each end of the spool so that if one end of the spool spindle is lower than the other due to the exhaustion of the supply at that end of the spool first the stop motion will be actuated to stop the machine even though the supply at the other end of the spool is not yet quite exhausted.

Extending across the front of the machine within convenient reach of the operator is a shipper rod 47 which is both rotatable and slidable. On this shipper rod 47 are placed grips or handles 48 by which the operator may rotate the rod or s'ide it lengthwise. A spring 49 engaging a collar 50 on the shipper rod and a fixed bracket 51 causes the shipper rod 47 to return instantly to its extreme right-hand position, when it is released by the operator. At the left hand end of the shipper rod 47, is a col'ar 52 provided with a lever arm 53 connected to a link 54, the upper end of which is connected to the arm 55 of a rock shaft 56 having a second arm 57 which acts as the movable member of the main control switch S in the power line. By grasping one of the grips or handles 48 on the shipper rod the operator may turn the rod away from her and thus move the main control switch to close it.

The shipper rod 47 is also provided with a cam shaped arm 64 (see Fig. 4) which, when the shipper rod 47 is rotated as described engages a roller 65 on the switch arm 36 of the starting switch No. 3. This switch is provided with two fixed contacts 66 and a movable contact 67 which bridges the two fixed contacts when the switch is closed. The switch is held normal'y open by a spring 68 and the switch arm 36 is normally held out of contact with the movable contact 67 by a spring 69.

The shipper rod 47 is also provided with a cone-shaped cam 58 (see Fig. 5) which engages a roller 59 on the switch arm 60 of the preliminary stopping switch No. 2. This switch is provided with contacts 61, 61, which are bridged by the movable contact member 62 when the switch is closed. The switch is held normally open by the spring 63 whenever the cam 58 on the shipper rod 47 is in the right hand or inoperative position. The switch arm 60 is normally held out of contact with the movable contact 62 by a spring 6. It will be seen that when the shipper rod 47 is pushed to the left by the operator the roller 59 rides on the conical cam 58 and moves the contact member 62 into engagement with the fixed contacts 61, 61 and closes the switch.

The builder motion shaft 31 on which is located the heart cam 32 is also provided with a cam 70 which operates the builder motion switch No. 4. This builder motion switch No. 4 is of a construction similar to the starting switch No. 3 and the preliminary stopping switch No. 2 and is provided with a roller 71 for contact with the cam 70, the roller being mounted on a switch arm 72 pivoted at 73 and arranged to move the movable contact 74 into engagement with the two fixed contacts 75, 75. The switch is held normally open by the spring 76 and the switch arm 72 is held out of contact with the movable contact 74 and in the path of the cam 70 by the spring 77.

In the relay R^1 of the control circuit, the electromagnet is designated 80, the winding 81, the armature 82 and the armature spring 83. This relay includes two pairs of contacts A and B. These contacts are normally open. The relay R^2 comprises the electromagnet 90, the winding 91, armature 92 and armature spring 93, and two pairs of contacts C and D. The contacts C are in the control circuit while the contacts D are in the power circuit. The contacts C in the control circuit are normally open while the contacts D in the power circuit are normally closed.

The transformer T is of a type to reduce the current in the control circuit. It is provided with a primary winding 96 and a secondary winding 97. The secondary winding 97 is connected by the wires 98 and 99 to one terminal 43 of

each of the roving supply switches No. 1, the other terminals 43 of the roving supply switches No. 1 being connected with each other by the wire 100 and by the wires 101 and 102 to one terminal 61 of the preliminary stopping switch No. 2. The other terminal 61 of the stopping switch No. 2 is connected by the wire 103 to the wire 98 already described. The other end of the secondary winding 97 is connected by the wire 104 to one terminal 66 of the starting switch No. 3, the other terminal 66 of which is connected by a wire 105 to the winding 91 of the relay R^2 and thence by wire 106 to one terminal 75 of the builder motion switch No. 4. In the wire 105 may be placed a rectifier 107 and the wires 98 and 105 are bridged by a condenser 108. It is not necessary to maintain this circuit using a condenser and rectifier. The purpose of these is to insure smooth operation. There is a transformer T, for the purpose of eliminating sparking which may be dangerous when inflammable materials, such as cotton and rayon are being spun. The wire 101 which is connected by the wire 102 to one terminal of the preliminary stopping switch No. 2 is also connected by wire 109 with one of the contacts A of relay R^1 and also by wire 110 with the winding 81 of this relay. The other end of the winding 81 of relay R^1 is connected by wire 111 with wire 105. The other of the contacts A is connected by wire 112 with wire 113 which connects one of the contacts B of relay R^1 with one of the contacts C of relay R^2. The other of the contacts B is connected by a wire 114 with one of the contacts 75 of the builder motion switch No. 4. The other of the contacts C is connected by a wire 120 with the wire 106. There is also a wire 115 that connects the wire 113 with the wire 98.

