May 29, 1945. O. V. PAYNE 2,377,102

ELECTRIC WEFT DETECTOR FOR LOOMS

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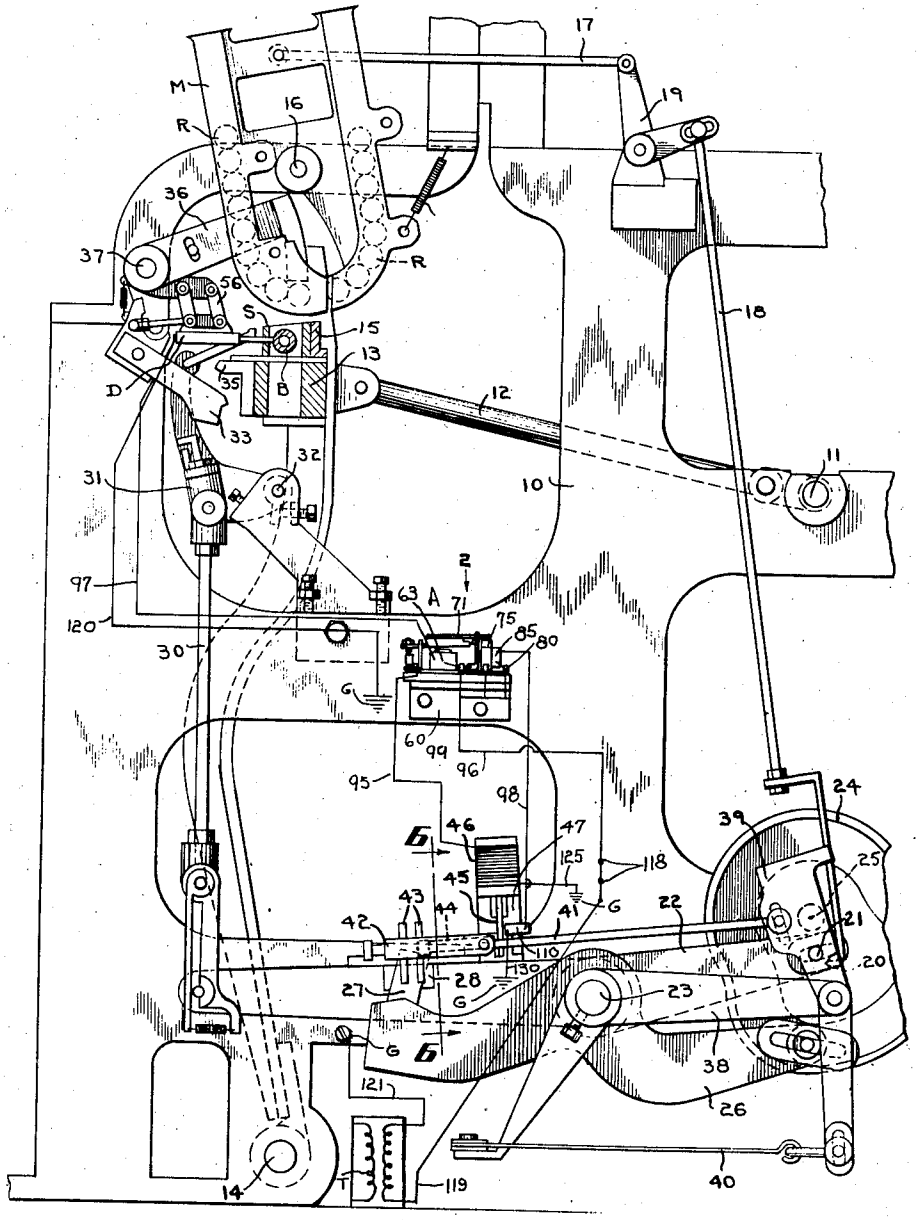


