Nov. 5, 1946. V. F. SEPAVICH 2,410,687

STOPPING MECHANISM FOR WEFT REPLENISHING LOOMS

Filed July 23, 1945 2 Sheets-Sheet 1

FIG 1

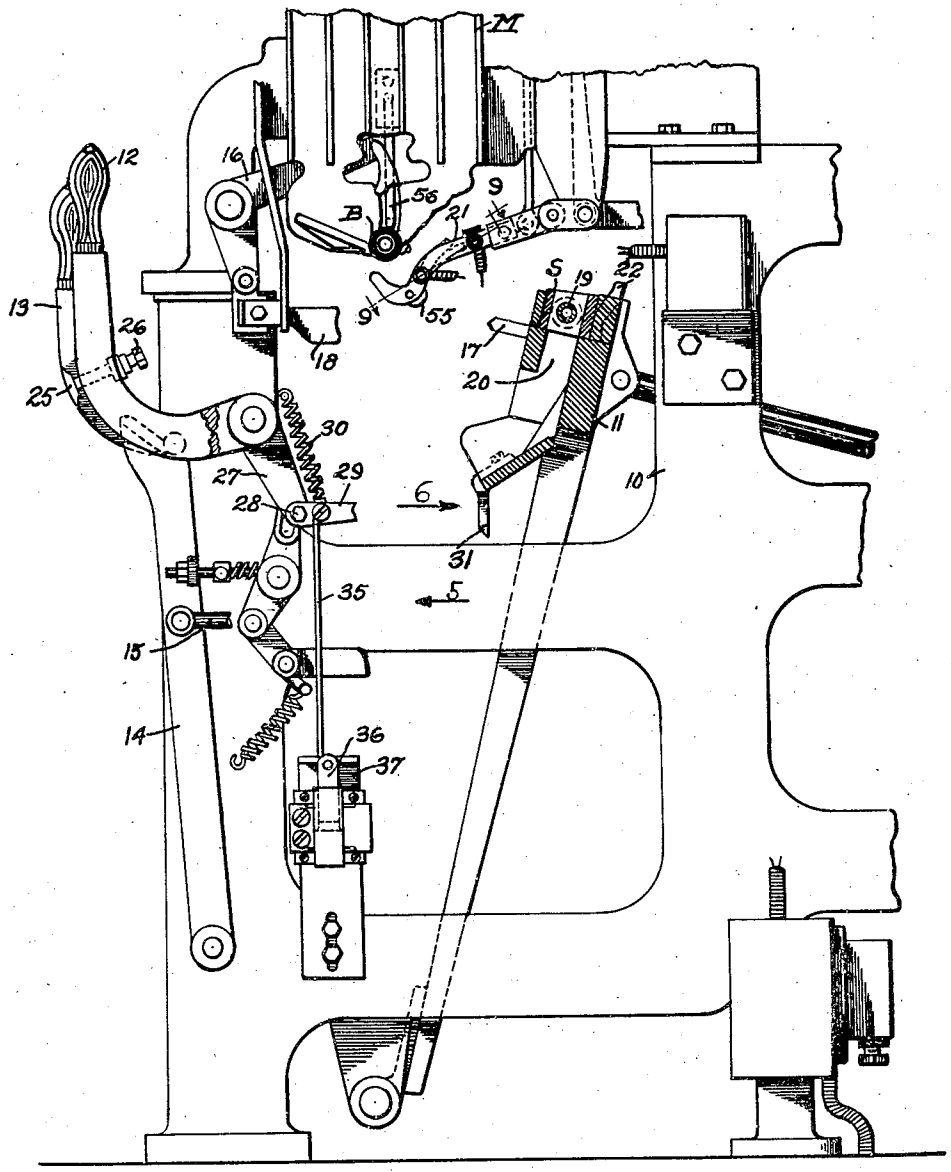
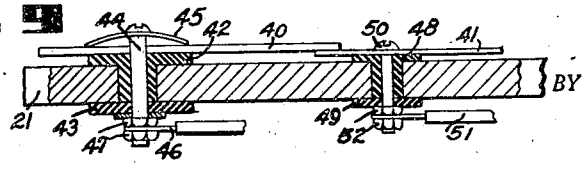


