

Dec. 25, 1945.

O. V. PAYNE

2,391,591

ELECTRIC WARP STOP MOTION

Filed Oct. 23, 1944

2 Sheets-Sheet 1

Fig-1

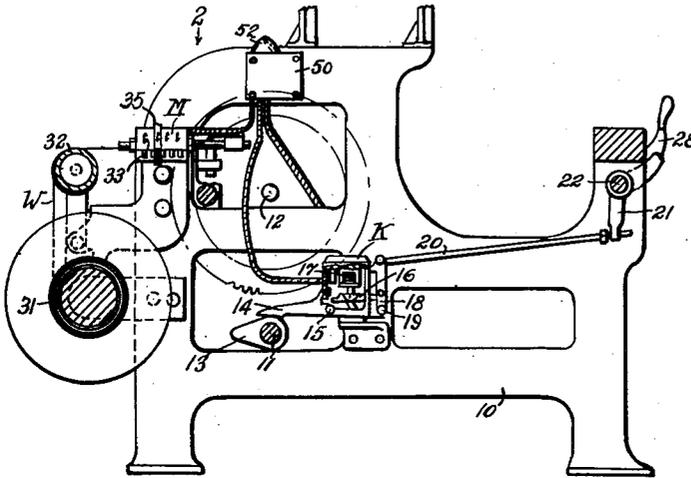
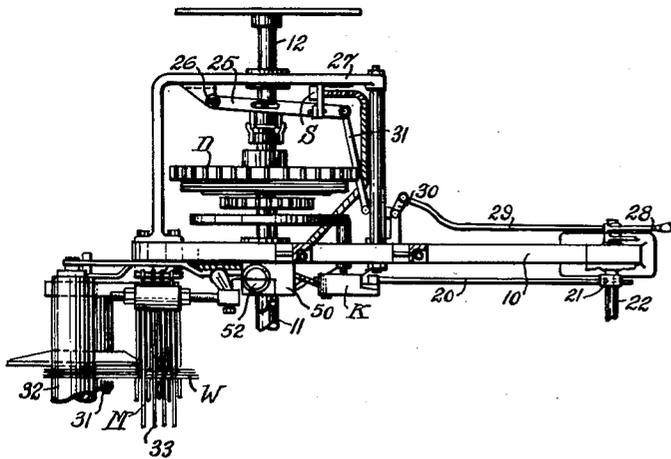


Fig-2



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2 Sheets-Sheet 2

Fig-3

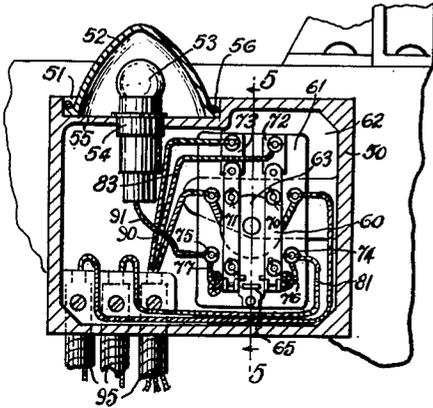


Fig-5

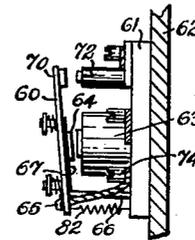


Fig-4

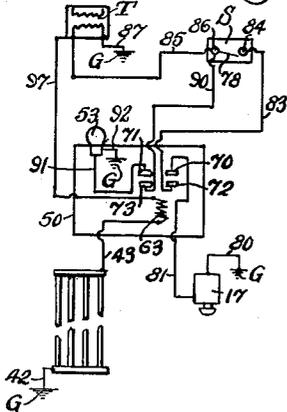


Fig-6

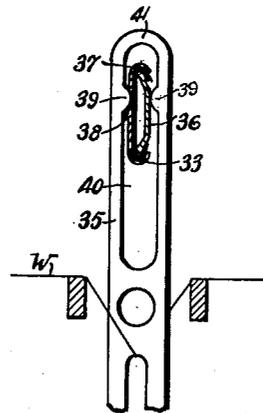
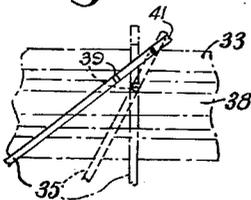


Fig-7



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# UNITED STATES PATENT OFFICE

2,391,591

## ELECTRIC WARP STOP MOTION

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Application October 23, 1944, Serial No. 559,938

8 Claims. (Cl. 139—351)

This is a continuation in part of application Serial No. 424,491, filed December 26, 1941, in the name of Oscar V. Payne for an Electric warp stop motion.