FIG. 1

INVENTOR
OSCAR V. PAYNE
Richard T. Hawley
ATTORNEY

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FIG. 2

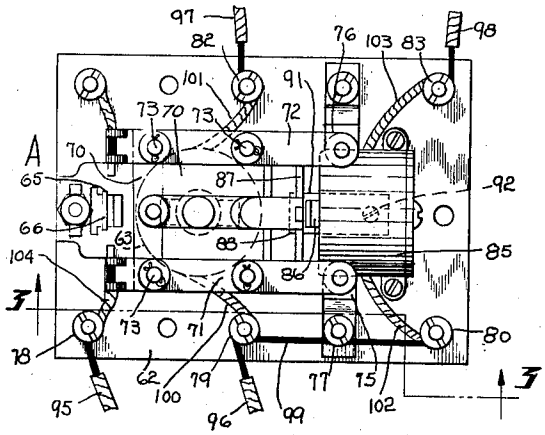


FIG. 3

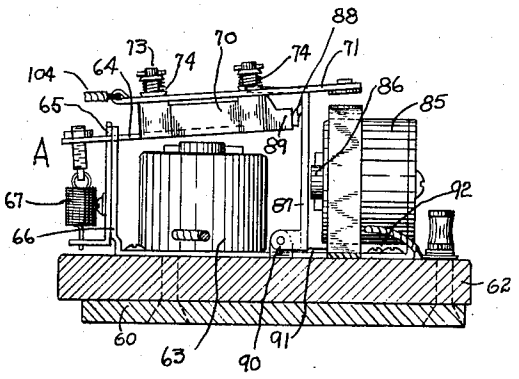


FIG. 4

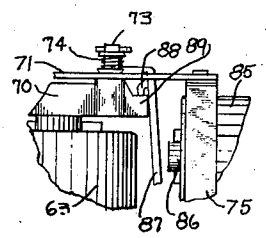


FIG. 5

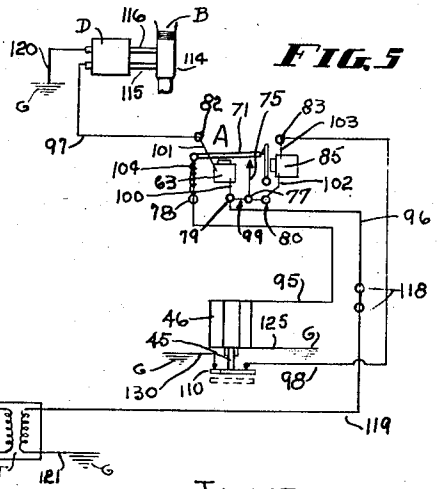
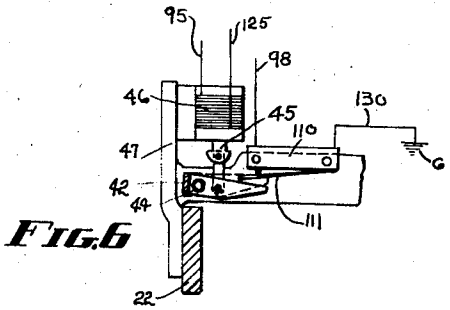


FIG. 6



INVENTOR,
OSCAR V. PAYNE
Chas. T. Howley
ATTORNEY

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ELECTRIC WEFT DETECTOR FOR LOOMS

Oscar V. Payne, Leicester, Mass., assignor to Crompton & Knowles Loom Works, Worcester, Mass., a corporation of Massachusetts

Application April 15, 1944, Serial No. 531,172

13 Claims. (Cl. 139—233)

This invention relates to electric weft detectors for looms and it is the general object of the invention to provide electric means by which a very brief indication of exhaustion by the detector can be utilized to set the loom for a change in its operation.

Electric weft detectors of the types heretofore employed have a tendency to abrade fine weft, particularly if the contacting part of the detectors strikes only a single strand of thread. The time required for the operation of these detectors has necessitated the setting of the detector in such position that the lay is moving fast enough at the instant of contact to cause thread abrasion or breakage. To reduce the danger of yarn abrasion it is desirable to have the detector contact the bobbin when the lay is moving at a slow rate, but to accomplish this result the time interval during which contact is closed is shortened to such an extent as to make uncertain the operation of the loom controlling solenoid in circuit with the detector.

