March 7, 1950

F. J. SULLIVAN ET AL
MEANS FOR PREVENTING INJURY IN
CASE OF LOOM SHUTTLE STOPPAGE

2,499,887

Filed June 2, 1948

2 Sheets-Sheet 1

Fig. 1.

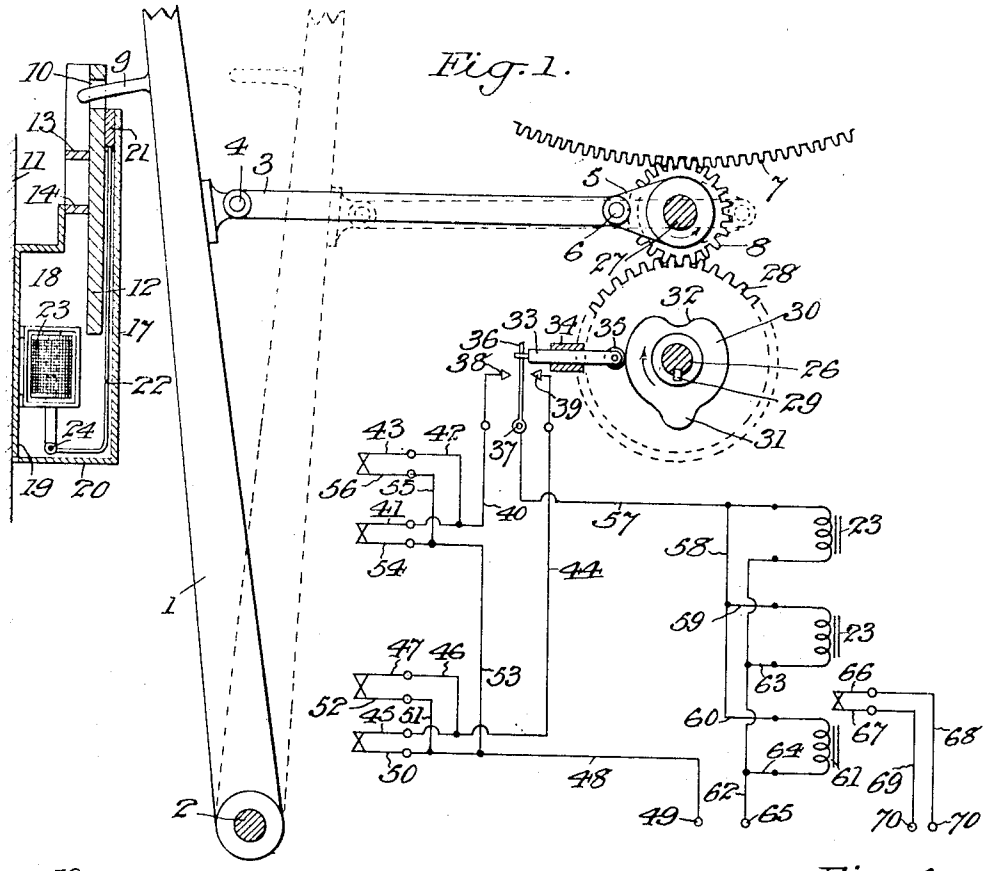


Fig. 2.

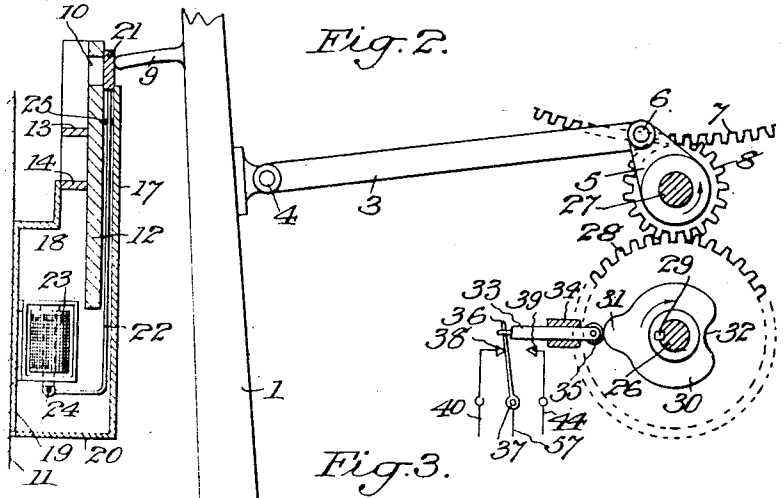


Fig. 3.

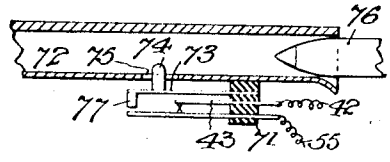
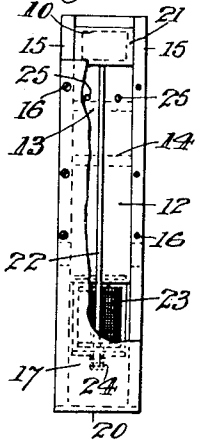


Fig. 4.



