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ELECTRIC WARP STOP MOTION FOR LOOMS

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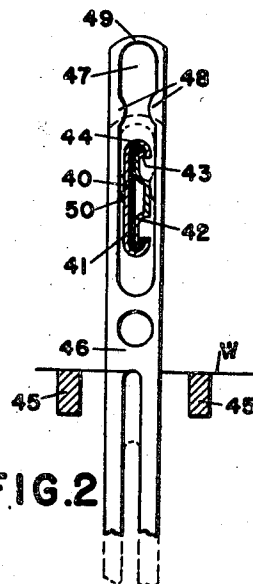
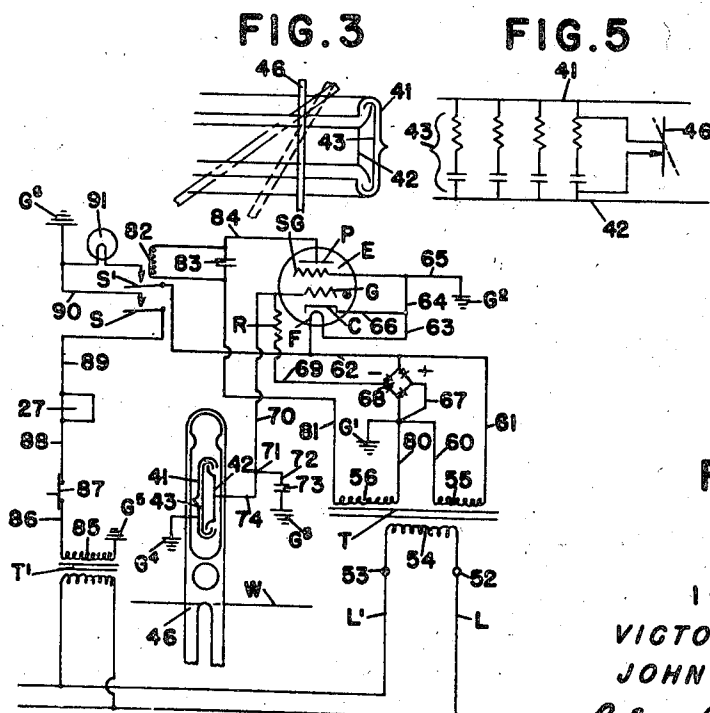
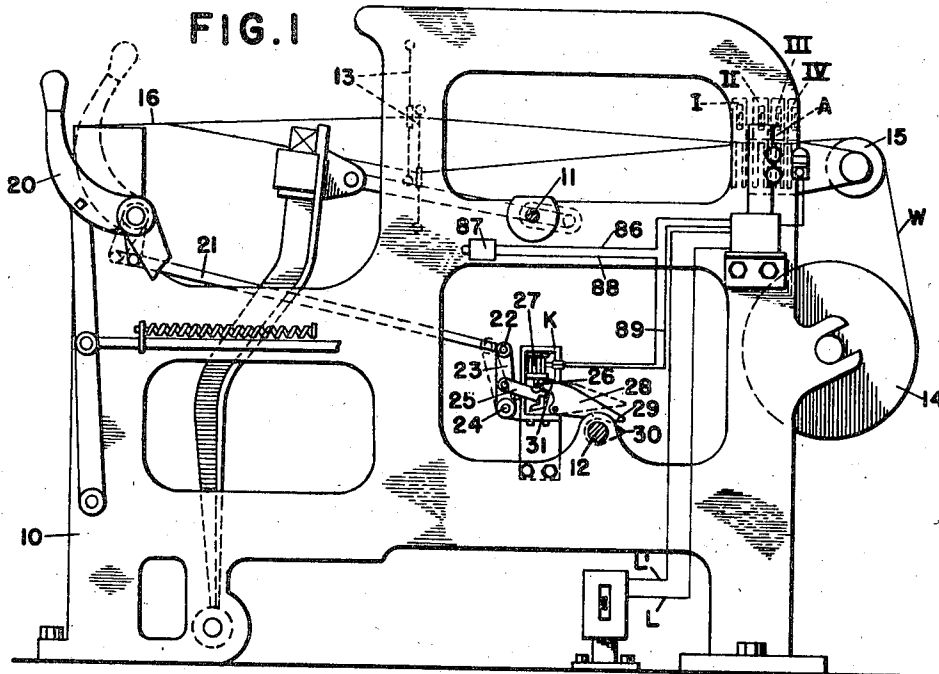


FIG. 4

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ELECTRIC WARP STOP MOTION
FOR LOOMS

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23 Claims. (Cl. 139—353)

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This is a continuation in part of our copending application Serial No. 592,987, filed May 10, 1945.