FIG 3



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STOPPING MECHANISM FOR WEFT REPLENISHING LOOMS

Filed July 23, 1945 2 Sheets-Sheet 2

FIG 1

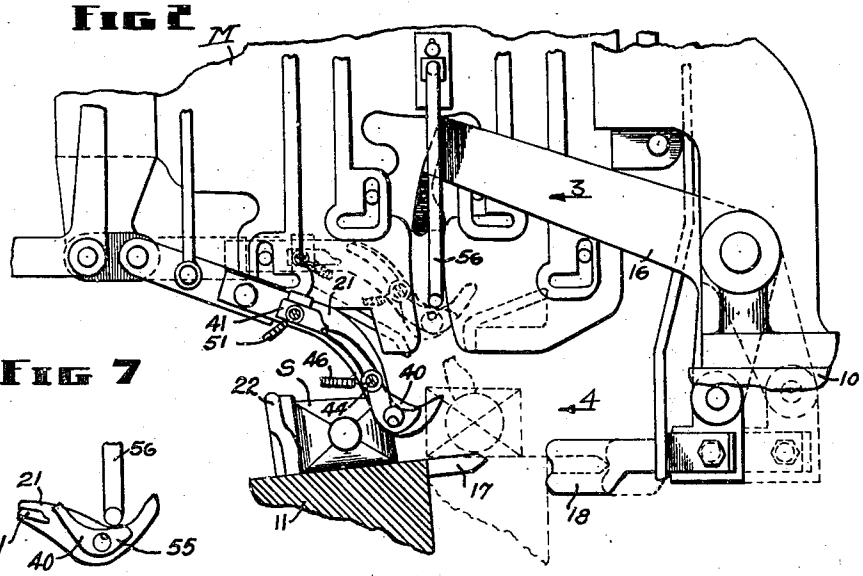


FIG 7

FIG 2

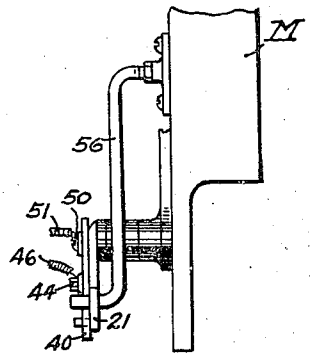


FIG 4

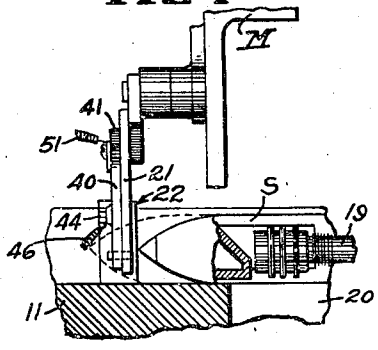


FIG 5

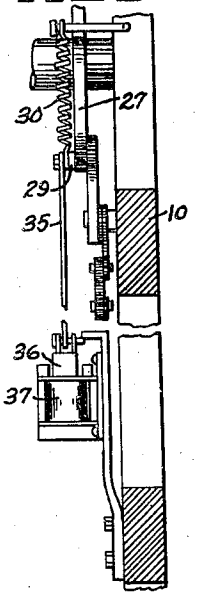


FIG 6

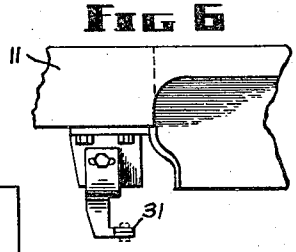


FIG 8

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STOPPING MECHANISM FOR WEFT REPLENISHING LOOMS

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Application July 23, 1945, Serial No. 606,602

12 Claims. (Cl. 139—290)

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This invention relates to weft replenishing looms and it is the general object of the invention to provide improved means for stopping the loom on a transferring beat thereof if the shuttle is improperly positioned for a transferring operation.

In weft replenishing looms a bobbin is moved downwardly into the shuttle on the transferring beat of the loom by transferrer mechanism actuated by the lay as the latter moves forwardly. If at the time of this operation the shuttle is improperly positioned due for instance to rebounding toward the center of the loom it will not be in correct position to receive the incoming bobbin.