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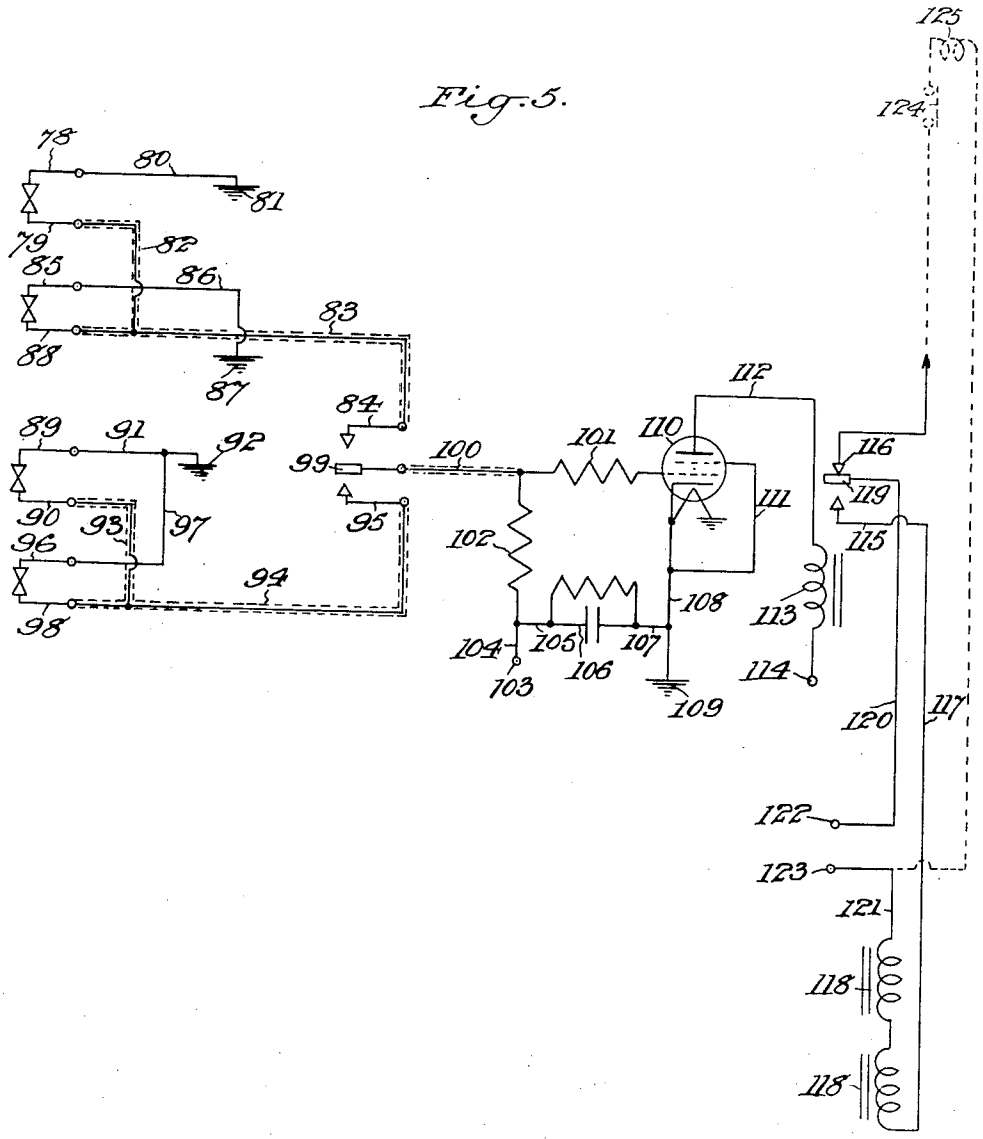
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2 Sheets-Sheet 2

Fig. 5.



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UNITED STATES PATENT OFFICE

2,499,887

MEANS FOR PREVENTING INJURY IN CASE OF LOOM SHUTTLE STOPPAGE

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Application June 2, 1948, Serial No. 30,544

18 Claims. (Cl. 139—341)

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This invention relates to looms and, more particularly, to electrically actuated means for preventing injury in case of shuttle stoppage, and has for an object to provide a construction in which the failure of a shuttle to enter its box at the end of a flight across the loom through the sheds will set in motion electrically actuated mechanism for stopping the loom before the lay can strike the faulty shuttle and cause injury to it and/or the yarn being woven.

Another object is to provide such a construction which eliminates the necessity for the usual dagger lifting mechanism associated with the shuttle boxes.

Another object is to provide such a construction in which the loom is stopped with a minimum of jar or shock as contrasted with conditions brought about by the usual "bang off" stoppage.

Another object is to provide such a construction in which the backs of the shuttle boxes do not need to be formed in any particular shape or be provided with any operative parts, with the result that they may be perfectly straight and smooth and thus not only avoid interference with shuttle flight but actually serve to guide the shuttle at the start of each flight and improve its accuracy.