This invention relates to warp stop motions for looms and it is the general object of the invention to provide an electrical warp stop motion in which the electric current which effects loom stoppage is not required to pass through the fallen drop wire.

A loom may stop for any one of several reasons and it is desirable that the weaver be apprised of the cause of stoppage. It is an important object of my present invention to provide a visual signal, such as an electric lamp, which indicates when the loom is stopped by a warp fault, and operate the lamp by a current which is larger than that which is permissible for passage through the fallen drop wire. This is particularly desirable when it is understood that the visual indication should continue from the time of loom stoppage until the warp fault is corrected. If a sufficiently large current to operate a lamp should flow continuously through a fallen drop wire, as would be necessary in former constructions, considerable damage to the drop wire would result before the weaver could correct the warp fault. With the use of my present invention, however, the current through the drop wire is considerably less than that required to operate the lamp, and can continue to flow through the drop wire without damage thereto.

It is a matter of practical difficulty to determine the location of a fallen drop wire when the loom is stopped due to warp fault. It is another object of my invention to provide means by which the weaver can find the fallen wire and broken warp thread quickly and easily by passing his hand over a bank of drop wires and interrupting a circuit which includes a signal lamp. In carrying this feature of my invention into effect the drop wire and contact bar are so constructed that when the tops of the drop wires in the bank are moved manually the fallen drop wire will be rocked in the direction of the length of the contact bar about a temporary pivot formed in part by the arch over the slot in the drop wire and in part by the contact bar. As the lower part of the drop wire rises in this pivotal movement the contact between the bar and drop wire is disturbed and causes the lamp either to go out or show a flickering in its illumination. The weaver can thus tell by a variation in the illumination of the lamp when he has reached the fallen drop wire.

It is a further object of my present invention

to assemble certain parts of the mechanism which operate with relatively high current intensities in a protecting inclosure and utilize the inclosure to support the visual indicator already mentioned.

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 set forth, and described.

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

Fig. 1 is a side elevation of a loom having my invention attached thereto, certain parts being shown in section,

Fig. 2 is a detailed plan view looking in the direction of arrow 2, Fig. 1,

Fig. 3 is an enlarged view of the protecting inclosure shown in the upper part of Fig. 1, parts being in section,

Fig. 4 is a diagrammatic view setting forth the circuits employed in my invention,

Fig. 5 is a detailed vertical section on line 5—5 of Fig. 3,

Fig. 6 is a detail vertical section through one of the contact bars showing a drop wire in fallen or stopping position to connect the two electrodes of the contact bar, and

Fig. 7 is a diagrammatic view showing different angular or deflected positions of the drop wire with respect to its contact bar and setting forth the manner in which the contact between the drop wire and one of the electrodes of the contact bar is varied during angular movement of the drop wire to disturb the circuit containing the signal lamp for the purpose of indicating the location of the broken thread.

Referring particularly to Figs. 1 and 2, I have shown a loom frame 10 and a bottom shaft 11 which rotates every other pick of the loom and a top shaft 12 which rotates every pick of the loom. The bottom shaft is provided with a cam 13 to rock a knock-off lever 14 pivoted as at 15 on a knock-off mechanism K. A link 16 is normally below the operating stroke of lever 14 and is controlled by a solenoid 17 mounted on the mechanism K. The link 16 is connected to an upright lever 18 pivoted as at 19 to the mechanism K and attached at its upper end to a forwardly extending rod 20 attached to a knock-off arm 21 secured to the shipper shaft 22.

Under normal loom conditions lever 14 oscillates without engaging the link 16 but when the solenoid 17 is energized it lifts the link into the path of the lever and when the latter rocks it transmits a force through the link to lever 18 and

causes forward motion, or motion to the right as viewed in Fig. 1, of rod 20 to rock the shipper shaft in a counter-clockwise direction and stop the loom.

Mounted on the top shaft 12 is a driving mechanism designated generally at D which may be of the usual construction to be operated by a lever 25 pivoted at 26 on a frame 27 secured to the loom frame. A shipper handle 28 secured to shaft 22 is connected to a rod 29 which extends rearwardly for attachment to a lever 30 and the latter in turn is attached by rod 31 to lever 25. When the shipper handle is pulled forwardly or to the right as viewed in Fig. 1 the driving mechanism is connected to the loom to cause loom operation. At the same time a switch designated at S and controlled by lever 25 is closed, the switch being open when the loom is stopped and being closed when the loom is operating.