Shuttle position feeler or detector mechanisms are ordinarily made as part of the replenishing mechanism for the purpose of revoking the transfer if the shuttle is widely misplaced, but certain of these mechanisms do not operate satisfactorily if a shuttle is only slightly misplaced and in such position that it cannot receive the incoming bobbin. It has been proposed heretofore, as in Darwin Patent No. 2,263,983, to provide the shuttle position feeler with a switch closure of which by a misplaced shuttle will cause a solenoid to move a stopping dagger or the like in the path of a bunter on the lay for the purpose of stopping the loom. The solenoid in that patent is in series with a source of electric power and the switch, and because of this type of circuit there is some risk of fire if lint has collected on the switch.

It is an important object of my present invention to provide a circuit including an electronic tube the grid of which is controlled by the switch on the shuttle position feeler. The current in the grid controlling circuit is very small and insufficient to ignite any lint which may collect on the switch.

The shuttle position feeler and its switch are exposed, and precautions must be taken to prevent shock to the weaver should these parts be touched. It is a further object of my present invention to place the switch in a circuit having very high resistance so that a very small current only can flow through the switch thereby reducing the likelihood of shock.

The shuttle position feeler is ordinarily depressed preparatory to transfer as the lay is moving forwardly and remains down, or in shuttle feeling position, for an appreciable part of the forward movement of the lay. When using an electronic tube it is necessary to hold the grid thereof in an altered condition for the period

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during which the tube is to operate. Because of the fact that the switch on the shuttle position feeler is closed throughout the aforesaid appreciable part of the forward beat of the lay the grid in the tube can be held in abnormal electric condition sufficiently long to energize an electromagnetic device for the purpose of stopping the loom merely by closure of the switch.

With these and other objects in view which will appear as the description proceeds, my invention resides in the combination and arrangement of parts hereinafter described and set forth.

In the accompanying drawings, wherein a convenient embodiment of my invention is set forth,

Fig. 1 is a side elevation of part of a weft replenishing loom having my invention applied thereto, the lay, shuttle, and bobbin therein being shown in section,

Fig. 2 is an enlarged view showing the structure illustrated in the upper part of Fig. 1, but as viewed from the center of the loom,

Fig. 3 is a detailed side elevation looking in the direction of arrow 3, Fig. 2, showing the resetting mechanism for the switch on the shuttle position feeler,

Fig. 4 is a detailed front elevation looking in the direction of arrow 4, Fig. 2 showing the relation of the shuttle position feeler with respect to the shuttle,

Fig. 5 is a rear elevation looking in the direction of arrow 5, Fig. 1, and illustrating the mechanism controlled by the solenoid for stopping the loom,

Fig. 6 is a detailed front elevation looking in the direction of arrow 6, Fig. 1, showing the bunter on the lay which operates the stopping mechanism,

Fig. 7 is a detailed view showing the relation between the switch on the shuttle position feeler and its resetter,

Fig. 8 is a diagrammatic view setting forth the electric circuits used with the invention, and

Fig. 9 is an enlarged section on line 9—9, Fig. 1.

Referring particularly to Figs. 1 and 2, the loom frame 10, lay 11, magazine M, shipper and brake handles 12 and 13, respectively, brake lever 14 and brake applying rod 15 may be of usual construction. The magazine has a transferrer arm 16 actuated by a bunter 17 on the lay when the latch 18 is in the raised transfer position shown in Fig. 1. A bobbin B awaiting transfer in the magazine will be inserted into the shuttle S by the transferrer arm when the lay reaches its front center position, providing the shuttle is correctly

positioned for transfer, and at the same time the depleted bobbin 19 in the shuttle will be driven downwardly through a slot 20 on the lay. A normally raised shuttle position feeler 21 will be in down position when the loom is set for a transferring operation and will be engaged by the shuttle if the latter is misplaced as the lay moves forwardly, or will be engaged by a box back part 22 for upward movement to normal position if the shuttle is properly placed.

The brake and shipper handles are normally in the driving position shown in Fig. 1, that is, forward or to the left. A lug 25 on the brake lever is positioned to engage a screw 26 on the shipper lever so that both levers move rearwardly, or to the right, to stopping position when the brake handle moves rearwardly. A depending arm 27 on the brake lever has a pivot pin 28 on which is mounted a stop dagger 29 normally held raised by a spring 30. Forward movement of the dagger can be effected by a bunter 31 depending from the lay and normally passing under the dagger.