Another object is to provide such a construction in which the number of moving parts on the lay is reduced together with the power required to operate the picking motion or mechanism.

Another object is to provide such a construction in which the stoppage of the loom can be very rapidly accomplished, whereby the speed of shuttle flight may be lessened with a corresponding decrease in the power required for operating the picking mechanism.

Another object is to provide such a construction in which the electric system is normally set to stop the loom and in which stoppage is prevented by the proper entry of the shuttle into their boxes during loom operation.

Another object is to provide such a construction in which the functioning of the electric system does not require the employment of high voltages, whereby the danger of fire and other forms of injury is minimized.

Another object is to provide such a construction which involves reduction in number of parts, simplification in mode of operation, and decrease in power required, whereby economy in both loom manufacture and loom operation is achieved along with smoothness and efficiency in weaving.

A further object is to provide certain improvements in the form, construction and arrangement of the parts, whereby the above named and other objects inherent in the invention may be effectively attained.

A practical embodiment of the invention is

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represented in the accompanying drawings, in which:

Fig. 1 represents, partly diagrammatically, a side elevation, partly in section, of a loom lay leg and associated parts, together with the mechanical and electrical means for effecting loom stoppage in the event of shuttle failure; the leg being shown in two positions in full and broken lines;

Fig. 2 represents a similar view showing in detail certain of the parts in positions different from those shown in Fig. 1;

Fig. 3 represents a broken detail section showing a shuttle box and its associated electric switch for operation by a shuttle; a portion of a shuttle being illustrated as entering the box;

Fig. 4 represents a broken front elevation of the dagger stop assembly; and

Fig. 5 represents a diagrammatic lay-out of an electronic control system.

It has been common practice in loom construction to provide means for stopping the loom in the event that a shuttle fails properly to enter its box, in order to prevent injury to the shuttle and/or yarn being woven through the striking of the former by the lay. This means has usually included one or more movable daggers carried by the lay in position to contact one or more blocks fixed to the loom frame, which contact serves to stop the loom by what is commonly referred to as a "bang off." To avoid this stoppage while the loom is operating satisfactorily and the shuttles are properly entering their boxes, mechanism, generally including bell cranks and rods, has been associated with the back of one or more shuttle boxes, which mechanism lifts the dagger or daggers on each forward or beat-up stroke of the lay when the shuttles are properly entering their boxes. It will be clear that the arrangement just described necessarily entails a certain amount of complication in loom structure and need for additional power in operation as well as increasing the probability of failure or faulty operation due to the increase in number of moving parts. The present invention is calculated to overcome these existing disadvantages by eliminating the necessity for movable daggers and mechanism for moving them, whereby there is obtained a substantial advance in loom construction and operation, including the hereinabove recited objects of this invention.

Referring to the accompanying drawings, one of the lay legs is denoted by 1 and it is mounted as usual on a rock shaft 2 which has journals (not shown) in the lower part of the loom frame and is arranged to be oscillated by a pitman 3, which is pinned to the lay leg at 4 and to a crank 5 at 6, which crank is rotated by a motor gear 7 that meshes with a gear 8 which is fixed to the crank.

Fastened to and projecting laterally from the

forward side of the leg is a fixed dagger 9 that is positioned to enter an opening or window 10, which is formed in a small dagger stop casing that is secured in any suitable manner, as by bolts (not shown), to an adjacent side member 11 of the loom frame. The said casing is preferably rectangular in horizontal cross section (see Figs. 1, 2 and 4) and comprises a vertical frame member 12 to the rear of which are suitably secured a pair of horizontally disposed cross members 13, 14. The front or face of member 12 is centrally cut away or channelled so as to form side ridges 15, 15, to which is affixed, as by screws 16, a face plate 17. Sides, one of which is shown and marked 18, are fastened, as by screws (not shown) to the frame members 12, 13, 14; a back 19 is similarly secured to the sides and the cross member 14, and a bottom 20 is likewise fastened to the face plate 17, the sides and the back.

In the vertical slot or space enclosed by the ridges 15, 15, and face plate 17, is slidably fitted a shutter 21 which is of such size that it can close the window 10 as illustrated in Fig. 2 or leave the same open by dropping to a lower position as illustrated in Fig. 1. A downwardly extending tail 22 is secured to the bottom of shutter 21 and extends below the member 12 into the body of the casing which is enlarged so as to accommodate a solenoid 23, that may be of standard type, which is suitably mounted therein. The lower end of tail 22 is bent at right angles to its main portion and is fastened, as indicated at 24, to the core of the solenoid. From the immediately foregoing description it will be clear that, when the solenoid 23 is not energized, the shutter 21 and its tail 22 will be permitted to drop in the casing to the position illustrated in Fig. 1 where it is supported by pins 25 (see Fig. 4); this position of the said parts permitting the fixed dagger 9 to pass over the shutter and enter the casing on each forward stroke of the lay, as shown in Fig. 1. When, on the other hand, the solenoid is energized, it will lift the tail 22 and hence the shutter 21 to the position shown in Fig. 2 wherein the latter closes the window 10 and prevents the entry of the dagger 9 into the casing. This condition is caused by the failure of a shuttle properly to enter its box and effects stoppage of the loom in a manner which will now be described.