All of the switches (No. 1, No. 2, No. 3 and No. 4) are of the normally open type as is also relay R^1, but relay R^2 is arranged with the power circuit through contacts D normally closed as shown in Fig. 7.

The operation of the machine will now be described, it being assumed that the machine is standing still ready to be started. To start the machine the operator grasps one of the grips 48 and rotates the control rod 47 away from her, thus closing the main control switch S and also the starting switch No. 3 as shown in Figs. 4 and 7. Thereupon the spinning begins and continues until the supply is exhausted or the operator desires to stop the machine. As is well understood by those skilled in the art, it may be necessary to stop the machine for various reasons. For instance, at the end of the work period or because the operator is called away from the machine, or for adjustment.

When the machine is to be stopped by the operator in the middle of the traverse, the operator slides the shipper rod 47 to the left, as viewed in Fig. 1 so that the cam 58 closes the preliminary stopping switch No. 2 and energizes the coil of relay R^1, closing its contacts A and B. Since the winding 81 of relay R^1 is connected through the closed contacts A, wires 112, 113, 115 and 98 with the transformer T, on one side, and with the other side of the transformer through wires 111, 105, switch No. 3 which is now closed, and wire 104, the coil of relay R^1 continues to be energized and its contacts remain closed, but relay R^2 is not energized and its contacts D in the power circuit are maintained closed because the circuit through the builder motion switch No. 4 is still open. Therefore, the movement of the control

rod to the left does not stop the machine immediately but only energizes relay R^1, the contacts of which remain closed. Thereafter the machine continues to operate and the heart cam shaft 31 revolves until the cam 70 on it closes the builder motion switch No. 4 as shown in Fig. 6. This energizes relay R^2 causing contacts C to close and D to open, thus opening the power circuit and stopping the machine, notwithstanding the fact that the main control switch S is closed. At this time the contacts C of the relay R^2 are closed and this has the effect of continuing to energize the coil of relay R^2 and to keep the contacts D open and the power circuit broken. The relay R^2 remains closed because its coil 91 is connected on one side with the transformer T through wire 105, starting switch No. 3 which is closed at this time, and wire 104, and on the other side through wires 106, 120, closed contacts C, wires 113, 115 and 98 with the transformer T. It will therefore be seen that the machine is stopped when the cam 70 closes the builder motion switch No. 4, and that this takes place according to the setting of this cam on its shaft, preferably in the middle of the traverse. Before the machine can be started again it is necesary to de-energize the relay R^2. This is done by turning the shipper rod toward the operator which allows starting switch No. 3 to open and break the control circuit. The machine can then be started as previously described.

From the foregoing it will be seen that whenever either or both of the supply switches No. 1 and the preliminary stopping switch No. 2 are closed, the former being closed upon the exhaustion of the supply and the latter by the movement of the control rod 47 to the left, the circuit through relay R^1 is energized but the machine will continue to run until the cam 70 on the heart cam shaft 31 closes the building motion switch No. 4, as a result of which the machine stops immediately. It will, therefore, be seen that the point in the traverse at which the machine will stop depends upon the angular position of the cam 70 on shaft 31. Ordinarily this cam is placed so that it will close the stopping switch at about the middle of the traverse but it can be set to stop the machine at any desired point in the traverse.

It will be understood that if the operator needs to stop the machine without allowing the builder motion to move the spindle rail 14 to the middle of the traverse she may do so by ordinary procedure of turning the shipper rod 47 toward her which opens the main control switch S and breaks the power circuit.