A rod 35 is connected at its upper end to the dagger 29 and at its lower end to a core 36 of a solenoid 37 held in fixed position on the loom frame. The core, rod, and dagger are normally held raised by the spring 30, but when the solenoid is energized its core is drawn downwardly to lower the dagger 29 and into the path of bunter 31. The latter will then engage the dagger 29 as the lay moves forwardly and rock the handles 12 and 13 clockwise as viewed in Fig. 1 to take power off the loom and also apply the brake.

The shuttle position feeler 21 has pivoted thereon a switch 40 and has secured thereto a contact 41 for engagement with the switch. Feeler 21 is usually made of metal, and in order to insulate the switch and contact the structure shown in detail in Fig. 9 may be employed. A bushing 42 and washer 43 of insulating material hold a screw 44 out of contact with feeler 21, and a friction spring 45 between the screw head and switch 40 holds the latter against the bushing. A wire 46 is connected to screw 44 by nuts 47 and is in electrical contact with the switch. Similarly, contact 41 is insulated from feeler 21 by bushing 48 and washer 49. Screw 50 holds the contact 41 in fixed position on feeler 21 and is attached to wire 51 by nuts 52. The switch and contact are therefore insulated from the loom.

The switch 40 has a nose 55 which normally extends below the lowest adjacent part of the feeler 21 where it can be engaged by the shuttle S if the latter is misplaced. When thus engaged switch 40 is moved into engagement with contact 41. A resetting rod 56 is fixed with respect to the magazine M and is so positioned that when the shuttle feeler 21 rises it will move switch 40 to open position away from contact 41. The resetter 56 also acts to move the nose 55 to its normal low position with respect to the feeler 21.

When the loom is set for transfer bobbin B will be in transfer position, latch 18 will be up, and the shuttle position feeler 21 will be down with nose 55 of switch 40 extending therebelow, all as shown in Fig. 1. If the shuttle is properly positioned as indicated in full lines in Fig. 4 its tip end will clear the shuttle position feeler as the lay moves forwardly and the bunter 17 will engage the latch 18 to depress the transferrer arm 15 and effect transfer. If the shuttle is misplaced as indicated in dotted lines in Fig. 4 it will engage the nose 55 and rock the switch so that the latter will engage the contact 41, and will then raise the shuttle position feeler if the shuttle be widely misplaced. If the shuttle misplacement is only slight, however, the switch will be swung to its closed position but upward movement of the shuttle feeler 21 will be effected by the box back part 22. In either event a misplaced shuttle will close the switch and the latter will remain closed during an appreciable part of the forward movement of the lay.

The matter thus far described, except the insulated mountings for the switch 40 and contact 41, may be as set forth in the aforesaid Darwin patent.

In carrying my present invention into effect I provide an improved form of circuit controlled by the switch 40 for the purpose of energizing the solenoid 37, this circuit being so designed that the current passing through the switch 40 will be too small to start a fire should lint have accumulated on the shuttle position feeler 21 around the switch.

As shown in Fig. 8 the power lines 60 and 61, which may conveniently connect with the alternating current lighting circuit, supplies power to the primary 62 of a transformer T, the secondary 63 of which supplies power to the heater filament F of a gas filled electronic tube designated generally at E. Wires 65 and 66 are connected respectively to binding posts 67 and 68 which are connected to the power lines 60 and 61. The circuit of the cathode C in the tube E is as follows: binding post 67, wire 70, resistance R', wire 68, cathode C, wire 69, resistance R^2, wire 71 and wire 66 back to binding post 68. The resistances R' and R^2 are of unequal value so that the potential of the cathode may be several volts above that of the binding post 67. The resistance R' may have a resistance of 3,000 ohms while the resistance R^2 may have a resistance of 27,000 ohms. These two resistances are connected permanently across the lines 60 and 61 as shown in Fig. 8 and determine the voltage of the cathode C.

Anode plate P of the tube is connected by wire 75 to one side of a relay R the other side of which is connected by wire 76 to wire 66, and a condenser 77 may be connected across the wires 75 and 66 in multiple with relay R. The relay may have a resistance of 2500 ohms and the condenser 77 may have the capacity of 10 microfarads.