The middle shaft 26 of the loom, which is mounted as usual in suitable bearings in the loom frame (not shown), is located below the crank shaft 27 and is driven at half the speed of the crank shaft by intermeshing gears 8, 28. On the said middle shaft is fixed, as by a key 29, a cam 30, which is formed on its periphery with a nose 31 and an oppositely disposed depression 32. A switch actuator 33 is slidably mounted in a support 34 that is carried by the loom frame in any suitable manner, and the end of the said actuator extending toward the cam 30 carries a cam roller 35 which is arranged to travel on the periphery of the cam. A spring switch 36 has one end fixed at 37 in a suitable part of the loom frame or a support carried thereby and the said spring switch is normally urged against the actuator 33 so as to hold the cam roller 35 in contact with the cam. Electric contacts 38, 39, are positioned at opposite sides of switch 36 and the relative arrangement of the parts just described is such that the switch will be pressed against contact 38 when the cam roller is riding on cam nose 31, as shown in Fig. 2, while the switch 36 will be permitted to spring press itself against contact 39 when the cam roller enters the cam depression 32. When the cam roller is riding on the cam periphery intermediate nose 31 and depression 32, the switch 36 is free of both contacts 38 and 39, as illustrated in Fig. 1.

The contact 38 is connected by a conducting wire 40 with one switch contact 41 that is associated with one shuttle box of a double shuttle pile loom, e. g., the lower right hand box; while a branch wire 42 also connects contact 38 with one switch contact 43 associated with the upper right hand shuttle box. Contact 39 is similarly connected by a conducting wire 44 with one switch contact 45 associated with the lower left hand shuttle box and by a branch wire 46 with one switch contact 47 associated with the upper left hand box. A current supply wire 48 leads from terminal 49 of a suitable source, such as a 220 volt A. C. commercial line, to the other switch contact 50 of the lower left hand shuttle box, and by a branch wire 51 to the other switch contact 52 of the upper left hand box; while a second branch wire 53 connects wire 48 with the other switch contact 54 of the lower right hand box and, by its own branch wire 55, with the other switch contact 56 of the upper right hand box.

Cam switch 36 is connected by a conducting wire 57 and branch wires 58, 59, 60, with one terminal of solenoids 23, 23, which are positioned in casings, as hereinabove described, at opposite sides of the loom; and also with one terminal of a control relay 61; while conducting wire 62 and branch wires 63, 64, connect the other terminal 65 of the source of current supply to the other terminals of solenoids 23, 23, and relay 61. A motor control switch having contacts 66 and 67, which are normally urged into closed position as by having one or both composed of spring metal, are mounted on any convenient support associated with the loom in operative relationship with relay 61 so that energizing of the latter will draw contact 67 toward it and open the switch; and conducting wires 68 and 69 lead from the contacts 66 and 67 and connect them in series with terminals 70 and 70 of the motor contactor coil; whereby the opening of the switch contacts 66, 67, will break the motor's operating circuit and bring it to a stop.

Fig. 3 illustrates in detail one of the pairs of switch contacts which are associated with each of the shuttle boxes, as previously described, together with the mechanism for separating the contacts to open the switch when a shuttle properly enters its box. Assuming that the switch here shown is the one associated with the upper right hand shuttle box, the contacts are denoted by 43 and 56, while the wires leading from them are marked 42 and 55, as hereinabove set forth. The said contacts are mounted in a lug 71 which is affixed, in any suitable manner, to the shuttle box 72, one or both of the said contacts being composed of spring metal so as normally to urge them into closed position. A switch actuator 73 is also mounted in lug 71 and is preferably composed of spring metal to normally hold it in an inoperative position. The said actuator carries a round ended pin 74 which projects through an opening 75 in a wall of the shuttle box so as to lie in the path of an incoming shuttle 76; and the opposite side of the actuator is provided with a stud 77 which is positioned so as to strike switch contact 56 when the actuator is moved away from the shuttle box as a result of impingement of the incoming shuttle

76 upon the pin 74, which action will separate contact 56 from contact 43 and thus break the electrical circuit at that point.

Referring now to the operation of this invention, it should be noted that the switch contacts associated with all the shuttle boxes are normally closed, as is also the control switch associated with relay 61; while the cam operated switch composed of the elements 36, 38 and 39 is open except when cam roller is riding on nose 31 or in depression 32 as hereinabove explained, the middle shaft 26 is driven from the crank shaft 27 at one half the speed of the latter and the middle shaft carries on each end the usual picking ball (not shown) for operating the picker sticks (not shown) which drive the shuttles back and forth across the loom through the warp yarn sheds, all as is well understood in the weaving industry. Thus it will be clear that each picking ball operates once for each two forward movements of the lay.