A warp beam 31 mounted on the rear part of the loom supplies warp W which passes over the whip roll 32 and then forwardly through a warp stop motion designated generally at M. This mechanism may comprise a series of contact bars 33 extending through banks of drop wires one of which is shown at 35 in Fig. 1. The drop wires 35 are supported by their respective warp threads and when the latter are taut the drop wires are held raised and in non-contacting position. Each contact bar comprises an insulated electrode 36 and a grounded electrode 37. The latter has a longitudinal rib 38 and the drop wire has lobes or projections 39 extending into a slot 40 in the upper part of the drop wire. An arch or top portion 41 of the drop wire closes the upper end of slot 40 and is located above the projections 39. Each contact bar extends through the slots of the drop wires in the associated bank, as suggested in Fig. 6.

When a warp thread breaks its drop wire falls to the stopping position shown in Fig. 6 to connect electrically the electrodes 36 and 37 of the corresponding contact bar. All of the electrodes 37 are grounded, as by wire 42, Fig. 4, while all the electrodes 36 are connected together and to wire 43. Wires 42 and 43 are disconnected so long as the warp is in proper condition and all the drop wires are in raised non-stopping position.

The matter thus far described, except as noted hereinafter, may be similar to that shown in my prior Patents Nos. 1,852,024 and 1,873,465.

In carrying my present invention into effect I provide improved means to effect loom stoppage and at the same time give visual indication that the stoppage of the loom is due to a warp fault whenever wires 42 and 43 are connected electrically by a fallen drop wire. An inclosed case 50 on the loom frame has the top thereof formed with a recess 51 into which fits a light transmitting protector or dome 52 resting on the case over an electric lamp 53. The latter is carried by a socket 54 supported by the top web 55 of the case forming the bottom of recess 51. The lamp extends sufficiently above the well or recess 51 to be visible through dome 52 when illuminated. A resilient holder, such as wire 56, serves to hold the dome 52 in the recess and prevents its accidental displacement.

Located within the case 50 is a relay 60 having base 61 of insulating material secured to the vertical wall 62 of the case 50. The relay comprises an electro-magnet 63 mounted on the base 61 in position to attract an armature 64 pivoted at 65 to upright 66 secured to the base 61. The

armature has mounted thereon and insulated therefrom by insulating plate 67 two contact bars 70 and 71 which are connected to binding posts or screws 74 and 75, respectively, by wires 76 and 77, and are located for engagement, respectively, with electrodes 72 and 73 insulated from each other and mounted on base 61, see Figs. 3 and 5. A light tension spring 82 shown in Fig. 5 serves normally to keep the contact bars 70 and 71 out of engagement with their respective electrodes and the armature spaced from the electro-magnet.

One side of the solenoid 17 is grounded by a wire 80 while the other side of the solenoid is connected by a second wire 81 to binding screw 74. Wire 83 connects the electrode 72 with an electrode 84 of switch S having a blade 78 for engagement with electrode 84. Blade 78 is permanently connected to electrode 86 of switch S and by wire 85 to one side of a transformer T the other side of which is grounded by wire 87. Electrode 86 is connected by wire 90 to electrode 73, and bar 71 is connected through wire 77 to wire 91 which leads to one side of lamp 53 the other side of which is grounded by wire 92. The wires are conveniently protected by sheaths indicated at 95 and are led into case 50 as suggested in Fig. 3.

Under normal loom running conditions the switch S is closed and all the drop wires are raised, therefore no current can reach the electro-magnet 63 through wires 42 and 43. The spring 82 is therefore able to keep the contact bars 70 and 71 spaced from their respective electrodes and the circuits shown in Fig. 4 are dead. Under these conditions the solenoid 17 remains unenergized, and lever 14 rocks back and forth without communicating a stopping impulse to the shipper shaft 22. When a drop wire falls due to warp defect the corresponding grounded electrode 37 is connected to its electrode 36 and wires 42 and 43 will be electrically connected, causing current to flow through the following detecting circuit: Ground G, wire 42, bar electrode 37, drop wire 35, bar electrode 36, wire 43, relay 63, wire 97, transformer T, and wire 87 back to the ground. The high resistance of the electro-magnet 63 prevents the flow of a damagingly large current through this circuit, and the drop wire will not be burned. Energization of the electro-magnet attracts the armature 64 so that contact bars 70 and 71 engage their electrodes 72 and 73, respectively, thus closing a stopping circuit including solenoid 17 and a signalling circuit including lamp 53.