The relay controls a switch 80 normally open but which when closed causes current to flow from the secondary 81 of a second transformer T' through the solenoid 37, as will be apparent from the right hand part of Fig. 8. Whenever the relay is energized therefore the solenoid will also be energized to exert a downward pull on the rod 35 to cause loom stoppage as already described.

The control grid G of the electronic tube is connected by wire 85 to wire 51 and one end of a high resistance R^3, the other end of which is connected by wire 86 to binding post 67. Wire 46 is connected to one side of another high resistance R^4, the other side of which is connected by wire 89 to binding post 68.

Ordinarily grid G is kept at a potential below that of the cathode by wire 85, resistance R^3 and wire 86 which is connected to post 67. The grid is therefore negative with respect to the cathode and prevents passage of current through the tube E. When the switch 40 is closed, however, the following signal or grid control circuit is closed: post 67, wire 86, resistance R^3, wire 51, contact 41, switch 40, wire 46, resistance R^4, and wire 89

to binding post 68. The drop in voltage across the resistances R^3 and R^4 will be proportional to their ohmic value, and these resistances are so chosen that the potential of wire 65 and the grid will be above that of the cathode. This creates a condition in which the grid permits passage of current through the tube, and the following relay operating circuit is closed: post 67, wire 70, resistance R', wire 68, cathode C through the tube to plate P, wire 75, relay R, wire 76, and wire 66 to post 68. The abnormal condition of the grid permits flow of current through the tube and relay to persist as long as the switch 40 is closed, but as soon as the switch is opened the grid potential drops to normal and the tube thereupon stops conducting current.

The resistances R^3 and R^4 may each be five megohms, but I do not wish necessarily to be held to these values, since I have found that some variation in them may be made without interfering with the operativeness of the circuit. Since the switch 40 is in such position that it may be touched by the weaver or loom fixer it is desirable that both resistances be sufficiently high so that no shock will be felt when the switch or contact is touched. Resistance R^4 may in fact be higher than five megohms, providing its relation with respect to resistance R^3 is such that the grid can be made positive with respect to the cathode when the switch 40 is closed.

The condenser is principally for the purpose of preventing chattering of the relay, and it may have values other than 10 microfarads.

A misplaced shuttle will close the switch while the lay is still a considerable distance behind front center and the switch will not be open until the lay is substantially on front center. Because of these facts closure of the grid control circuit through the switch 40 will persist long enough to insure operation of the relay.

From the foregoing it will be seen that I have provided simple means by which a misplaced shuttle can cause stoppage of the loom by closing a switch through which a very small current flows. It will also be seen that both parts of the grid control circuit which are on the shuttle position feeler 21, that is, the parts 40 and 41, although connected to opposite sides of the power line, are nevertheless protected through high resistances so that there is no danger of shock to the operator. Also, the timing of the loom is such that the switch 40 will remain closed long enough to permit current to flow through the tube long enough to effect adequate energization of the relay.

Having thus described my invention it will be seen that changes and modifications may be made therein by those skilled in the art without departing from the spirit and scope of the invention and I do not wish to be limited to the details herein disclosed, but what I claim is:

1. In a weft replenishing loom having a shuttle position feeler moved to feeling position preparatory to a replenishing operation of the loom and moved away from feeling position by a misplaced shuttle, said feeler having a normally open contact which is closed when the misplaced shuttle moves the feeler away from the feeling position thereof, stopping means for the loom including an electromagnetic device which when energized causes said stopping means to stop the loom, operating circuit means effective to energize said device when electric current can flow in said circuit means, an electronic tube in said circuit means including a grid normally operative when said contact is open to prevent electric current from flowing through said tube and in said circuit means, and electric means effective upon closure of said contact to cause the grid to permit electric current to flow through said tube and in said circuit means to energize said device.

2. In a weft replenishing loom having a shuttle position feeler moved to feeling position preparatory to a replenishing operation and moved away from feeling position by a misplaced shuttle, said feeler having a normally open contact which is closed when the feeler is moved away from the feeling position thereof by the misplaced shuttle, stopping means for the loom including an electromagnetic device which when energized causes said stopping means to stop the loom, a source of electric power, two resistances, one connected to one side of said source and one side of said contact and the other connected to the other side of said source and the other side of said contact, operating circuit means including an electronic tube, said source and device effective when current can flow through said tube to energize said device by power derived from said source, a grid in the tube connected to one of said resistances at a point adjacent to said contact and normally effective when the contact is open to prevent flow of current through said tube, closure of said contact connecting said resistances across said source and causing a change in said grid which causes the latter to permit electric current to flow through the tube and said operating circuit means.

