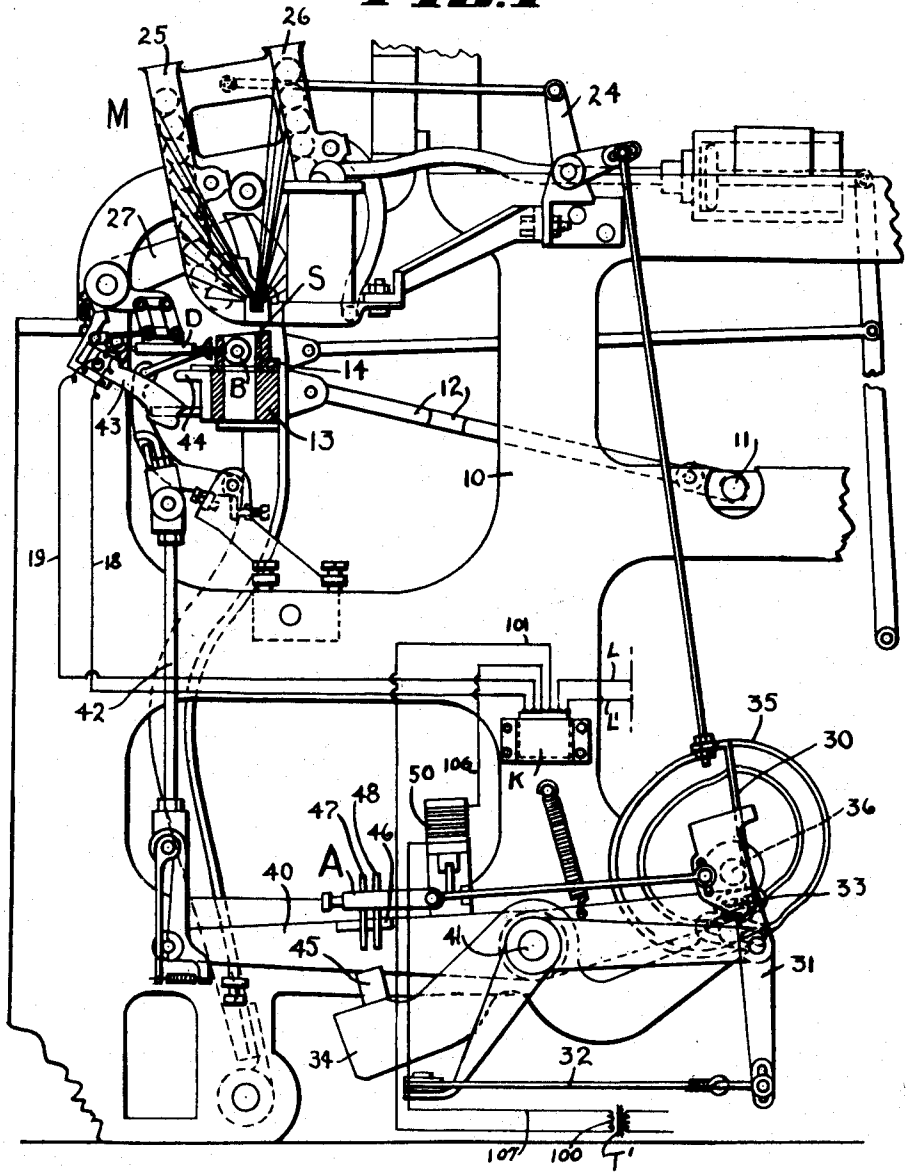
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ELECTRONIC WEFT DETECTOR FOR LOOMS