Assuming the parts to be in the position illustrated in Fig. 1, with the lay leg 1 and its crank operating mechanism at the beginning of a forward stroke of the lay as represented in broken lines, the rotation of crank shaft 27 will swing the lay forwardly (i. e., to the left in Fig. 1) and, at the limit of its forward stroke, the fixed dagger 9 will pass through the window 10 if the shutter 21 is in its lower position shown in Fig. 1. Just prior to the attainment of this condition, the cam roller 35 will ride up on cam nose 31 and close switch 36 against contact 38 so as to provide for completing the electric circuit through the right hand switch boxes, the solenoids, the relay and the motor control switch, with the result of raising the shutter 21 into the position shown in Fig. 2, so as to prevent any further forward movement of the lay due to the contact of the fixed dagger 9 with the shutter, and with the further result of stopping the motor. However, as long as the shuttles are both operating correctly and properly entering their boxes, the results just mentioned will not be effected because the entry of the shuttles into the right hand boxes will open the switches associated with the boxes, thus making breaks in the electric circuit and preventing energization of the solenoids or the relay. But, if either shuttle fails properly to enter its box the switch associated with that box will remain closed; the electric circuit will be completed; and the solenoids and relay will be energized with the result previously mentioned. It will be understood that the entry of the cam roller 35 into the cam depression 32 will have the same effect as the riding of the roller up on nose 31 because the cam switch 36 will close with contact 39 when roller 35 is in depression 32, and complete the circuit through the left hand boxes.

The parts are timed so that the shuttles in normal flight enter their boxes and open the switches associated with their boxes immediately before the cam switch 36 is closed with either contact 38 or 39, so that the closing of the last named switch will just fail of completing the electric circuit and stopping the loom as long as shuttle operation is correct; but failure of either of the shuttles properly to complete its flight as, for instance, by becoming lodged in the sheds, will bring the electrically controlled mechanism into position to not only stop the loom but also to restrain the forward movement of the lay through contact of the fixed dagger with the shutter 21 and thus prevent injury by the lay to the faulty shuttle or to the yarn being woven. It should also be noted that the timing of the operations is such that the cam roller 35 rides up on nose 31 immediately after the picker mechanism has driven the shuttles toward the right hand boxes, and that the said roller drops into depression 32 immediately after the shuttles are driven in the opposite direction; so that the electric circuit is ready to be operatively completed through the switches on the boxes toward which the shuttles are alternately traveling in the event of failure of either shuttle properly to enter its box. The shuttles open the box switches as they enter their boxes almost instantly thereafter the cam switch closes, but the operation is preferably so adjusted that the cam switch closes as late as can be permitted consistent with proper functioning of the shutter 21, thus allowing as much time as possible for a comparatively slow shuttle to enter its box, open the box switch, and prevent loom stoppage. Hence, it is evident that the faster the operation of a control system designed to stop the loom in the event of shuttle failure, the greater is the permissible reduction in shuttle speed with the consequent saving in power required for any given loom speed. The electric system embodied in the present invention notably excels in this desirable respect as contrasted with the mechanical arrangements commonly employed.

While we have shown and described particularly only a single lay arm and its associated parts, including the stop casing with its shutter and solenoid; it may be noted that we prefer to provide the said arrangement in connection with the lay arms at both sides of the loom.

Fig. 5 shows diagrammatically a modified form of control which may be characterized as electronic and is susceptible of more accurate control in operation than the electric control shown in Fig. 1 and hereinabove described, though it operates in a similar manner.

In this form the contacts for the upper right hand shuttle box are marked 78, 79, the former being grounded by a wire 80 at 81, and the latter being connected by a shielded wire 82 with another shielded wire 83 that leads to contact 84 which corresponds with contact 38 of the middle shaft cam switch shown in Fig. 1. Contact 85 of the lower right hand box is grounded by a wire 86 at 87, while the other contact 88 of the said box is connected to wire 83. The contacts of the upper left hand shuttle box are denoted by 89, 90, and a wire 91 grounds the former at 92 while a shielded wire 93 connects the latter with another shielded wire 94 that runs to contact 95 which corresponds with contact 39 of the middle shaft cam switch in Fig. 1. Contact 96 of the lower left hand box is grounded by wire 97 at 92, and contact 98 of the said box is connected to wire 94.