It is an important object of my present invention to utilize a relay in circuit with the detector and control the loom setting solenoid by the relay. This arrangement provides two circuits one of which draws a very light current and responds to a brief contact at the detector, and the other of which, closed by the relay, operates with a heavier current such as that needed for the controlling solenoid.

When the detecting interval is very short it is desirable to provide some means independent of the detector for maintaining the solenoid circuit closed long enough to insure proper operation of the solenoid. It is a further object of my present invention to hold the solenoid circuit closed until the solenoid operates and provide a third or release circuit under control of the solenoid and operative to open the solenoid circuit after the solenoid has performed its loom controlling function.

In the type of loom on which my invention is more particularly applicable the solenoid is used to initiate a replenishing operation by moving one or another of a plurality of trips from normal to indicating position. Mechanism controlled by the trips subsequently completes the replenishing operation on a pick of the loom subsequent to that on which indication of weft exhaustion is given. It is another object of my present invention to cause interruption of the aforesaid solenoid circuit by means brought into action at the time the solenoid moves a trip to indicating position.

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 a loom having my invention applied thereto, parts being shown in section,

Fig. 2 is an enlarged detailed plan view of the relay and holding circuit mechanism, looking in the direction of arrow 2, Fig. 1,

Fig. 3 is a vertical section on line 3—3 of Fig. 2,

Fig. 4 is a view similar to a part of Fig. 3, but showing the holding mechanism in a different position,

Fig. 5 is a diagram showing the circuits used with my invention, and

Fig. 6 is a detailed vertical section on line 6—6, Fig. 1, and showing the trips which are operated by the loom controlling solenoid.

Referring particularly to Fig. 1, I have shown a loom frame 10 supporting a top or crank shaft 11 which operates through connectors 12 to rock a lay 13 around the lay rocker pin 14. In the present instance the lay operates with two shuttles and is provided with a shuttle box 15 which receives them one at a time. One of these shuttles is shown at S in box 15 with a bobbin B for cooperation with a weft detector D.

A magazine M of the rocking two-color type is mounted on a pivot 16 and is connected to a rod 17 which in turn is connected to a depending rod 18 by means of lever mechanism 19. The lower end of rod 18 has attached thereto a hook 20 which is depressed by a pin 21 on a lever 22 rockable about a fixed stud 23 when one of the shuttles is active and indicates depletion of weft. A cam 24 secured to the bottom shaft 25 of the loom rocks an actuator lever 26 in a two-pick cycle and raises a dog 27 on the forward end of lever 26 when the shuttles are on the side of the loom opposite that shown in Fig. 1. The dog 27 ordinarily clears a lifting lug 28 on lever 22 but can be moved into engaging position with respect to the lug by mechanism to be described.

The forward end of lever 22 has connected thereto an ascending rod 30 the upper end of which is connected to a lever 31 movable about a fixed pivot 32 on the loom frame. The transferrer latch 33 is normally in the down position shown in Fig. 1 but is raised into the path of bunter 35 on the lay when lever 31 is rocked in a clockwise direction about its pivot 32, see Fig. 1. The latch 33 is pivoted to a transfer arm 36

movable about a fixed stud 37 mounted preferably on that part of the loom frame which supports the magazine.

A support 38 is held in fixed position on the outer end of stud 23 and has pivoted thereon a positioning lever 39 the lower end of which is attached to a flexible connector 40 extending across the loom and connected to some part which moves in timed relation with the shifting shuttle boxes not shown. A rod 41 extends forwardly from the upper part of positioning lever 39 and is attached to a pair of trips 43 slidable relatively to a rod 44 on which a cradle 42 is pivoted, one for each of the stacks of the bobbins R in the magazine M. The cradle 42 is rocked about rod 44 when a core 45 is raised by a solenoid 46 due to energization thereof. Whichever trip 43 happens to be registered with the cradle is thereupon moved from normal to indicating position to initiate a replenishing operation. The solenoid, rod 44 and cradle are mounted on a stand 47 extending upwardly from lever 22.