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FIG. 1



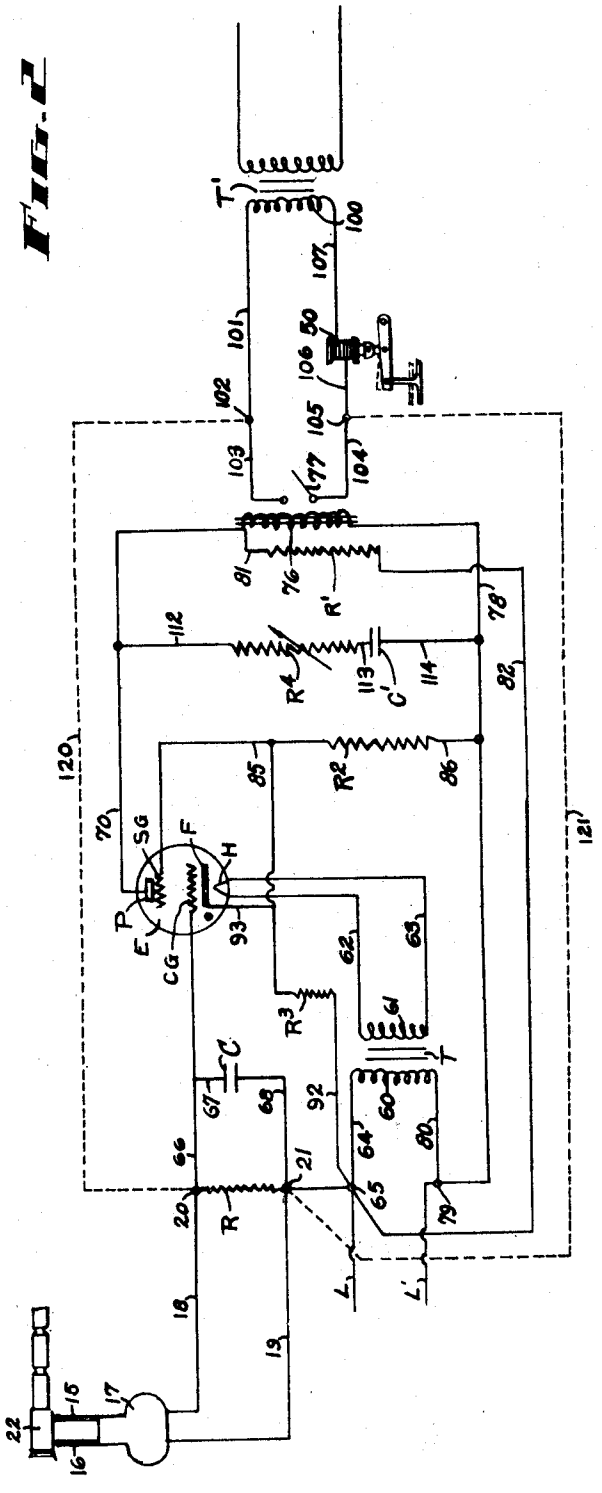
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Fig. 2



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FIG. 3

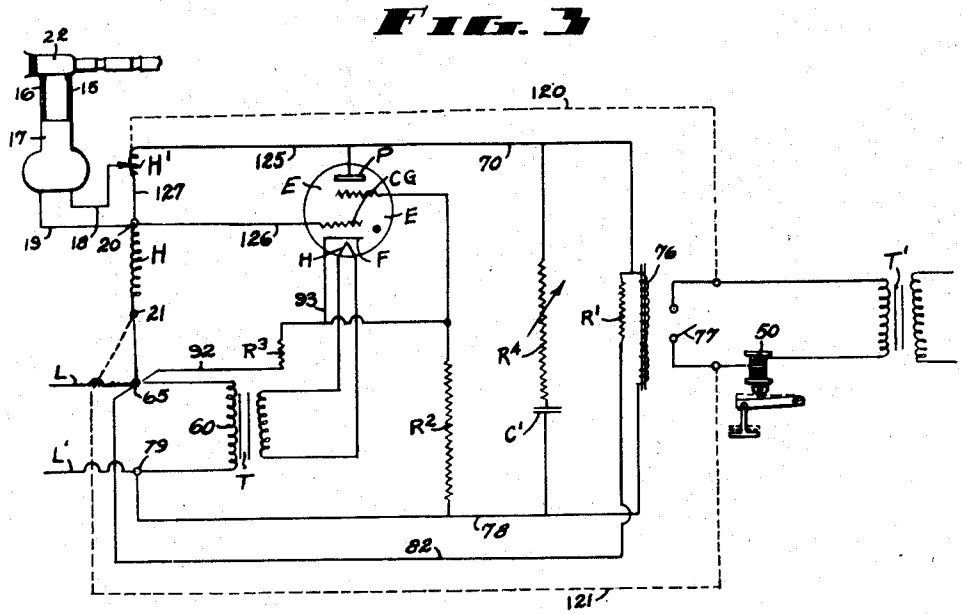
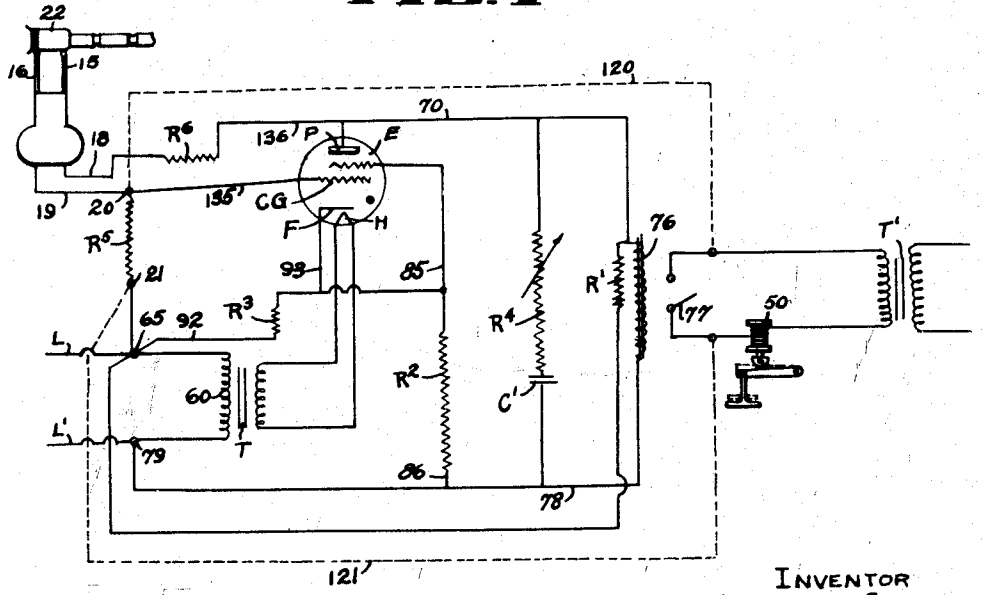