Switch 99 which corresponds with switch 36 of Fig. 1 is connected by a shielded wire 100 with a resistor 101 that may be of one hundred thousand ohms resistance capacity and also with another similar resistor 102. A source of bias current which may be of minus twelve volt capacity is denoted by 103 and it is connected by a wire 104 with resistor 102 and by wire 105 with grid leak and condenser 106 of which the resistor may be similar to resistors 101 and 102 while the condenser may have a capacity of fifty microfarad; the said grid leak and condenser, in turn, being connected by wire 107 with a wire 108 that is grounded at 109 and is also connected with a tube 110 that is of the tetrode type with indirectly

heated cathode. One grid of the tube is connected to resistor 101 and the other grid is connected by wire 111 with wire 108. The plate of the tube is connected by wire 112 with relay 113, which is of the double pole double throw type, takes the place of relay 61 of the form shown in Fig. 1, and is, in turn, connected with a source of power 114 that may be a two hundred volt direct current line. The contacts of the control switch associated with the relay are marked 115, 116, contact 115 being connected by wire 117 with two solenoids 118, 118, which correspond with the solenoid 24 of Fig. 1; while contact 116 is normally closed with switch 119, which latter and the solenoids 118, 118, are connected by wires 120 and 121, respectively, with the terminals 122 and 123 of a source of electric current which may be a two hundred twenty volt alternating current line. Contact 116 and terminal 123 of the alternating current source are connected with the motor holding circuit which is shown diagrammatically and without detail in broken lines and includes the main contactors, denoted generally by 124 and the holding coil 125.

As this electronic control illustrated in Fig. 5 operates in the loom in the same general manner as the electric control shown in Fig. 1, there seems no occasion here to set forth at length its mode of operation; but it should be stated that, when a shuttle fails properly to enter its box and open the switch associated therewith, the grid of tube 110 is short circuited to the ground at 109, which short circuiting fires the tube and it, in turn, energizes relay 113 and causes the latter to move control switch 119 from contact 116 to contact 115. This breaks the motor holding coil circuit, releases the main contactors 124, and stops the motor; while the closing of switch 119 with contact 115 will energize solenoids 118, 118, and cause shutters 21, 21, at the opposite sides of the loom to close the windows 10, 10, and arrest the forward movement of the lay by contact of daggers 9, 9, with the said shutters, to avoid injury to the faulty shuttle and yarn being woven, as heretofore explained. As long as both shuttles properly enter their boxes and open the switches associated therewith, the closing of the middle shaft cam switch 99 with either contact 84 or 95 will not serve to ground the tube grid, the bias current to the tube will remain in effect and the loom will continue to run.

It should be noted that this system has the advantage of eliminating the use of dangerously high voltages in connection with the shuttle boxes, i. e., twelve volts as compared with two hundred twenty volts, which greatly decreases the liability of fires, shocks and allied injuries; while prolonging the life and efficiency of the shuttle box switch contacts since they are required to conduct only the small grid current.

In the drawings and foregoing description we have set forth the invention as applied to a double shuttle pile or plush loom; but it should be noted that the invention is equally applicable to single shuttle looms.

It will thus be seen that this invention provides for attaining the objects hereinbefore recited, and we desire it to be understood that various changes may be resorted to in the form, construction, material and arrangement of the several parts without departing from the spirit or scope of the invention; and hence we do not intend to be limited to details herein shown or described except as they may be included in the claims or be required by disclosures of the prior art.

What we claim is:

1. A loom comprising, a frame, a shuttle box at each side thereof, picking mechanism for driving a shuttle to and from the boxes, lay mechanism, electric means for stopping the loom when the shuttle fails properly to enter its box, and electrically controlled mechanical means for also stopping the lay mechanism when the lay has partly completed a forward stroke, said last named means including a dagger carried by the lay and an electrically actuated element movable into and out of the path of travel of the dagger.

2. A loom comprising, a frame, a shuttle box at each side thereof, picking mechanism for driving a shuttle to and from the boxes, lay mechanism, electric means for stopping the loom when the shuttle fails properly to enter its box, and electrically controlled mechanical means for also stopping the lay mechanism when the lay has partly completed a forward stroke, said last named means including a dagger carried by the lay and an electrically actuated element normally positioned out of the path of travel of the dagger but adapted to be moved into said path for contact by the dagger.

3. A loom comprising, a frame, a shuttle box at each side thereof, picking mechanism for driving a shuttle to and from the boxes, lay mechanism, electric means for stopping the loom when the shuttle fails properly to enter its box, and electrically controlled mechanical means for also stopping the lay mechanism when the lay has partly completed a forward stroke, said last named means including a dagger carried by the lay, a member mounted on the loom frame and provided with an opening in the path of movement of the dagger, an element slidably mounted adjacent said opening and of such size as to be adapted to obstruct the passage of the dagger therethrough, and electrically actuated means for sliding said element to obstruct the opening in said member and arrest the forward movement of the dagger.

4. A loom comprising, a frame, a shuttle box at each side thereof, picking mechanism for driving a shuttle to and from the boxes, lay mechanism, electric means for stopping the loom when the shuttle fails properly to enter its box, and electrically controlled mechanical means for also stopping the lay mechanism when the lay has partly completed a forward stroke, said last named means including a dagger carried by the lay, a casing mounted on the loom frame and having an open window in the path of movement of the dagger, a shutter movably mounted in the casing and of such size as to be adapted to obstruct the passage of the dagger through the window, a solenoid positioned in the casing and mechanically connected with the shutter, and means for energizing the solenoid to cause it to move the shutter and obstruct the window to arrest the movement of the dagger.