This invention relates to improvements in electric warp stop motions for looms and it is the general object of the invention to provide an electrical system which will operate by the flow of a very small current through the fallen drop wire.

Electric warp stop motions usually include one or more banks of drop wires having slots through which contact bars are strung. Each bar is composed of two electrodes insulated from each other and so related that when a drop wire falls due to breakage of the associated warp the electrodes will be electrically connected or short circuited. As heretofore made the warp stop mechanism has included a solenoid energized by a relatively large electric current which passes through the fallen drop wire. This arrangement results in heating and burning of the drop wire, and constitutes a fire hazard.

It is an important object of our present invention to provide an electronic circuit which will be controlled by the drop wires and which will be operated by a very small current incapable of causing heating or burning of the drop wires.

A loom can ordinarily be stopped by any one of several stopping mechanisms, such as the filling fork, protector, or warp stop motion, and it is not always easy for the weaver to know just which fault of loom operation has caused the stoppage. In order that the warp stop motion may give a signal when it is responsible for loom stoppage we use a lamp or other form of signal which will become illuminated whenever the warp stop mechanism operates. The current for operating the lamp will ordinarily be larger than that which should pass through the drop wire, and in order to prevent the lamp current from passing through the drop wire we connect the latter and lamp to the electronic circuit in such a way that a very small current flowing through the drop wire will cause illumination of the lamp.

After the weaver has determined by illumination of the lamp that loom stoppage has been caused by a warp fault, he may have difficulty in determining the location of the broken thread. In a type of electric warp stop motion heretofore developed and shown in Payne Patent No. 1,852,217 there is employed a form of drop wire having an arch at the top thereof over a vertical slot into which project two ears or projections. When the drop wire falls these projections engage the electrodes of the contact bar to connect them electrically. When the drop wire is manu-

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ally tilted its arch engages the upper part of the contact bar, after which further tilting will lift the projections and break the contact between the electrodes and the drop wire.

It is another object of our invention to utilize this breaking of contact between the drop wire and contact bar to alter the potential of the grid of the electronic tube and thus cause a change in the illumination of the lamp. By moving his hands over a bank of drop wires the weaver can readily determine the location of the fallen drop wire by noting the change in illumination of the lamp.

In the previously mentioned contact bars the electrodes are separated by a strip of insulating material which acts as a dielectric, causing the contact bar to act as an electric condenser. The strip of insulating material also has a high resistance, but this resistance varies with atmospheric conditions, being low when there is considerable moisture in the air and being high when the air is dry. These changes in atmospheric conditions also alter the capacitance of the contact bars. The circuit for the grid of the electronic tube includes the contact bars and a resistance in series with them. These two resistances provide the normal bias of the grid, but because of the changing resistance of the dielectric it is necessary that the resistance in series with the contact bar be high enough to take care of all resistance conditions of the contact bar. When this resistance is high enough to produce a correct voltage at the grid when the contact bars are dry, it is found that the condenser action of the contact bars will permit firing of the tube in damp weather due to variation in the capacitance of the contact bar.

It is a further object of our invention to connect a condenser across the electrodes of the contact bars and make its capacity much higher than that of the bars. In this way the total capacity of the grid circuits undergoes very little change even though considerable variation may exist in the capacitance of the bars themselves. The resistances can then be chosen with respect to resistance of a contact bar and be made of such value that the capacity of the circuit will never cause firing of the electronic tube.

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

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

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Fig. 1 is a side elevation of a loom having our invention applied thereto.

Fig. 2 is an enlarged side elevation of a drop wire with the contact and warp supporting bars shown in section.

Fig. 3 is a diagrammatic view illustrating the manner in which the contact between the drop wire and the contact bar may be interrupted or disturbed for the purpose of determining the location of the broken thread.

Fig. 4 is a diagrammatic view showing the circuits employed in our invention, and

Fig. 5 is a diagrammatic view indicating the resistance and capacitance of four contact bars connected in parallel, indicating also a drop wire in two positions.