FIG. 4



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2,429,528

ELECTRONIC WEFT DETECTOR FOR LOOMS

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Application April 5, 1945, Serial No. 586,754

11 Claims. (Cl. 139—273)

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This invention relates to electric weft detectors for looms and it is the general object of the invention to provide a detector connected to an electronic circuit part of which is responsive to a very brief contact at the detector and another part of which is capable of setting the loom for a change in its operation.

In the weaving of very fine yarns the usual type of weft detector is likely to abrade or cut the yarn unless provision is made for reducing the force which holds the detector against the bobbin during detecting operation. In order to insure closure of the detector circuit at the bobbin it has been necessary in previous types of electric weft detectors to set them back far enough to engage the bobbin an appreciable fraction of an inch before the lay reaches front center. At the instant of contact the lay is moving with a sufficient speed to cause the detector prongs to cut the fine weft, but this could not be helped because of the length of time required to keep the detector contact closed to insure proper response of the loom controlling solenoid.

It is an important object of the present invention to provide a detector circuit in which electric means for maintaining control of the grid bias is connected across the prongs of the detector and short circuited when the detector engages a bare bobbin. The resultant alteration in the electronic tube then causes a plate current to flow to effect energization of a relay which controls the loom controlling solenoid.

It is another object of the invention to charge a condenser when the plate current flows and discharge the condenser through a control relay to continue energization of the latter after the plate current stops. It is in this way that the period for energizing the relay can be longer than the brief interval during which the detector indicates weft exhaustion.

It is another object of the invention to cause a small alternating current to flow through the relay coil to prevent permanent magnetization of the relay core.

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 three forms of the invention are shown,

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Fig. 1 is a side elevation of a portion of a loom having the improved weft detector system applied thereto,

Fig. 2 is a diagrammatic view of the preferred form of circuits used with the invention,

Figs. 3 and 4 are diagrammatic views of portions of the circuit shown in Fig. 2 illustrating the first and second modifications, respectively, of the invention.