5. A loom comprising, a frame, a shuttle box at each side thereof, picking mechanism for driving a shuttle to and from the boxes, and electric means for stopping the loom when the shuttle fails properly to enter its box, said electric means including a source of electric current, a motor electrically connected thereto, a switch associated with each shuttle box in position to be operated when the shuttle enters the box, another switch having a pair of contacts, conducting

wires connecting one of said contacts with the switch of one shuttle box and the other of said contacts with the switch of the other shuttle box, and means actuated in timed relationship with the picking mechanism for alternately closing the current circuit through said contacts and said shuttle box switches and breaking the current circuit to the motor.

6. A loom comprising, a frame, a shuttle box at each side thereof, picking mechanism for driving a shuttle to and from the boxes, and electric means for stopping the loom when the shuttle fails properly to enter its box, said electric means including a source of electric current, a motor electrically connected thereto, a switch associated with each shuttle box in position to be operated when the shuttle enters the box, another switch having a pair of contacts, conducting wires connecting one of said contacts with the switch of one shuttle box and the other of said contacts with the switch of the other shuttle box, a switch member located for cooperation with said contacts and connected with said source of current, and means actuated in timed relationship with the picking mechanism for alternately closing said member with said contacts.

7. A loom comprising, a frame, a shuttle box at each side thereof, picking mechanism for driving a shuttle to and from the boxes, and electric means for stopping the loom when the shuttle fails properly to enter its box, said electric means including a source of electric current, a motor electrically connected thereto, a switch associated with each shuttle box in position to be operated when the shuttle enters the box, another switch having a pair of contacts, conducting wires connecting one of said contacts with the switch of one shuttle box and the other of said contacts with the switch of the other shuttle box, a switch member located for cooperation with said contacts and connected with said source of current, a motor current control in electrically operative connection with said member, and means actuated in timed relationship with the picking mechanism for alternately closing said member with said contacts and causing it to actuate said motor current control to break the current circuit to the motor.

8. A loom comprising, a frame, a shuttle box at each side thereof, picking mechanism for driving a shuttle to and from the boxes, lay mechanism, and electrically operated means activated when the shuttle fails properly to enter its box for stopping the loom and also stopping the lay mechanism when the lay has partly completed a forward stroke, said means including a source of electric current, a motor electrically connected thereto, a switch associated with each shuttle box in position to be operated when the shuttle enters the box, another switch having a pair of contacts, conducting wires connecting one of said contacts with the switch of one shuttle box and the other of said contacts with the switch of the other shuttle box, a switch member located for cooperation with said contacts and connected with said source of current, a motor current control, a unit in electrical connection with said switch member for operating said control, a mechanical element arranged to be brought into the path of forward movement of the lay to arrest it, another unit in electrical connection with said switch member for operating said mechanical element, and means actuated in timed relationship with the picking mechanism for alternately closing said switch member with said contacts and causing it to energize said motor control unit and said unit which operates said mechanical element.

9. A loom comprising, a frame, a shuttle box at each side thereof, picking mechanism for driving a shuttle to and from the boxes, lay mechanism, and electrically operated means activated when the shuttle fails properly to enter its box for stopping the loom and also stopping the lay mechanism when the lay has partly completed a forward stroke, said means including a source of electric current, a motor electrically connected thereto, a switch associated with each shuttle box in position to be operated when the shuttle enters the box, another switch having a pair of contacts, conducting wires connecting one of said contacts with the switch of one shuttle box and the other of said contacts with the switch of the other shuttle box, a switch member located for cooperation with said contacts and connected with said source of current, a motor current control, a relay unit in electrical connection with said switch member for operating said control, a mechanical element arranged to be brought into the path of forward movement of the lay to arrest it, a solenoid unit in electrical connection with said switch member for operating said mechanical element, and means actuated in timed relationship with the picking mechanism for alternately closing said switch member with said contacts and causing it to energize said relay unit and solenoid unit.

10. A loom comprising, a frame, a shuttle box at each side thereof, picking mechanism for driving a shuttle to and from the boxes, and electric means for stopping the loom when the shuttle fails properly to enter its box, said electric means including a source of electric current, a motor electrically connected thereto, a normally closed switch associated with each shuttle box in position to be opened when the shuttle enters the box, another switch having a pair of contacts, conducting wires connecting one of said contacts with the switch of one shuttle box and the other of said contacts with the switch of the other shuttle box, and means actuated in timed relationship with the picking mechanism for alternately closing the current circuit through said contacts and said shuttle box switches and breaking the current circuit to the motor.

11. A loom comprising, a frame, a shuttle box at each side thereof, picking mechanism for driving a shuttle to and from the boxes, and electric means for stopping the loom when the shuttle fails properly to enter its box, said electric means including a source of electric current, a motor electrically connected thereto, a normally closed switch associated with each shuttle box in position to be opened when the shuttle enters the box, another switch having a pair of contacts, conducting wires connecting one of said contacts with the switch of one shuttle box and the other of said contacts with the switch of the other shuttle box, a switch member located for cooperation with said contacts and connected with said source of current, and means actuated in timed relationship with the picking mechanism for alternately closing said member with said contacts.