It is not thought necessary to set forth further details of the setting or replenishment initiating mechanism shown in Fig. 6, since it is sufficient for the purposes of my present invention to state that energization of solenoid 46 and consequent lifting of core 45 causes rocking of the cradle 42 and movement of one or the other of trips 43 to indicating position. For further description of the structure and operation of the cradle 42 and trips 43 reference may be had to Patents Nos. 2,054,174 and 2,054,192.

In carrying my invention into effect I provide electrical apparatus designated generally at A and mounted on a bracket 60 secured to the loom frame. Secured on the bracket 60 is a base 62 of insulating material on which is mounted a relay coil or electromagnet 63 having an armature 64 the left end of which as viewed in Figs. 2 and 3 has pivotal connection at 65 with an upright arm 66 fastened to base 62. A light adjustable tension spring 67 serves normally to hold the right end of the armature 64 in raised position.

Secured to the armature 64 is a block 70 of insulating material on which are mounted two contact bars 71 and 72 through which pass guide posts 73 fastened to block 70 and surrounded by light compression springs 74. The effect of the springs is to press the contact bars 71 and 72 down against the block 70. The bars 71 and 72 extend over and are adapted for engagement with upright contacts 75 and 76, respectively, secured to the base 62. Contact 75 is provided with a binding post or screw 77, and other binding posts 78, 79 and 80 are secured to the base 62 and are shown on the lower part of Fig. 2, while additional binding posts 82 and 83 are on the opposite side of the base 62 and are shown at the top of Fig. 2.

A release coil or electromagnet 85 is secured to the base 62 and has a core 86 positioned to attract an armature 87 on the upper part of which is located a detent 88 adapted to overhang end 89 of the armature body 70. Armature 87 is pivoted at 90 with respect to the base 62 and a light flat spring 91 held to the base 62 at 92 engages a part of armature 87 and tends to move the latter to the left as viewed in Fig. 3 for the purpose of urging the detent 88 toward the armature body 70.

Binding posts 78, 79, 82 and 83 are connected respectively to wires 95, 96, 97 and 98, and a bus bar or wire 99 connects binding posts 79, 77 and 80. Wires 100 and 101 connect binding posts 79 and 82, respectively, to the relay coil 63, while wires 102 and 103 connect binding posts 80 and 83, respectively, to the release electromagnet 85. Flexible wire 104 connects binding post 78 to contact bar 71.

Bracket 47, Fig. 6, supports a normally open switch 110 having an arm 111 adapted for operation by the cradle 42 when the latter is rocked from the full line position to the dotted line position of Fig. 6 incident to energization of the solenoid 46. This switch 110 tends normally to remain open and is closed only when the cradle has rocked sufficiently to move one or the other of the trips 43. As soon as the solenoid 46 is deenergized its core 45 falls and the cradle returns to the full line position of Fig. 6, thereby permitting switch 110 to open.

The electric circuits connecting the various electrical parts thus far described are shown in Fig. 5. During normal running of the loom the bobbin B in shuttle S will be presented to the detector D on alternate beats of the loom but being provided with sufficient weft it will not cause indication by the detector. When weft exhaustion occurs, however, the metallic ferrule 114 on the bobbin will connect the electrodes 115 and 116, whereupon current will flow in the following circuit: ground G, wire 120, electrode 116, ferrule 114, electrode 115, wire 97, binding post 82, wire 101, relay electromagnet 63, wire 100, binding post 79, wire 96, closed switch 118 (closed when the loom is running), wire 119, transformer T, wire 121 back to the ground G. Current flowing in this first or detector circuit energizes the relay electromagnet 63 and causes the latter to attract armature 64, moving the latter down from the position shown in Fig. 3 to the position shown in Fig. 4.