Referring first to Fig. 1, we have shown a type of loom to which our invention can be conveniently applied. Such a loom is customarily employed for the weaving of fine fabrics which might be damaged if the ordinary type of electric weft detector were employed. The loom frame 10 supports a top shaft 11 which by connectors 12 reciprocate the lay 13 on which is mounted a shuttle box 14 for the shuttle S. The shuttle has a bobbin B therein which on alternate beats of the loom is presented to a weft detector designated generally at D. This detector may be of the type shown in Payne Patent No. 1,924,197 and has two prongs 15 and 16, see Fig. 2, slidably mounted in a base 17 made of insulating material. The prongs 15 and 16 are connected respectively to wires 18 and 19 which lead respectively to binding posts 20 and 21 on the outside of a case or box K mounted conveniently on the loom frame. Under ordinary conditions when sufficient weft for continued weaving is present the prongs 15 and 16 are out of electrical contact with each other on detecting beats of the loom, but at weft exhaustion a ferrule 22 on the bobbin is uncovered and electrically connects the detector prongs, thereby electrically connecting the binding posts 20 and 21.

The loom is provided with a magazine M which can be rocked by connections designated generally at 24 so that the bottom bobbin of either the front stack 25 or the rear stack 26 can be in transfer position under a transfer arm 27. The mechanism 24 includes a hook 30 controlled by a positioning lever 31 connected to the shuttle boxes not shown at the opposite end of the loom. These boxes are connected by a flexible connector 32 to the bottom of lever 31 and whenever there is a shift in the shuttle boxes lever 31 will rock so that the hook will either be in or out of the path of a pin 33. A lever 34 is rocked at two-pick intervals by a cam 35 on the bottom shaft

36. A normally stationary lever 40 carries pin 33 and is pivoted on a stationary stud 41 which also affords support for lever 34 and has the forward end thereof connected to an ascending rod 42 which when raised lifts the latch 43 into the path of the bunter 44 on the lay. The mechanism for determining when lever 40 shall be rocked is shown in the lower part of Fig. 1 and is designated generally at A. This mechanism includes a dog 45 on lever 34 and a lug 46 on lever 40 for engagement with the dog when the latter is deflected toward the lug. The means for deflecting the dog includes two elements 47 and 48 both under control of a solenoid or loom controlling coil 50.

The matter thus far described is of common construction and for a further understanding of its operation reference may be had to the following patents: 2,054,192 and 2,138,974. During normal loom operation, solenoid 50 is deenergized and remains so until the detector establishes electrical contact with the ferrule 22, after which the solenoid is energized as will be described hereinafter to move one or the other of the elements 47 or 48 into indicating position to cause dog 45 to engage lug 46. It is thought sufficient for the present purposes to state that if the coil or electromagnetic device 50 is energized the loom will be set for a transferring operation. While one particular kind of loom has been shown, the different forms of the invention set forth hereinafter are not necessarily limited to that type of loom.

In carrying the different forms of the invention into effect the several parts of the circuits to be described may be located in box K secured in convenient position on the loom frame 10. The contents of this box are indicated diagrammatically in Figs. 2, 3 and 4, and it is not thought necessary to set forth the actual physical relation of the parts within the box.

Referring more particularly to Fig. 2 and the preferred form of the invention, the transformer T has primary and secondary windings 60 and 61, respectively, so related that the secondary will supply a current of low voltage, such as 6.3 volts, for the heater filament H of the cathode F of a gas filled electronic tube E, by means of wires 62 and 63. One side of primary 60 is connected by wire 64 to a binding post 65 on the outside of box K, and this post is electrically connected to post 21. Wire 66 leads from post 20 to the control grid CG in tube E, and a high resistance R of the order of 10 megohms is connected across posts 20 and 21. A small condenser C having a capacity of the order of 0.003 microfarad is connected across wire 66 and binding post 21 by wires 67 and 68.

The plate P of tube E is connected by wire 70 to one side of a relay coil or electromagnetic device 76 which has a resistance of about 1500 ohms. When energized relay 76 closes a normally open switch 77. A resistance R' of the order of 30,000 ohms is connected to relay 76 by a wire 81 forming a common connection between the resistance and relay.

The screen grid SG and cathode are connected by wire 85 to one side of a resistance R2 which may be of the order of 25,000 ohms, and the other side of the cathode is connected by wire 93 to one side of a resistance R3 of about 400 ohms the other side of which is connected to post 65 by wire 92. Resistance R3 acts as a cathode bias resistor. A resistance R4 of about 1000 ohms, is in series with normally discharged condenser C' having a capacity of about 20 microfarads. Resistance R4 is preferably variable to alter the time constant of unit C'—R4. The various values of voltages, resistances, condensers, etc. given herein are those which have been used in a circuit which has operated successfully for several months, but the invention is not limited to these particular values.