12. A loom comprising, a frame, a shuttle box at each side thereof, picking mechanism for driving a shuttle to and from the boxes, and electric means for stopping the loom when the shuttle fails

properly to enter its box, said electric means including a source of electric current, a motor electrically connected thereto, a normally closed switch associated with each shuttle box in position to be opened when the shuttle enters the box, another switch having a pair of contacts, conducting wires connecting one of said contacts with the switch of one shuttle box and the other of said contacts with the switch of the other shuttle box, a switch member located for cooperation with said contacts and connected with said source of current, a motor current control in electrically operative connection with said member, and means actuated in timed relationship with the picking mechanism for alternately closing said member with said contacts and causing it to actuate said motor current control to break the current circuit to the motor.

13. A loom comprising, a frame, a shuttle box at each side thereof, picking mechanism for driving a shuttle to and from the boxes, lay mechanism, and electrically operated means activated when the shuttle fails properly to enter its box for stopping the loom and also stopping the lay mechanism when the lay has partly completed a forward stroke, said means including a source of electric current, a motor electrically connected thereto, a normally closed switch associated with each shuttle box in position to be opened when the shuttle enters the box, another switch having a pair of contacts, conducting wires connecting one of said contacts with the switch of one shuttle box and the other of said contacts with the switch of the other shuttle box, a switch member located for cooperation with said contacts and connected with said source of current, a motor current control, a unit in electrical connection with said switch member for operating said control, a mechanical element arranged to be brought into the path of forward movement of the lay to arrest it, another unit in electrical connection with said switch member for operating said mechanical element, and means actuated in timed relationship with the picking mechanism for alternately closing said switch member with said contacts and causing it to energize said motor control unit and said unit which operates said mechanical element.

14. A loom comprising, a frame, a shuttle box at each side thereof, picking mechanism for driving a shuttle to and from the boxes, lay mechanism, and electrically operated means activated when the shuttle fails properly to enter its box for stopping the loom and also stopping the lay mechanism when the lay has partly completed a forward stroke, said means including a source of electric current, a motor electrically connected thereto, a normally closed switch associated with each shuttle box in position to be opened when the shuttle enters the box, another switch having a pair of contacts, conducting wires connecting one of said contacts with the switch of one shuttle box and the other of said contacts with the switch of the other shuttle box, a switch member located for cooperation with said contacts and connected with said source of current, a motor current control, a relay unit in electrical connection with said switch member for operating said control, a mechanical element arranged to be brought into the path of forward movement of the lay to arrest it, a solenoid unit in electrical connection with said switch member for operating said mechanical element, and means actuated in timed relationship with the picking mechanism for alternately closing said switch member with said contacts and causing it to energize said relay unit and solenoid unit.

15. A loom comprising, a frame, a shuttle box at each side thereof, picking mechanism for driving a shuttle to and from the boxes, lay mechanism, electronic means for stopping the loom when the shuttle fails properly to enter its box, and electronically controlled means for also stopping the lay mechanism, said last named means including a solenoid, a lay arresting device operatively associated with the solenoid, and means for energizing the solenoid.

16. A loom comprising, a frame, a shuttle box at each side thereof, picking mechanism for driving a shuttle to and from the boxes, lay mechanism, electronic means for stopping the loom when the shuttle fails properly to enter its box, and electronically controlled means for also stopping the lay mechanism, said last named means including a solenoid, a lay arresting device operatively associated with the solenoid, an electron tube operatively connected with the solenoid, a source of bias current for the tube, and means for short circuiting the tube to energize the solenoid.

17. In a loom, electronic means for stopping the loom and arresting the forward lay motion when a shuttle fails properly to enter its box, said means including a source of electric current, a motor electrically connected thereto, a switch associated with each shuttle box in position to be operated when the shuttle enters the box, a relay, a source of electric current for the relay, a motor current control switch operatively associated with the relay, a solenoid electrically connected with the motor current control switch, a lay arresting device operatively associated with the solenoid, an electron tube electrically connected with the relay, a source of bias current for the tube, and means for short circuiting the tube to energize the relay and solenoid.

18. In a loom, electronic means for stopping the loom and arresting the forward lay motion when a shuttle fails properly to enter its box, said means including a source of electric current, a motor electrically connected thereto, a normally closed switch associated with each shuttle box in position to be opened when the shuttle enters the box, a relay, a source of electric current for the relay, a motor current control switch operatively associated with the relay, a solenoid electrically connected with the motor current control switch, a lay arresting device operatively associated with the solenoid, an electron tube electrically connected with the relay, a source of bias current for the tube, and means for short circuiting the tube to energize the relay, actuate the motor current control switch to break the motor current circuit and energize the solenoid to activate the lay arresting device.

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