Referring particularly to Fig. 1, the loom frame 10 has top and bottom shafts 11 and 12 and harness frames two of which are indicated at 13. The warp beam 14 at the back of the loom supplies the warp W which passes upwardly and around a whip roll 15 and then forwardly through the warp stop motion designated generally at A. From the warp stop motion the warp leads forwardly or to the left as viewed in Fig. 1 through the harness frames and then to the fabric 16.

Operation of the loom is controlled by a shipper handle 20 to which is connected a rearwardly extending rod 21 attached as at 22 to an upright lever 23 forming part of a loom stopping or knockoff mechanism K. Lever 23 is pivoted as at 24 to the mechanism K and has a link 25 pivoted thereto and connected to the core 26 of a solenoid 27. A lever 28 is pivoted on the knockoff mechanism and has an arm 29 which rests on a cam 30 secured to the bottom shaft 12. An actuating arm 31 on lever 28 is provided for operation of the link 25.

Under normal running conditions when the solenoid is not energized its core 26 and the link 25 will be in down position below the path of travel of the actuator arm 31 as lever 28 is oscillated due to rotation of cam 30. The shipper handle 20 will be in the forward running position shown in full lines, Fig. 1, and lever 23 will be in the full line position shown in Fig. 1. Should the solenoid 27 be energized its core and link 25 will rise and upon the next oscillation of lever 28 in a counter-clockwise direction as viewed in Fig. 1 the actuator arm 31 will engage link 25 and move lever 23 to the dotted line position shown in Fig. 1, thereupon moving rod 21 to the left as viewed in Fig. 1 to rock the shipper handle from the running full line position to the stopped dotted line position.

Warp stop motions will ordinarily comprise several banks of drop wires each having its contact bar, and we have shown herein four banks I, II, III and IV. These banks and their contact bars are alike and a detailed description will be given for bank I only. The contact bar 40 of bank I is formed of an outer and normally grounded electrode 41 which is suitably supported at the sides of the loom. Within the grounded electrode is a second or live electrode 42 insulated from the inclosing electrode 41 by a strip 43 of insulating material. The upper part of the grounded electrode is round as at 44 and extends above electrode 42. Separator bars 45 support the warp W and are related to the contact bar 40 as indicated in Fig. 2. Insulation 43 has a high resistance which varies due to atmospheric changes, and is also a dielectric

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which causes the contact bar to have an electric capacitance.

The bank I has a plurality of drop wires one of which is shown at 46, Fig. 2. Slot 47 in the upper end of drop wire 46 receives the contact bar 40. Ears or projections 48 on drop wire 46 extend into the slot from the sides thereof, and the upper part of the drop wire has an arch or bridge 49 extending across the top thereof to connect the two sides of the drop wire on opposite sides of the slot.

Ordinarily, the drop wire 46 will be in the raised full line position shown in Fig. 2 with the ears or projections 48 in such position that they cannot electrically connect the electrodes 41 and 42. When the warp thread W breaks the drop wire will fall to the dotted line position shown in Fig. 2, whereupon the left hand projection 48 will engage a rib 50 extending longitudinally of the outside electrode 41. This rib causes a camming of the drop wire to the left, Fig. 2, thereby moving the right hand projection 48 against the insulated electrode 42. The two electrodes are thus electrically connected and the arch or bridge 49 is located only a short distance above the upper rounded edge 44 of the electrode 41.

The matter thus far described may be made as set forth in the aforesaid patent to Payne and also another of his patents No. 1,873,465.

In carrying our present invention into effect we provide improved means whereby electric connection of the electrodes 41 and 42 will cause operation of an electronic circuit for the purpose of energizing the solenoid 27 and illuminating a signal. The electric circuit shown in Fig. 4 includes a gas filled electronic tube E having plate P, grid G, shield grid SG, and cathode C which is heated by a filament F. The alternating current power lines L and L' are connected, respectively, to binding posts 52 and 53 which in turn are connected to the primary 54 of a transformer T. The transformer has a low voltage winding 55 for the filament F, and has also a higher voltage winding 56.

The circuit for the filament F of the electronic tube is as follows: ground G', wire 60, secondary winding 55, wire 61, wire 62, filament F, wire 63, and wires 64 and 65 to ground G2. This circuit remains closed during loom operation and the filament heats the cathode C. The latter is connected by wire 66 to wires 63 and 64 and has a potential bias due to flow of current in the filament circuit.