We claim:

1. In a ring spinning frame which has a builder motion which traverses the ring rail and the spindle rail with respect to each other, the combination of a power circuit, an electrically operated switch in the power circuit, a control circuit, two normally open switches in the control circuit, means for closing one of the switches in the control circuit, and means timed with the traverse mechanism and acting after the closing of the other of the switches in the control circuit to complete the control circuit and open the switch in the power circuit thereby stopping the machine when a predetermined point in the traverse is reached.

2. In a ring spinning frame which has a builder motion which traverses the ring rail and the spindle rail with respect to each other, the combination of a power circuit, an electrically operated

switch in the power circuit, a control circuit, a roving supply switch, a hand-operated preliminary stopping switch, and a builder motion switch all in the control circuit, means for closing one of said first two switches in the control circuit, and means actuated in time with the traverse mechanism after the closing of said first switch to close the builder motion switch and complete the control circuit and open the switch in the power circuit thereby stopping the machine when a predetermined point in the traverse is reached.

3. In an electrically driven ring spinning frame which has a builder motion which traverses the ring rail and the spindle rail with respect to each other, the combination of a control circuit, a switch in the control circuit arranged to be closed by the operator on starting the machine, a switch in the control circuit arranged to be closed preliminary to stopping the machine, a switch in the control circuit arranged to be closed in time with the builder motion at a predetermined point in the traverse, two relays and wiring connections such that the first relay is closed and held closed by the closing of the preliminary stopping switch, and the second relay is closed and held closed by the closing of the builder motion switch, said second relay acting to open the power circuit and hold it open until the starting switch is opened again.

4. In a ring spinning frame which has a builder motion which traverses the ring rail and the spindle rail with respect to each other, a power circuit, a control circuit, an electrically operated switch in said power circuit forming a part of a relay in the control circuit, two normally open switches in the control circuit, means for closing one of the switches in the control circuit, means timed with the traverse mechanism and acting after the closing of one of the switches in the control circuit to energize the relay and open the switch in the power circuit and stop the machine when a predetermined point in the traverse is reached and a hand operated starting switch in said control circuit for de-energizing the relay and opening the power circuit switch.

5. In a ring spinning frame which has a builder motion which traverses the ring rail and the spindle rail with respect to each other and a rotating builder motion shaft, the combination of a power circuit, an electrically operated switch in the power circuit, a control circuit, two normally open switches in the control circuit, one of said switches being hand operated and a member rotating with the builder motion shaft to close

the other of the switches in the control circuit and to complete the control circuit and open the power circuit thereby stopping the machine when a predetermined point in the traverse is reached.

6. In an electrically driven ring spinning frame which has a builder motion which traverses the ring rail and the spindle rail with respect to each other, the combination of a power circuit, a control circuit, a slidable rotatable shipper rod extending lengthwise of the machine, a starting switch in the control circuit arranged to be closed by one movement of the shipper rod, a switch in the control circuit arranged to be closed by the other movement of the shipper rod preliminary to stopping the machine, a switch in the control circuit arranged to be closed in time with the builder motion at a predetermined point in the traverse, two relays in the control circuit the first of said relays being closed and held closed by the closing of the preliminary stopping switch, and the second relay being closed and held closed by the closing of the builder motion switch, said second relay acting upon the power circuit and holding it open until the starting switch is opened again by movement of the shipper rod.

7. In a ring spinning frame which has a builder motion which traverses the ring rail and the spindle rail with respect to each other and lowers the spindle rail progressively during spinning to lay successive layers of yarn on the bobbin, the combination therewith of a stopping mechanism including a preparatory device movable in advance of the stopping mechanism to make the stopping mechanism ready for operation, two actuating devices, one operable by hand and the other by exhaustion of the supply to actuate the preparatory device, and a second device operated in time with the builder motion and after the actuation of the preparatory device arranged and constructed to stop the machine when a predetermined point in the traverse is reached after the actuation of the preparatory device by one or the other of the said actuating devices.

ARTHUR A. WORTH.
HAROLD S. ADAMS.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
1,926,390	Kooistra	Sept. 12, 1933
2,373,263	Rowe	Apr. 10, 1945