The stopping circuit is as follows: Ground G, wire 80, solenoid 17, wire 81, contact bar 70, electrode 72, wire 83, post 84, blade 78, (normally closed during loom operation), post 86, wire 85, transformer T, and wire 87 back to ground G. This circuit when closed results in lifting link 16 into the path of lever 14 and when the latter next has a right hand motion as viewed in Fig. 1 the loom will be stopped by rocking of shipper shaft 22 in a counter-clockwise direction as viewed in Fig. 1. The shipper handle therefore moves to the left to cause movement of shipper lever 25 as already described a result of which is to open switch S, after which the solenoid becomes deenergized.

The signalling circuit closed when the relay is energized is as follows: Ground G to one side of lamp 53 (wire 92 in Fig. 4 diagrammatically indicating the connection), lamp 53, wire 91, contact bar 71, electrode 73, wire 90, post 86, wire

85, transformer T, and wire 87 back to the ground. It will be noted that this circuit is closed through post 86 and is not interrupted when the switch S is open. The lamp 53 therefore continues to burn after the loom has stopped and thus gives a visual signal that the loom has been arrested by a warp defect.

The electro-magnet 63 serves two purposes in the circuit including the fallen drop wire the first of which is to introduce a relatively high resistance to permit a small current only to flow through the drop wires. The second purpose is to move the armature 64 by electro-magnetic attraction to close the circuits through the stopping solenoid 17 and the signalling lamp 53. So long as the drop wire is down the small current permitted to flow through the high resistance electro-magnet 63 can maintain the latter energized and pass through the fallen drop wire without damaging the latter. At the same time the lamp 53, which requires a larger current than would be safe to pass through the drop wire, can continue to be illuminated until the warp defect is corrected.

Another important feature of my invention grows out of the ease with which the weaver can locate the broken warp thread. Referring again to Fig. 6, it will be seen that when the drop wire is down in stopping position the arch or top portion 41 thereof is nearer the top of the contact bar than is the bottom of slot 40 to the bottom of the bar 33. Also, the lobes 39 are able by their shape and relation to rib 38 and electrode 36 to serve as a primary pivot around which the drop wire can be swung in a vertical plane. When the drop wire is thus deflected in the direction of the length of the contact bar the arch 41 will engage the top of bar 33 while the bottom of slot 40 is still a considerable distance below the contact bar. Thereafter, a still further deflection of the wire 35 will cause it to move around a secondary pivotal center located at the point where arch 41 engages bar 33, thereby lifting the lobes 39 and disturbing the electric contact between electrodes 36 and 37 in the signalling circuit.

To find the fallen drop wire the weaver runs his hand over the bank of drop wires and when near the fallen drop wire the latter will first be deflected from the dot and dash line position around the aforesaid primary pivot to the dotted line position shown in Fig. 7 with lobes 39 still in contact with the electrodes 36 and 37 and with the bottom of the arch in engagement with the top of the grounded electrode. Further movement of the weaver's hand causes the drop wire to move around the aforesaid secondary pivot to the full line position shown in Fig. 7 due to movement of adjacent drop wires not shown in Fig. 7. When moving from the dotted line to the full line position shown in Fig. 7 the lower part of the drop wire is raised, thereby lifting the lobes and disturbing the contact between them and the contact bar 33. This disturbance of the contact effects a change in the lamp or signalling circuit which causes the lamp either to go out or to flicker. In this way the weaver receives a visual signal from the lamp when he reaches a fallen drop wire.

From the foregoing it will be seen that I have provided simple mechanism for reducing the amount of current which flows through a fallen drop wire and at the same time provide ample current for operating the stopping solenoid 17 and the signalling lamp 53. This result is accom-

plished by the electro-magnet 63 which introduces a high resistance in the detecting circuit and serves also to close the stopping and signalling circuits in which flow currents large enough to damage the drop wire if they flowed through the detecting circuit. It will further be seen that the casing 50 is the common mounting for the relay and the contacts which it controls as well as the lamp 53 and the protective dome 52. It will also be seen that the lamp which continues to burn after the loom is stopped to indicate that stoppage is due to warp fault, can also have its illumination varied by tilting of the fallen drop wire and thereby indicate the location of the warp fault. The lamp is therefore made to serve the dual purpose of not only showing that the loom has been stopped because of a break in the warp but also assist the weaver in locating the broken thread.