The circuit for grid G is as follows: ground G', wire 67, full wave rectifier 68, wire 69, resistance R, wire 70, connection 71, thence through two branches one of which includes wire 72 and condenser 73 to the ground, and the other of which includes wire 74, insulated electrode 42, the strip of insulation 43 acting as a high resistance, and outside electrode 41 to ground G4.

The resistance of the dielectric or strip of insulating material 43 varies considerably due to atmospheric changes, as already mentioned, changing from a high value of several megohms under dry atmospheric conditions to a much lower value under humid conditions. Resistance R, which may be 25,000 ohms, is chosen so that the grid will be kept negative with respect to the cathode for all usual resistances of the dielectric.

When the dielectric is of low resistance the contact bar has a relatively low electric capacitance, a condition which might result in raising

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the voltage of the grid and cause firing of the tube E. In order that the grid circuit may not be unduly affected by variations in the capacitance of the contact bar, we make the condenser 73 of much higher capacity than that of the bar, one hundred times as great, for instance, and since this condenser is in parallel with the bar a considerable variation in the capacity of the bar can take place without causing material change in the total capacity of the grid circuit. The resistance R can then be chosen with reference to the resistance of the dielectric and of such value that the combined condenser effect of the contact bar and the condenser 73 will not cause undesirable firing of the tube E.

The tube is thus maintained in idle or non-firing condition so long as the drop wire is raised. When the drop wire 46 falls it electrically connects the electrodes 41 and 42, thereby short-circuiting the resistance of the dielectric 43 and causing an increase in the voltage of the grid G, whereupon current can flow through the tube E in the following plate or relay circuit: ground G', wire 80, secondary winding 56, wire 81, relay 82 and condenser 83 in parallel with each other, wire 84, plate P, through the tube to the cathode C, and wires 66, 64 and 65 to the ground G2. Current in this circuit is alternating and flows only when the plate P is positive. The condenser 83 is for the purpose of discharging into the relay 82 to continue energization of it when the plate P is negative.

When relay 82 is energized it closes two switches S and S', one for the solenoid and the other for a signal circuit. Closure of switch S completes the following solenoid circuit: ground G5, low voltage (12 volts) winding 85 of the second transformer T', wire 86, shipper handle control normally closed switch 87, wire 88, solenoid 27, wire 89, switch S and wire 90 to ground G6. This circuit causes energization of the solenoid with resultant operation of the knockoff mechanism K, and when the shipper handle moves from the full to the dotted line position of Fig. 1, switch 87 will be opened, thereby breaking the solenoid circuit to prevent further flow in it of the relatively high current required for the solenoid.

When switch S' is closed by the relay, the following signal circuit is closed: ground G', wire 80, winding 55 (6 volts), wires 61 and 62, switch S', lamp 91 and ground G6. This lamp circuit remains closed so long as the relay 82 remains energized, and this latter condition will continue so long as the tube is kept in firing condition by the fallen drop wire.

As already indicated it is desirable that the weaver be able to locate the fallen drop wire, and he may do this by running his hand over the bank of drop wires and watching the lamp 91. Whenever illumination of the latter changes he will have reached the fallen drop wire. Referring to Fig. 3, the drop wire is indicated in down or circuit closing position in full lines, in which position one of the ears 48 contacts the insulated electrode 42. As the hand is moved over the bank of drop wires the fallen drop wire is first tilted to the dotted line position shown in Fig. 3 to cause engagement of the arch 49 of the drop wire with the rounded top part 44 of the electrode 41. Continued tilting of the drop wire then tilts it to the dot and dash line position of Fig. 3, in which position the drop wire moves out of contact with the electrode 42, thus breaking the grid circuit and restoring the tube to normal non-firing condition with resultant deenergization of the relay 82.

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Lamp 91 is thus extinguished and gives a visual indication to the weaver that his hand is over the fallen drop wire.

The foregoing description has been given largely with reference to one drop wire and one contact bar, but it is to be understood that in common practice several banks of wires are used and the falling of any drop wire in any bank will result in operation of the circuits as already described in connection with Fig. 4. Fig. 5 diagrammatically indicates the conditions existing when four banks of drop wires are used. In Fig. 5 the drop wire 46 is indicated in full line position corresponding to that shown in full lines in Fig. 3, and all of the contact bars are electrically connected through the fallen drop wire, since the electrodes 42 are connected in parallel. The drop wire is connected across the resistance and capacitance of all the contact bars, and thereby discharges whatever charge may have accumulated on the bars because of their action as electric condensers. This discharge, however, does not affect the circuit materially, since these condensers are also in parallel with the relatively high capacity condenser 73 (approximately .01 microfarad). A second warp breakage occurring immediately after the repair of a previous breakage will not result in delayed or improper indication as a result of discharge of charges on the contact bars. In Fig. 5 the dot and dash position of the drop wire corresponds to the similarly indicated position in Fig. 3.