3. In a weft replenishing loom having a shuttle position feeler moved to feeling position preparatory to a replenishing operation and moved away from feeling position by a misplaced shuttle, said feeler having a normally open contact which is closed when the feeler is moved away from feeling position by the misplaced shuttle, stopping means for the loom including an electromagnetic device which when energized causes said stopping means to stop the loom, a source of electric power, an electronic tube having a grid therein, electric circuit means including said source, tube and device effective when current can flow through said tube to energize said device by power derived from said source, grid control means connected to said source and normally operative when said contact is open to cause said grid to prevent flow of current through the tube, said grid control means effective upon closure of contact to change said tube so that the latter permits current to flow through said tube.

4. In a weft replenishing loom having a shuttle position feeler moved to feeling position preparatory to a replenishing operation and moved away from feeling position by a misplaced shuttle, said feeler having a normally open contact which is closed when the feeler is moved away from feeling position by the misplaced shuttle, stopping means for the loom including an electromagnetic device which when energized causes said stopping means to stop the loom, a source of electric power, an electronic tube including a grid and having a cathode connected to one side of said source, electric circuit means including the source, tube and device and effective when current is able to pass through the tube to energize the device, grid control means including a resistance connected to said one side of said source and to said grid and normally effective when the contact is open to cause the grid to prevent flow of current through the tube, said grid control means being effective upon closure of said con-

tact to change the electric condition of the grid relatively to said cathode in such manner as to enable current to flow through the tube and effect energization of said device by said source.

5. In a weft replenishing loom having a shuttle position feeler moved to feeling position preparatory to a replenishing operation and moved away from feeling position by a misplaced shuttle, said feeler having a normally open contact which is closed when the feeler is moved away from feeling position by the misplaced shuttle, stopping means for the loom including an electromagnetic device which when energized causes said stopping means to stop the loom, a source of electric power, normally open signal circuit means including said contact and a resistance between said contact and each side of said source of power, an electronic tube having a grid therein connected to said signal circuit, and operating circuit means including the source, tube and device effective when current is able to pass through the tube to energize the device, said signal circuit means effective when the contact is open to cause the grid to prevent flow of current through the tube and effective when the contact is closed to alter the grid in such manner as to enable current to flow through the tube.

6. In a weft replenishing loom having a shuttle position feeler moved to feeling position preparatory to a replenishing operation, the loom having a lay carrying a shuttle and movable forwardly toward the feeler, said feeler having a normally open contact which is closed during forward movement of the lay by the shuttle if the latter is misplaced, stopping means for the loom including an electromagnetic device which when energized causes said stopping means to stop the loom, a source of alternating current, an electronic tube including a grid, operating circuit means including said source, tube and device effective to energize the latter when alternations of the electric current of a given polarity are able to pass through the tube, alternations of the opposite polarity being unable to pass through the tube, and grid control means including said contact effective when said contact is open to cause the grid to prevent said alternations of given polarity from passing through said tube and effective when said contact is closed to alter the grid and thereby enable said alternations of given polarity to pass through the tube, said contact when closed by a misplaced shuttle remaining closed sufficiently long during forward movement of the lay to enable at least one alternation of said given polarity to pass through said tube.

7. In a weft replenishing loom having a shuttle position feeler moved to feeling position preparatory to a replenishing operation, said feeler being moved away from the feeling position thereof by the shuttle if the latter is misplaced, means constituting a normally open contact on the feeler positioned for closure by the shuttle if the latter is misplaced, loom controlling means including an electromagnetic device which when energized causes a change in loom operation, operating circuit means including an electronic tube and said device and effective when current can flow through said tube to energize said device, a grid forming part of said electronic tube, and grid control means including said contact normally effective when the contact is open to cause said grid to prevent flow of current through the electronic tube and effective when said contact is closed to change said grid to enable current to flow through said tube.