A loom control circuit shown at the right of Fig. 2 includes solenoid 50 and switch 77, and when the latter is closed, current flows as follows: secondary 100 of a second transformer T', wire 101, binding post 102 on box K, wire 103, switch 77, wire 104, binding post 105 also on box K, wire 106, solenoid 50, and wire 107 back to secondary 100. This circuit operates with about 12 volts potential and is closed to initiate a change in loom operation whenever switch 77 is closed.

The detector D and wires 18 and 19 leading from it to the binding posts 20 and 21 will have a small capacitance and the condenser C is chosen to have a somewhat larger capacity. If wires 18 and 19 are quite long condenser C may need a larger capacity than that previously mentioned. The purpose of condenser C is to control the sensitivity of the detector circuit. Without this condenser the slightest variation in the resistance or capacity of the detector circuit would initiate a change by varying the control grid voltage. Such a high degree of sensitiveness is undesirable. Condenser C makes the detector circuit less sensitive to small changes, and also acts to absorb any temporary surging which may develop in the detector circuit.

Under normal conditions the transformer T is excited by alternating current supplied by line wires L and L' and keeps the cathode and heater at operating temperature. The cathode circuit includes resistances R2 and R3 and is connected across posts 65 and 79 connected respectively to the main line leads L and L'. The voltage drop across the resistances R2 and R3 will be proportional to their ohmic value, and since resistance R3 is much smaller than resistance R2, the cathode will be at a potential above that of post 65 by a small voltage.

The electrons from the cathode form a cloud around grid CG, and these electrons try to escape, and as shown in Fig. 2 two paths lead from the tube to post 65 and form the following electron flow circuit: grid CG, wire 66, resistance R, post 21, post 65, wire 92, resistance R3, wire 93 and cathode F. This circuit is powered by the small potential on the cathode and would afford an escape for the cloud of electrons if the resistance R did not have such a high ohmic value. This latter resistance, however, prevents electron escape of sufficient amount to alter the tube effectively, and the tube remains idle so long as prongs 15 and 16 are not connected.

When an empty bobbin is presented to the detector, however, its ferrule 22 will establish contact with prongs 15 and 16 and thereby short circuit resistance R. The latter thereupon loses its restraint over grid CG, and the detector, being across posts 20 and 21 and in parallel with resistance R, affords a low resistance escape path from the grid CG to post 65. A stream of electrons thereupon flows from the cathode to the plate, and the following plate-relay electron flow circuit is closed: plate P, wire 70, relay 76, wire 78, post 79, post 65, wire 92, resistance R3, wire 93, cathode F, and back to the plate. Relay 76 is thereby energized for the first stage of its actuation.

From Fig. 2 it will be noted that resistance R4

and condenser C' are across wires 70 and 78 and are in parallel with the relay. When the last traced circuit is closed, therefore, current will also flow in the following condenser charging electron flow circuit: wires 70 and 112, resistance R4, wire 113, condenser C', wire 114, and wire 78, thereby charging condenser C'. When the polarity of plate P changes, current through the tube is interrupted and ends the first stage of relay energization, whereupon the condenser C' causes current to flow in the following condenser discharge circuit: condenser C', wire 113, resistance R4, wire 112, wire 70, relay 76, wire 78, and wire 114 back to condenser C'. Current flowing in this circuit effects the second stage of actuation of the relay. The length of time required for the condenser C' to discharge itself in this condenser circuit will depend upon the capacity of the condenser and the combined resistances of the relay and resistance R4. By making these resistances sufficiently high the condenser can be caused to discharge itself through a period of time sufficiently long to permit the relay 76 to maintain switch 77 closed long enough to effect full energization of solenoid 50. The two stages of relay actuation are consecutive and their times of operation are therefore added.

It will be noted in Fig. 2 that the resistance R' and relay 76 are permanently in series across the primary of the transformer T and are included in the following demagnetizing circuit: binding post 65, wire 82, resistance R', wire 81, relay 76, wire 78, and back to binding post 79. This last circuit assumes that current entered from line wire L, but on the next alternation current will enter from wire L', and the current flow will be in the opposite direction. A very small alternating current is therefore always moving in this last named circuit to effect a sufficient reversal of the magnetism of relay 76 to prevent the latter from becoming permanently magnetized. In this way proper conditions for closure of switch 77 are maintained in the relay over a long period of time. Post 65 is common to both the plate and demagnetizing circuits so that when a current is flowing through the plate and the relay, the demagnetizing current will flow through the relay in the same direction. The demagnetizing current therefore does not oppose but helps the plate current to actuate the relay. The demagnetizing current is too small to operate the relay when acting alone.