Down motion of the armature 64 permits detent 88 to move over end 89 of block 70 to prevent upward movement of the latter, as shown in Fig. 4. At the same time contact bar 71 engages upright contact 75, whereupon current flows in the following circuit: ground G, wire 125, solenoid 46, wire 95, binding post 78, flexible wire 104, contact bar 71, upright contact 75, bus bar 99, binding post 79, wire 96, switch 118, wire 119, transformer T, wire 121, and back to ground G. When this circuit is closed the solenoid will be energized and causes rocking of cradle 42. This second or solenoid circuit will remain closed so long as detent 88 holds the armature down.

When the core 45 has been raised by the solenoid 46 and completes movement of a trip 43 to indicating position, cradle 42 will effect closure of switch 110, whereupon current will flow in the following circuit: ground G, wire 130, switch 110, wire 98, binding post 83, wire 103, release electromagnet 85, wire 102, binding post 80, bus bar 99, wire 96, switch 118, wire 119, transformer T, wire 121, and back to ground G. Current flowing in this third or release circuit energizes electromagnet 85 and causes it to attract armature 87 to the right from the position shown in Fig. 4 to that shown in Fig. 3. Spring 67 thereupon lifts the right end of the armature and breaks the contact between bar 71 and binding post 75. The second or solenoid circuit will therefore be opened and the solenoid will become deenergized, whereupon its core falls and switch 110 returns to its normal open position to interrupt the third circuit. The first or detector circuit was opened as soon as the lay moved the bobbin ferrule away from the contacts 115 and 116 and therefore all

three of the circuits shown in Fig. 5 are returned to their normal open condition.

It will be noted that the second or holding circuit remains closed after the first or detector circuit is opened at the detector D and continues closed until the solenoid **46** raises its core **45** to close switch **110** and cause energization of release magnet or coil **85** for the purpose of breaking the second or holding circuit.

The contact bar **72** and upright contact **76** shown in Fig. 2, are set forth herein merely to balance the pull of relay **63** on armature **64**, but are not otherwise utilized in the present invention.

The contact bar **71** engages the binding post **75** before the armature **64** is all the way down, and the latter part of the downward movement of the armature is accompanied by compression of one or both of the springs **74**. The contact established by the bar **71** is therefore maintained under spring pressure and any slight wearing which may result on the part either of the detent **88** or the end **89** of the body **74** will not result in opening of the second circuit. The end **89** of block **70** serves as a stop for the detent **88** and armature **87** when the armature is raised as in Fig. 3.

From the foregoing it will be seen that I have provided an electric detector system for a loom including three circuits the first or detecting circuit of which is closed momentarily and energizes a relay which effects closure of the second or solenoid circuit. The second circuit is held closed by detent **88** until the third or releasing circuit is closed by core **45**, whereupon the release electromagnet **85** effects opening of the second circuit. This opening, however, does not occur until after the solenoid has properly performed its function with respect to one or another of the trips **43**. Assurance is thus given that the solenoid will be maintained energized sufficiently long after the contact at the detector D is broken to cause operation of the solenoid, but after the solenoid has performed its setting function its circuit as well as the third circuit will be broken.

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 weft detecting system for a loom having a weft detector contact which is closed upon indication of weft exhaustion by the detector, the loom having a solenoid which when energized initiates a change in loom operation, a detecting circuit including an electromagnet and the detector contact closed to energize the electromagnet when the detector contact is closed, a second contact closed when the electromagnet is energized, a solenoid circuit including said solenoid and said second contact and closed to energize the solenoid when said second contact is closed, means to maintain the solenoid circuit closed subsequent to opening of said detector contact, means dependent upon energization of said solenoid to effect opening of the solenoid circuit, and electric means to energize said circuits.