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 an electric warp stop motion for a loom having a signal lamp and an electro-magnetic controller for loom stopping mechanism to be operated when the loom is stopped due to a warp fault, the loom having a two-electrode contact bar the electrodes of which are connected by a drop wire when the latter moves to stopping position, a source of electric power connected to the lamp, means constituting two electric circuits to be energized by said source of electric power, one circuit for said lamp and one for said controller, an electro-magnetic device energized by said source of electric power when the drop wire is in stopping position, switch means controlled by said device effective when the latter is energized to close both of said circuits, said one circuit including said lamp, said switch means and said source of power and remaining closed after loom stoppage to cause illumination of the lamp so long as the electro-magnetic device is energized due to the drop wire being in stopping position, and a loom operated switch in the other circuit closed during loom operation and open when the loom is stopped, said other circuit including said source of power, said switch, said switch means and said controller and causing operation of the latter when the electro-magnetic device closes said other circuit, stoppage of the loom causing breaking of said other circuit due to opening of said switch and said one circuit remaining closed for operation of the lamp subsequent to loom stoppage.

2. In an electric warp stop motion operating with a source of electric power and a signal lamp, a contact bar having two electrodes insulated from each other, a drop wire having a slot to receive the contact bar, said drop wire having a top portion extending over the contact bar and having also projections below said top portion projecting into the slot for engagement with said electrodes when the drop wire is in stopping position, and electric circuit means including said signal lamp, said source of electric power and said electrodes closed when the drop wire is in stopping position with said projections in engagement with said electrodes to cause illumination of the lamp, deflection of the drop wire when in stopping position sufficient to cause engagement of said top portion with the contact bar effecting a change in said circuit means due to movement

of said projections relatively to said electrodes to cause variation in the illumination of the signal lamp and thereby indicate the location of the fallen drop wire.

3. In an electric warp stop motion operating with a source of electric power and a signal lamp, a contact bar having two electrodes insulated from each other, one electrode extending above the other electrode, a drop wire having a slot through which the contact bar passes, said drop wire having a top portion above said slot and contact bar and having a contact part below said top portion on one side of the slot for engagement with said other electrode when the drop wire is in stopping position, said drop wire when in stopping position engaging said one electrode and causing said contact part to engage said other electrode to connect the electrodes electrically, and electric circuit means closed when the drop wire is in stopping position and including said source of electric power, said lamp, said electrodes and said contact part, said drop wire when deflected laterally in the direction of the length of the contact bar establishing a temporary pivot between said one electrode and said top portion of the drop wire and moving said contact part away from said other electrode to thereby interrupt said circuit means and cause a variation in the illumination of said lamp to indicate the location of the drop wire in stopping position.

4. In an electric warp stop motion for a loom having a signal lamp operated when the loom is stopped due to warp fault, the loom having also a two-electrode contact bar the electrodes of which are connected by a drop wire in stopping position, the drop wire having a contact bar receiving slot into which project integral contact parts of the drop wire to engage the electrodes when the drop wire is in stopping position, the drop wire having a portion above said contact parts and over the contact bar, an electro-magnetic device, primary electric circuit means to energize said device electrically by an electric current flowing through the electrodes and drop wire when the latter is in stopping position, a switch moved from normal to abnormal position by said electro-magnetic device when the latter is energized and returning to normal position when the electro-magnetic device is deenergized, and secondary electric circuit means causing illumination of the lamp by an electric current flowing through said switch when the latter moves to abnormal position, said lamp requiring for its illumination a current strength greater than that required to energize the electro-magnetic device and sufficient to burn the drop wire, said portion of the drop wire when the latter is in stopping position and is deflected engaging the contact bar and moving said contact parts relatively to the electrodes to interrupt said primary circuit means, whereupon said electro-magnetic device is deenergized and said switch returns to normal position and interrupts said secondary electric circuit means to indicate the location of the warp fault by interruption of the illumination of the lamp.