In the first modification of the invention shown in Fig. 3 the resistance R and condenser C are omitted, and in their place inductances are used to control grid CG. An inductance H is connected across posts 20 and 21 and wire 19 is connected to post 20, while wire 18 leads to a variable inductance H' connected by wire 125 to wire 70 and by wire 127 to post 20. Grid CG is connected by wire 126 to post 20, and inductance H is between the grid and the post 65.

Inductances H and H' are normally energized by the following circuit: post 65, post 21, inductance H, post 20, wire 127, variable inductance H', wire 125, wire 70, relay 76, wire 78, and post 79. A very small current flows in this circuit insufficient in strength to energize relay 76, but the inductances H and H' have the effect of producing a phase displacement of the grid with respect to the plate and cathode sufficient to enable the grid to prevent the tube from firing or operating.

When contact is closed at the detector the lower part of the variable inductance H' is short-

circuited, and therefore the phase displacing effect of the two inductances is altered to such an extent that the grid potential moves toward the positive and permits current to flow through the tube as already described for the preferred form of the invention, and relay 76 will have two successive stages of energization.

That part of inductance H' between wire 18 and post 20 should be large enough to offset any capacity in the detector and detector wires 18 and 19. This relationship is somewhat similar to that existing between condenser C and the capacity of the detector circuit described in connection with Fig. 2.

In the second modification shown in Fig. 4 resistances are shown connected to the control grid and the detector in such a way that when the detector closes contact the control grid voltage will be made less negative or actually becomes positive with respect to the cathode to permit the tube to fire or operate. In this form of the invention the resistance R5 is preferably somewhat greater in ohmic value than the resistance R6, although this is not an essential relationship.

Normally conditions with respect to escape of electrons from grid CG are described in Fig. 2, resistance R5 preventing electron escape. When contact is closed at the detector the following circuit is closed; post 65, post 21, resistance R5, wire 19, prong 16, ferrule 22, prong 15, wire 18, resistance R6, wire 136, wire 70, relay 76, wire 78, and post 79. Except for the slight and negligible voltage drop across the relay, the full drop of voltage of the main line will be across resistances R5 and R6 with the grid connected at a point between these two resistances. The voltage drops will be proportional to the resistances, and since resistance R5 has a high value relatively to the resistance R6 the grid voltage now becomes positive with respect to the cathode and therefore permits the tube to fire or operate. As in the previous forms of the invention, relay 76 is thereupon energized in two successive stages.

It may be desirable at times to connect the detector to the solenoid circuit without using the electronic circuits shown in Figs. 2, 3 and 4, in which case wires 120 and 121 can be used as indicated by dotted lines in Fig. 2. Wire 120 can be used to connect posts 20 and 102, while wire 121 in a similar manner can connect posts 65 and 105. These two wires, which may be kept with the equipment as readily attachable connectors, will not ordinarily be used, but if a loom to which the detector is applied happens to be weaving a fabric in which the weft is coarse the electronic circuits can be bypassed by these wires 120 and 121 with suitable adjustment of the detector, or the wires can be used if temporary difficulty develops in the electronic circuits.

From the foregoing it will be seen that we have provided a weft detecting system for a loom possessing exceptional sensitivity and so constructed that a very brief momentary engagement of the detector prongs with the bobbin ferrules causes actuation of the loom controlling electromagnetic device. In each of the three forms of the invention set forth hereinbefore firing of the tube causes the first stage of relay energization and simultaneously charges a normally discharged condenser which, upon interruption of the plate circuit, discharges back into a circuit which includes the electromagnetic device. In this way actuation of the relay lasts for two successive stages or intervals which collectively are long

enough to cause effective energization of the solenoid. It will also be seen that in each form of the invention a small demagnetizing alternating current is constantly applied to the relay and that this current helps the plate current in the first stage of energization of the relay. In each of the circuits shown in Figs. 2, 3 and 4 it will also be noted that when the weft detector closes contact at the ferrule a change results in the relationship of the control grid with respect to the cathode which causes the tube to fire. In this connection it will be seen that detector D is of the usual electrical type and is not the source of controlling current but serves merely to close a control circuit external to the electronic circuits. The current which charges the condenser C' is required to pass through the relatively low resistance R4, hence the condenser can be fully charged during the brief interval of time during which plate current flows, but when the condenser discharges it causes current to flow back through the additional resistance possessed by the relay and thereby prolongs the flow of current from the relay sufficiently long to provide ample time for energization of the solenoid.