From the foregoing it will be seen that we have provided an electric warp stop motion including electronic circuits which permit an indication for stopping the loom by the use of a very small current such as eliminates heating of the drop wire and fire hazard. It will also be seen that the lamp 91 can have its illumination altered to indicate the location of a fallen drop wire by disturbance of the grid circuit, more specifically by removing the short-circuit which the fallen drop wire establishes around the dielectric 43. It will also be seen that the condenser 73 is in parallel with the contact bars and has a much higher capacitance than do the bars, so that variation in the capacitance of the bars due for instance to atmospheric conditions will have practically no effect on the grid circuit. The grid circuit operates at low voltage direct current supplied by rectifier 68 powered by winding 55, and there is no danger of shock when the weaver passes his hand over a bank of drop wires. The tube E requires a higher voltage due to its own internal resistance and that of the relay, but the winding 56 which supplies this higher voltage does not supply the electric power for the grid circuit.

Having thus described our 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 we do not wish to be limited to the details herein disclosed, but what we claim is:

1. In an electric warp stop motion for a loom having an electromagnetic device which when energized effects loom stoppage and wherein a fallen drop wire electrically connects two insulated electrodes of a contact bar, a source of electric power, an electronic tube including a grid, electric circuit means including the source, tube and electromagnetic device normally maintained inoperative by the grid when the aforesaid electrodes are not electrically connected, and electric means controlled by said drop wire and effective upon electric connection of electrodes

by said drop wires thereby to effect a change in the grid and thereby enable said electric circuit means to energize the electromagnetic device.

2. In an electric warp stop motion for a loom having an electromagnetic device which when energized effects loom stoppage and wherein a fallen drop wire electrically connects two insulated electrodes of a contact bar, a source of electric power, an electronic tube, electric circuit means including the source, tube and electromagnetic devices, a grid in the tube normally operative to prevent flow of electric current in said electric circuit means, and electric connections between said electrodes and grid effective to alter the latter and thereby permit said electric circuit means to energize the electromagnetic device when the aforesaid electrodes are electrically connected by the fallen drop wire.

3. In an electric warp stop motion for a loom having an electromagnetic device which when energized effects loom stoppage and wherein a fallen drop wire electrically connects two insulated electrodes of a contact bar, a source of electric power, an electronic tube having a grid, electric circuit means including the source, tube and device tending normally to energize said device but prevented from doing so by the normal electric condition of the grid when said electrodes are electrically disconnected, and electric means connected to the grid and rendered operative by electric connection of said electrodes by the fallen drop wire to alter the electric condition of said grid in such manner as to enable said circuit means to energize said device.

4. In an electric warp stop motion for a loom having an electromagnetic device which when energized effects loom stoppage and wherein a contact bar comprising two electrodes separated by a high resistance dielectric are electrically connected by a drop wire when the latter falls incident to warp fault, said contact bar due to the electrodes and dielectric having an electric capacitance, a source of electric power, an electronic tube including a grid, electric circuit means including the source, tube and electromagnetic device, and grid circuit means including said contact bar and a condenser connected in parallel with the electrodes of said bar and normally effective to maintain said grid at such electric potential as will prevent electric current from flowing through said electric circuit means, said drop wire when fallen electrically connecting said electrodes and short-circuiting said high resistance dielectric and causing a change in the electric condition of said grid enabling said electric circuit means to energize said electromagnetic device.

5. In an electric warp stop motion for a loom having an electromagnetic device which when energized effects loom stoppage and wherein two electrodes of a contact bar separated by a high resistance dielectric are connected electrically when a drop wire falls, said contact bar due to the electrodes and dielectric acting as an electric condenser, a source of electric power, an electronic tube including a grid, an electric condenser, grid circuit means including a resistance and having said electrodes connected electrically in parallel with said condenser, said grid being electrically connected to said grid circuit means between said resistance and said electrodes and normally preventing flow of electric current through said grid, and electric circuit means including said source, tube and electromagnetic device normally maintained inoperative by the grid

when said electrodes are electrically disconnected, said drop wire when in fallen position electrically connecting said electrodes to short-circuit the resistance of said dielectric and thereby alter the potential of the grid in such manner that electric current can flow through said tube and in said electric circuit means to energize said electromagnetic device.