2. In an electric weft detector system for a loom having a detector contact which is closed when a weft detector indicates weft exhaustion, the loom having a solenoid which when energized initiates a change in loom operation, a detector circuit including said detector contact and an electromagnet and operative when closed to energize said electromagnet, a solenoid circuit including said solenoid and a normally open solenoid contact closed by said electromagnet when the latter is energized, mechanism dependent upon energization of said electromagnet and moving to controlling position to maintain said solenoid contact closed subsequent to opening of said detector contact, means operating due to energization of the solenoid to move said mechanism away from controlling position, whereupon said solenoid contact opens to open said solenoid circuit, and electric means to energize said circuits.

3. In an electric weft detector system for a loom having a detector contact which is closed when a weft detector indicates weft exhaustion, the loom having a solenoid which when energized initiates a change in loom operation, a detector circuit including said detector contact and an electromagnet closed to energize the latter when the detector contact is closed, a normally open solenoid contact under control of the electromagnet and closed when the latter is energized, a solenoid circuit including said solenoid and said solenoid contact and closed to energize said solenoid when said solenoid contact is closed, holding means dependent upon energization of said electromagnet to hold said solenoid contact closed, an electric switch closed by said solenoid when the latter is energized, electromagnetic means energized when said switch is closed and controlling said holding means to effect opening of said solenoid contact, and electric means to energize said circuits and said electromagnetic means.

4. In an electric weft detector system for a loom having a detector contact which is closed when a weft detector indicates weft exhaustion, the loom having a solenoid which when energized initiates a change in loom operation, a detector circuit including an electromagnet and said detector contact and operative when the latter is closed to energize said electromagnet, a normally open solenoid contact closed by energization of said electromagnet, a solenoid circuit including said solenoid contact and said solenoid and closed to energize the latter when said solenoid contact is closed, means operating upon closure of said solenoid contact to hold the latter closed subsequent to opening of said detector contact, a releasing circuit including an electromagnetic device and a switch which is closed by energization of said solenoid, closure of said releasing circuit energizing said electromagnetic device and the latter thereupon acting upon said means to effect opening of the solenoid circuit, and electric means to energize each of said circuits when closed.

5. In an electric weft detector system for a loom having a detector contact which is closed upon indication of weft exhaustion, an electromagnet, a second contact closable by the electromagnet when the latter is energized, a solenoid effective when energized to initiate a change in loom operation, a normally open electric switch closed by said solenoid when the latter is energized, and an electromagnetic device which when energized effects opening of said second contact, said system comprising a detecting circuit including said detector contact and electromagnet energizing the latter when closed, a solenoid circuit including said solenoid and second contact effective when closed due to energization of the electromagnet to energize said solenoid,

means effective to maintain said second contact closed subsequent to closure of the electromagnet independently of opening of the detecting circuit, and a releasing circuit including said normally open switch and electromagnetic device and effective when closed by closure of said normally open switch due to energization of the solenoid to open said second contact, and electric means to energize each of said circuits when closed.

6. In an electric detector system for a loom having a detector contact which is closed upon indication of weft exhaustion, an electromagnet, a solenoid which when energized initiates a change in loom operation, and a solenoid contact closed by energization of said electromagnet, said system comprising a detecting circuit including said detector contact and electromagnet energizing the latter when said detector contact is closed, a solenoid circuit including said solenoid and solenoid contact closed to energize the solenoid when the solenoid contact is closed due to energization of the electromagnet, holding means maintaining said solenoid circuit closed subsequent to opening of the detector contact, electric means under control of the solenoid and controlling said holding means and causing the latter to effect opening of the solenoid circuit when the solenoid is energized, and electric means to energize said circuits.

7. In an electric detector system for a loom having a detector contact which is closed upon indication of weft exhaustion, an electromagnet, a solenoid which when energized initiates a change in loom operation, a solenoid contact closed by energization of said electromagnet, said system comprising a detecting circuit including said detector contact and electromagnet and energizing the latter when the detector contact is closed, a solenoid circuit including said solenoid and solenoid contact closed when the latter is closed to energize the solenoid, means maintaining the solenoid circuit closed subsequent to opening of the detector contact, a normally open switch closed by the solenoid when the latter is energized, an electromagnetic device effective when energized to cause opening of the solenoid circuit, means constituting a third circuit including said switch and electromagnetic device and energizing the latter when the switch is closed, and electric means to energize each of said circuits when closed.