5. In an electric warp stop motion for a loom having a signal lamp operated when the loom is stopped due to warp fault, the loom having also a two-electrode contact bar the electrodes of which are connected by a drop wire in stopping position, the drop wire having a contact bar receiving slot on one side of which is a contact part integral with the wire to engage one of the electrodes and the drop wire having a portion above

said contact part and over the contact bar, an electro-magnetic device, primary electric circuit means to energize said device electrically by an electric current flowing through the said contact part, the electrodes and said drop wire when the latter is in stopping position, a switch moved from normal to abnormal position by the electro-magnetic device when the latter is energized and returning to normal position when the electro-magnetic device is deenergized, and secondary electric circuit means including said switch and lamp and causing illumination of the lamp by an electric current which flows through the switch when the latter is in abnormal position, said electro-magnetic device causing movement of the switch to abnormal position when energized by a current of insufficient strength to cause illumination of the lamp, said contact part of the drop wire when the latter is in stopping position and is deflected engaging the contact bar and moving said contact part away from said one electrode and thereby interrupting said primary circuit means to deenergize said electro-magnetic device, whereupon said switch returns to normal position and interrupts said secondary circuit means and thereby indicates the location of the warp fault by interruption of the illumination of the lamp.

6. In an electric warp stop motion operating with a source of electric power and a signal lamp, a contact bar having two electrodes one of which is insulated from and extends above the other electrode, a drop wire having a slot through which the contact bar passes, said drop wire having a top portion above said slot and contact bar and said drop wire having a contact part below said top portion on one side of the slot for engagement with said other electrode, said drop wire when in fallen position engaging said one electrode and having said contact part in engagement with said other electrode to connect the electrodes electrically, and electric circuit means closed when the drop wire is in fallen position and including said source of electric power, said lamp, said electrodes and said contact part, said top portion of the drop wire when moved in the direction of the length of the contact bar establishing a temporary pivot with said one electrode and moving said contact part relatively to said other electrode to vary the electric resistance of the electric contact between said contact part and said other electrode to vary the current in said electric circuit means and cause a change in the illumination of said lamp to indicate the location of the fallen drop wire.

7. In an electric warp stop motion operating with a source of electric power and a signal lamp, a contact bar having two electrodes one of which is insulated from and extends above the other electrode, a drop wire having a slot through which the contact bar passes, said drop wire having an arch at the upper end thereof above said slot and said drop wire having a contact part below said arch on one side of the slot for engagement with said other electrode, said drop wire when in fallen position engaging said one electrode and having said contact part in engagement with said other electrode to connect the electrodes electrically, the contact bar and slot being so proportioned that when the drop wire is in fallen position said arch is nearer the top of the contact bar than the bottom of the slot is to the bottom of the contact bar, and electric circuit means closed when the drop wire is in fallen position and including said source of electric power, said lamp, said electrodes and said

contact part, said arch when moved in the direction of the length of the contact bar establishing a temporary pivot with said one electrode and moving said contact part relatively to said other electrode to vary the electric resistance of the electric contact between said contact part and said other electrode to vary the current in said electric circuit means and cause a change in the illumination of said lamp to indicate the location of the fallen drop wire.

8. In an electric warp stop motion for a loom having a signal lamp operated when the loom is stopped due to warp fault, the loom having also a two-electrode contact bar the electrodes of which are electrically connected by a drop wire in stopping position, the drop wire having a contact bar receiving slot on one side of which is a contact part integral with the wire to engage one of the electrodes and the drop wire having a portion above said contact part and over the contact bar, an electro-magnetic device, detecting electric circuit means effective to cause energization of said electro-magnetic device when the drop wire is in stopping position and said contact part is in contact with said one electrode, said device

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becoming deenergized when said contact part moves out of contact with said one electrode, a switch moved from normal to abnormal position by the electro-magnetic device when the latter is energized and returning to normal position when the electro-magnetic device is deenergized, and signal circuit means including said switch and lamp and causing illumination of the lamp by an electric current which flows through said switch when the latter is in abnormal position, said electro-magnetic device causing movement of the switch to abnormal position when energized by a current of insufficient strength to cause illumination of the lamp, said contact part of the drop wire when the latter is in stopping position and is deflected engaging the contact bar and moving said contact part of the drop wire away from said one electrode and thereby interrupting said detecting circuit means to deenergize said electro-magnetic device, whereupon said switch returns to the normal position thereof and interrupts said signal circuit means and thereby indicates the location of the warp fault by interruption of the illumination of the signal lamp.

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