6. In an electric warp stop motion for a loom having an electromagnetic device which when energized effects loom stoppage and wherein a fallen drop wire electrically connects two insulated electrodes of a contact bar, an electronic tube having a grid, a source of relatively high voltage electric power, electric circuit means including said source, tube and electromagnetic device effective when current can flow through said tube to energize said device, a second source of relatively low voltage electric power, and grid circuit means including said second source and said electrodes and effective when the latter are electrically disconnected to enable said grid to prevent passage of electric current through said tube, electric connection of said electrodes by a fallen drop wire causing said grid circuit means to alter the electric potential of said grid in such manner as to enable electric current to flow through said tube and electric circuit means to energize said device.

7. In an electric warp stop motion for a loom having an electromagnetic device which when energized effects loom stoppage and having a contact bar comprising two insulated electrodes, an electronic tube including a grid and a cathode filament heater, a source of relatively low voltage electric power electrically connected to the heater to cause operation thereof, a grid circuit including said source and said contact bar connected to the grid and maintaining the latter at a normal bias effective to prevent flow of electric current through the tube when said electrodes are not electrically connected, a source of relatively high voltage electric power, and electric circuit means including the second source, tube and electromagnetic device normally inoperative to energize said device due to the normal bias of the grid, said electrodes when electrically connected by a fallen drop wire altering said grid circuit in such manner as to raise the potential of the grid to permit electric current to flow through the tube and enable said electric circuit means to energize said electromagnetic device.

8. In an electric warp stop motion for a loom having an electromagnetic device which when energized effects loom stoppage, the loom having a contact bar comprising two electrodes separated by a high resistance dielectric, an electronic tube including a grid, a resistance having a lower ohmic value than the ohmic value of said dielectric, a source of relatively low voltage electric power, grid circuit means including said source, resistance, and dielectric and normally effective to maintain the grid at such potential bias as to prevent passage of electric current through the tube, said electrodes when electrically connected by a fallen drop wire altering said grid circuit in such manner that the grid permits flow of electric current through the tube, a source of relatively high voltage electric power, and electric circuit means including the second source, tube and electromagnetic device effective to energize the latter when the grid is at such potential as to permit electric current to flow through said tube.

9. In an electric warp stop motion for a loom

having an electromagnetic device which when energized effects loom stoppage, the loom having a contact bar comprising two electrodes connectible electrically by a fallen drop wire and separated electrically by a high resistance dielectric which together with the electrodes causes the contact bar to act as an electric condenser, an electronic tube having a grid, a source of relatively low voltage electric power, a resistance having an ohmic value less than the ohmic value of said dielectric, a grid circuit including said source, resistance, electrodes and dielectric connected in series and connected to the grid between said resistance and said electrodes, a condenser having a higher capacitance than the capacitance of the contact bar connected to said grid circuit in parallel with said electrodes, said grid circuit normally enabling said grid to prevent flow of electric current through said tube when said electrodes are not electrically connected by the drop wire, a second source of relatively high voltage electric power, and electric circuit means including said second source, tube and electromagnetic device normally prevented from energizing the latter, said electrodes when electrically connected by the fallen drop wire short-circuiting the resistance of the dielectric and causing a change in the grid circuit which enables said electric circuit means to energize said electromagnetic device.

10. In an electric warp stop motion for a loom having an electromagnetic device which when energized effects loom stoppage, a contact bar having two electrodes separated by a high resistance dielectric, an electronic tube having a grid, a source of electric power, a grid circuit including said source, electrodes and dielectric and normally effective to maintain the grid at such a potential as to prevent passage of electric current through the tube, a second source of electric power, and electric circuit means including said second source, tube and electromagnetic device normally prevented from energizing said device by said grid but effective to energize said device by current flowing through the tube when the resistance of said dielectric is short-circuited by electric connection of the electrodes.

11. In an electric warp stop motion for a loom having an electromagnetic device which when energized effects loom stoppage and wherein two electrodes of a contact bar separated by a high resistance dielectric are connected electrically when a drop wire fails, electric circuit means including an electronic tube with a grid and said device and tending to energize the latter, and a grid circuit means including said electrodes and dielectric and normally enabling said grid to prevent flow of electric current in said electric circuit means when the electrodes are not electrically connected by a drop wire, the drop wire when fallen electrically connecting said electrodes to short-circuit said dielectric and said grid circuit altering the grid in such manner as to permit flow of electric current in said electric circuit means.