8. In an electric detector system for a loom having a detector contact which is closed upon indication of weft exhaustion, an electromagnet, a solenoid which when energized initiates a change in loom operation, a solenoid contact closed by energization of said electromagnet, said system comprising a detecting circuit including said detector contact and electromagnet and energizing the latter when the detector contact is closed, a solenoid circuit including said solenoid and solenoid contact closed when the latter is closed to energize the solenoid, means maintaining the solenoid circuit closed subsequent to opening of the detector contact, an electromagnetic device controlling said means and when energized operating on said means to effect opening of the solenoid circuit, a normally open switch closed by the solenoid when the latter is energized, a third circuit including said switch and electromagnetic device and energizing the latter when said switch is closed, and electric means energizing each of said circuits when closed.

9. In an electric detector system for a loom having a detector contact which is closed upon indication of weft exhaustion, an electromagnet, a solenoid which when energized initiates a change in loom operation, a solenoid contact closed by energization of said electromagnet, said system comprising a detecting circuit including said detector contact and electromagnet and energizing the latter when the detector contact is closed, a solenoid circuit including said solenoid and solenoid contact and energizing the solenoid when the solenoid contact is closed, means maintaining the solenoid contact closed subsequent to opening of the detector contact, an electromagnetic device controlling said means and when energized causing said means to effect opening of the solenoid circuit, means constituting a third circuit including said electromagnetic device closed to energize the latter as a result of energization of the solenoid, and electric means to energize each of said circuits when closed.

10. In an electric detector system for a loom having a detector contact which is closed upon indication of weft exhaustion, an electromagnet, a solenoid which when energized initiates a change in loom operation, a solenoid contact closed by energization of said electromagnet, said system comprising a detecting circuit including said detector contact and electromagnet and energizing the latter when the detector contact is closed, a solenoid circuit including said solenoid and solenoid contact and energizing the solenoid when the solenoid contact is closed, means acting subsequent to closure of the solenoid contact to maintain the solenoid circuit closed subsequent to opening of the detector contact, and mechanism controlling said means and operative upon energization of the solenoid to cause said means to effect opening of the solenoid circuit, and electric means to energize each of said circuits when closed.

11. In an electric weft detector system for a loom having a detector contact which is closed upon indication of weft exhaustion and having a solenoid which when energized initiates a change in loom operation, a detecting circuit including an electromagnet which is energized on closure of said detecting circuit by the detector contact, a solenoid circuit including said solenoid and closed by energization of the electromagnet to energize the solenoid, means movable from normal to holding position upon energization of the electromagnet to maintain said solenoid circuit closed, and means operative due to energization of the solenoid to move the first named means from holding to normal position and cause said means to effect opening of the solenoid circuit, and electric means to energize said circuits when the latter are closed.

12. In an electric detector system for a loom having a detector contact which is closed on indication of weft exhaustion and having a solenoid which when energized initiates a change in loom operation, electric circuit means controlled by closure of the detector contact to effect energization of the solenoid, holding means effective upon closure of the detector contact to move from normal to holding position and maintain said solenoid energized, said electric circuit means tending to open to deenergize said solenoid when the holding means is in normal position, and means dependent upon energization of the solenoid to move said holding means from holding to normal position.

13. In an electric detector system for a loom

having a detector contact which is closed on indication of weft exhaustion and having a solenoid which when energized initiates a change in loom operation, electric circuit means controlled by closure of the detector contact to effect energization of the solenoid, holding means effective upon closure of the detector contact to move from normal to holding position and maintain said solenoid energized, said electric circuit means opening when said holding means moves to normal position, and electromagnetic means controlled by the solenoid and effective when the latter is energized to move said holding means from holding position to normal position to effect deenergization of the solenoid.

OSCAR V. PAYNE.