8. In a weft replenishing loom having a shuttle position feeler moved to feeling position preparatory to a replenishing operation when the lay and shuttle are in rearward position, said feeler being moved away from the feeling position thereof by the shuttle if the latter is misplaced during forward movement of the lay, means constituting a normally open contact on the feeler positioned for closure by the shuttle if the latter is misplaced during forward movement of the lay, loom controlling means including an electromagnetic device which when energized causes a change in loom operation, a source of alternating current, an electronic tube including a grid, electric circuit means including the source, tube and device and effective when current can pass through said tube to energize said device, grid control means including said contact and normally effective when said contact is open to cause the grid to prevent alternations of a given polarity derived from said source from passing through said tube, the alternations of opposite polarity being incapable of passing through said tube, said grid control means effective when said contact is closed to change the grid to enable said alternations of said given polarity to pass through said tube, said contact when closed by a misplaced shuttle remaining closed long enough to permit at least one alternation of said given polarity to pass through the tube.

9. In a weft replenishing loom having a shuttle position feeler provided with a contact which is normally open when said feeler is in normal position, the loom having provision for moving the feeler from normal to feeling position thereof preparatory to a replenishing operation and said contact being closed by the shuttle if the latter is misplaced, control means including an electromagnetic device operative to effect a change in loom operation when said device is energized, a source of alternating current, an electronic tube capable of passing alternations of electric current from the source and of a given polarity but incapable of passing alternations of the opposite polarity, operating circuit means including said source, tube and device effective to energize the device when alternations of said given polarity can pass through said tube, a grid in said tube controlling passage of current therethrough, and grid control means including said contact normally effective when the contact is open to cause the grid to prevent said alternations of given polarity from passing through the tube and effective when said contact is closed to change the grid in such manner as to permit alternations of said given polarity to pass through the tube, said feeler being moved from the feeling position thereof to the normal position thereof during an interval of time sufficiently long to include at least one alternation of said given polarity.

10. In a weft replenishing loom having a shuttle position feeler moved to feeling position preparatory to a replenishing operation and moved away from feeling position by a misplaced shuttle, said feeler having a normally open contact which is closed by a misplaced shuttle when the feeler is in feeling position, loom control means including an electromagnetic device which when energized causes said control means to effect a change in loom operation, a source of electric power, operating circuit means including an elec-

tronic tube, said device and said source and normally ineffective to energize said device due to inability of said tube to transmit electric current, a pair of contact elements on said feeler insulated from each other and from said feeler, one of said contact elements being moved into engagement with the other contact element when engaged by a misplaced shuttle, and electric control means for said electronic tube including said contacts and operative when the latter engage each other to enable said tube to transmit electric current and permit said operating circuit means to effect energization of said device.

11. In a weft replenishing loom having a shuttle position feeler which is moved from normal to feeling position preparatory to a replenishing operation of the loom, a pair of contact elements mounted on and insulated from the feeler and normally out of electric engagement with each other, one of said elements being movable into engagement with the other element when the feeler is in shuttle feeling position and said one element is engaged by a misplaced shuttle, loom control means including an electromagnetic device which when energized effects a change in loom operation, an electronic tube having a grid, electric circuit means including the tube and device effective to energize the latter when current is able to pass through the tube, and grid control means connected to the grid and to one of said contact elements and normally causing the grid to prevent flow of current through the tube when said contact elements are out of engagement with each other, said grid control means effective to alter the condition of the grid to enable current to flow through said tube when said contact elements are in engagement with each other.

12. In a weft replenishing loom having a shuttle position feeler moved from normal to shuttle feeling position preparatory to a replenishing operation of the loom, two contact elements mounted on and insulated from said feeler, one of said elements being normally out of engagement with the other element and moved into engagement with said other element when engaged by a misplaced shuttle, a source of electric power, an electronic tube including a control grid, loom control means including an electromagnetic device effective when the latter is energized to cause a change in loom operation, operating electric circuit means including said source, tube and device effective to energize the latter when current is able to pass through the tube, and two resistances, one of said resistances connected between one side of said source and said one element and the other resistance connected between the other side of said source and said other contact element, said grid being connected to one of said elements, said grid normally preventing flow of current through the tube when said contact elements are out of engagement with each other and enabling current to pass through said tube when said contact elements are in electric engagement with each other.

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