12. In an electric warp stop motion for a loom having a lamp to be illuminated upon occurrence of a warp fault, a contact bar having two electrodes insulated by a high resistance dielectric, an electronic tube having a grid, a source of relatively low voltage electric power, a grid circuit including said source, electrodes and said dielectric normally enabling the grid to prevent flow of electric current through the tube, an electromagnetic relay, electric circuit means energizing

said relay when current flows through said tube, a switch closed by said relay when the latter is energized, and a second circuit normally open and including said source, switch and lamp, said electrodes when connected electrically to short-circuit the resistance of said dielectric altering the grid circuit and enabling said electric circuit means to energize said relay to close said switch, whereupon said lamp is illuminated and said grid is maintained in a condition enabling current to pass through said tube so long as said electrodes are electrically connected.

13. In a warp stop motion for a loom having a lamp to be illuminated upon occurrence of warp fault, a source of low voltage alternating current, a rectifier energized by said source, an electronic tube having a grid, a contact bar having two electrodes separated by a high resistance dielectric, a grid circuit including said rectifier, electrodes and dielectric normally effective to enable a grid to prevent passage of electric current through the tube, an electromagnetic relay, electric circuit means including said electronic tube and relay to energize the latter when current is able to flow through the tube, a switch closed by said relay when the latter is energized, and a lamp circuit including said source, switch and lamp, said electrodes when electrically connected to short-circuit the resistance of the dielectric causing the grid to permit passage of current in said electric circuit means to energize said relay to close said switch to thereby effect illumination of said lamp, the latter remaining illuminated and the grid remaining effective to permit flow of current through the tube so long as said electrodes are electrically connected.

14. In an electric warp stop motion for a loom having a drop wire which when in fallen position due to warp breakage contacts two electrodes of a bar, the loom having an electric lamp to be illuminated upon contact of the drop wire with the electrodes, a source of electric power, an electronic tube, a relay, electric circuit means including the source, tube and relay tending normally to energize the latter, a grid forming part of the tube which when in normal electric condition when said drop wire is out of contact with both electrodes prevents said electric circuit means from energizing said relay, electric means operative upon contact of said drop wire with both electrodes to alter the normal electric condition of said grid and enable said electric circuit means to operate said relay, and electric power means separate from said electric circuit means causing illumination of said lamp when said relay is energized.

15. In an electric warp stop motion for a loom having a drop wire which when in fallen position due to warp breakage closes contact with a contact bar, the loom having an electric lamp to be illuminated upon operation of the warp stop motion, an electronic tube, electric circuit means including the tube normally tending to cause current to flow through said tube, electric power means separate from said electric circuit means operative when current flows through the tube to cause illumination of the lamp, a grid forming part of the tube and acting normally to prevent passage of current in said circuit means and through the tube, and electric means operative when said contact is closed at the contact bar to alter the grid to permit electric current to pass through the electric circuit means and said tube.

16. In an electric warp stop motion for a loom having a drop wire which

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due to warp breakage closes contact with a contact bar, the loom having an electric lamp to be illuminated upon operation of the warp stop motion, an electronic tube, a source of electric power, electric circuit means including said source and tube tending normally to cause electric current to pass through said tube, means separate from said electric circuit means causing illumination of said lamp when current passes through the tube, a grid in the tube which when in normal electric condition when said contact is open prevents electric current from passing through said tube, and electric means operative when the contact is closed at the contact bar by the fallen drop wire to alter the electric condition of said grid to enable said electric circuit means to cause current to pass through said tube.

17. In an electric warp stop motion for a loom having a drop wire which when in fallen position due to warp breakage closes contact with a contact bar, the loom having an electric lamp to be illuminated upon operation of the warp stop motion, an electronic tube, electric circuit means tending normally to cause electric current to flow through said tube, means separate from said electric circuit means operative when current flows through the tube to cause illumination of said lamp, a grid in the tube which when in normal electric condition prevents current from flowing through the tube, and electric circuit means operative when said contact is closed at the contact bar to alter the normal electric condition of said grid and enable said electric circuit means to cause electric current to flow through said tube.

18. In an electric warp stop motion for a loom having a drop wire which when in fallen position due to warp breakage closes contact with a contact bar, the loom having an electric lamp to be illuminated upon operation of the warp stop motion, an electronic tube, electric circuit means tending normally to cause current to flow through said tube, electric power means separate from said electric circuit means so related to said lamp and electric circuit means that when current flows in the latter the lamp is illuminated, a grid in the tube the normal electric condition of which prevents current from flowing through said tube when said contact at the contact bar is open, and electric means operative upon closure of said contact at the contact bar to alter the electric condition of the grid and restrain the latter from preventing current from flowing in said circuit means through said tube, thereby enabling current to flow in said circuit means through said tube and causing illumination of the lamp.

19. In an electric warp stop motion for a loom having an electric contact bar comprising two electrodes insulated from each other and a drop wire which when in fallen position electrically connects said electrodes, said drop wire being manually tiltable when in fallen position to break said contact, an electric lamp, an electronic tube, a source of electric power, electric circuit means tending normally to cause current to flow from said source through said tube, electric power means separate from said electric circuit means so related to the lamp and tube that whenever current flows through the tube the lamp will be illuminated, a grid in the tube which when in normal electric condition when said contact is open prevents current from passing through the tube, and electric means operative when said contact is closed to alter the normal electric condi-

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tion of the grid to permit current to flow in said circuit means and through the tube, the normal electric condition of grid being restored to interrupt flow of current through the tube when said drop wire is manually tilted to break said contact.

20. In an electric warp stop motion for a loom having an electric contact bar comprising two electrodes insulated from each other and a drop wire which when in fallen position closes a contact between said electrodes, said drop wire when in fallen position being manually tiltable to interrupt contact between said electrodes, an electronic tube including a grid normally operative to prevent flow of current through the tube when said contact is open, electric circuit means tending normally to cause electric current to flow through said tube, electric means operating when said contact is closed to alter the electric condition of said grid to permit current to flow in said circuit means and through the tube, an electric lamp, and electric means separate from said electric circuit means causing illumination of the lamp when current flows through said tube, the normal condition of said grid being restored when the drop wire is in fallen position and is tilted to break said contact, thereby altering the illumination of said lamp.

21. In an electric warp stop motion for a loom having an electric contact bar comprising two electrodes insulated from each other and having a drop wire which when in fallen position closes a warp stop contact between said electrodes, said drop wire when in fallen position being manually tiltable to open said warp stop contact, a source of electric power, an electronic tube, a lamp contact, an electromagnetic device which when energized closes said lamp contact, electric circuit means including said source, tube and device tending normally to cause electric current to flow through the tube and energize said device, a grid in the tube normally operative to prevent flow of current in said electric circuit means when said contact is open, electric connections between the contact bar and grid effective to alter said grid in such manner as to enable the electric circuit means to cause current to flow through the tube and energize said device when said contact is closed by the fallen drop wire, an electric lamp, and electric means separate from said electric circuit means to cause illumination of the lamp when said lamp contact is closed by the device, manual tilting of the drop wire when the latter is in fallen position to cause breaking of said warp stop contact resulting in interruption of the flow of current in said electric circuit means to cause deenergization of said device and opening of said lamp contact.

22. In an electric warp stop motion for a loom having an electric contact bar comprising two electrodes insulated from each other and having a drop wire which when in fallen position closes a contact between said electrodes, said drop wire when in fallen position being manually tiltable to open said contact, a source of electric power, an electronic tube having a grid, electric circuit means normally tending to cause current to flow through said tube, said grid normally preventing current from flowing through the tube when said contact is open, electric means operative upon closure of said contact to alter the grid in such manner as to enable electric current to pass through said tube, an electric lamp, and electric means separate from said electric circuit means causing illumination of said lamp whenever cur-

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rent passes through said tube, tilting of said fallen drop wire to break said contact causing the grid to interrupt the flow of current through the tube and prevent illumination of said lamp.

23. Control means for the electric warp stop motion of a loom having an electromagnetic device which effects loom stoppage when energized under control of a fallen drop wire electrically connecting two insulated electrodes of a contact bar, electric circuit means including said electromagnetic device and an electronic tube having a control grid which normally maintains said tube and circuit means inoperative, and electric means whereby upon the electrical connection of said insulated electrodes by said drop wire the

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grid potential will be changed so that the tube will operate and the circuit through the electromagnetic device completed.

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