In the preferred form of the invention a high resistance serves normally to maintain the grid in such condition that it will prevent firing of the tube, and the detector upon indication of weft exhaustion short-circuits this high resistance and thereby alters the grid so that current can flow through the tube. In the second form of the invention inductance is used to effect a phase displacement of the grid potential with respect to the cathode under normal conditions, but when the detector indicates weft exhaustion a part of the inductance is short-circuited to bring about such a change in the phase of the grid with respect to the cathode as will permit a tube to fire. In the third form of the invention two resistances are employed and the detector operates in such a way as to cause the potential drop across one of these resistances to be applied to the grid to make the latter positive with respect to the cathode. In the practical operation of our invention we are able to effect full energization of the solenoid as the result of a contact between the detector prongs and the ferrule 22 which would be entirely too brief for operation with the usual type of electric weft detecting circuit. As previously mentioned the various values of the component parts of the electronic circuit set forth hereinbefore are merely illustrative and our invention is not limited to them.

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 weft detecting system for a loom having an electromagnetic device which when effectively energized initiates a change in loom operation, the loom having also a weft detector capable of giving indication of weft exhaustion, an electronic circuit including a source of power and an electronic tube having a control grid, said circuit when energized causing effective energization of said electromagnetic device, an electric resistance connected to said source and to said grid and acting to prevent escape of electrons from the grid and thereby enable the latter to prevent operation of the tube and energization of said circuit, and means by

which the weft detector when indicating weft exhaustion short-circuits said resistance to permit escape of electrons of the grid through said detector and thereby enable the tube and said source to energize said electronic circuit.

2. In an electric weft detecting system for a loom having an electromagnetic device which when effectively energized initiates a change in loom operation, the loom having also a weft detector capable of giving indication of weft exhaustion, an electronic circuit including a source of power and an electronic tube having a cathode and control grid, said circuit when energized causing effective energization of said electromagnetic device, a resistance, means constituting an electric circuit connected to one side of said source and including the cathode, grid and said resistance, the latter normally effective to prevent escape of electrons from the grid in the last traced circuit, and means operative to short-circuit said resistance when the detector indicates weft exhaustion and thereby provide a path of escape for the electrons on the grid, said source and tube thereupon cooperating to energize said electronic circuit.

3. In an electric weft detecting system for a loom having an electromagnetic device which when effectively energized initiates a change in loom operation, the loom having also a weft detector capable of giving indication of weft exhaustion, an electronic circuit including a source of power and an electronic tube having a control grid, said circuit when energized causing effective energization of said electromagnetic device, a resistance connected to the grid and said source, and a normally open detecting circuit closed when the detector indicates weft exhaustion and in parallel with said resistance, said resistance normally preventing escape of electrons from said grid, and said detecting circuit when closed affording a means of escape for the electrons on the grid through said detecting circuit, said source and tube thereupon cooperating to energize said electronic circuit.

4. In an electric weft detecting system for a loom having an electromagnetic device which when effectively energized initiates a change in loom operation, the loom having also a weft detector capable of giving indication of weft exhaustion, an electronic circuit including a source of power and an electronic tube having a control grid, said circuit when energized causing effective energization of said electromagnetic device, a resistance having one side connected to said grid and having the other side thereof connected to said source, said resistance normally preventing escape of electrons from the grid, a detecting circuit in parallel with said resistance and closed when the detector indicates weft exhaustion, and a condenser in parallel with said resistance, said detector circuit when closed affording means of escape of the electrons on the grid, whereupon said source and tube cooperate to energize said electronic circuit.

5. In an electric weft detecting system for a loom having an electromagnetic device which when effectively energized initiates a change in loom operation, the loom having also a weft detector capable of giving indication of weft exhaustion, an electronic circuit including a source of power and an electronic tube having a control grid, said circuit when energized causing effective energization of said electromagnetic device, a resistance having one side thereof connected to the grid and having the other side thereof con-

nected to said source, said resistance normally effective to prevent escape of electrons from the grid, a detector circuit having a given capacitance and in parallel with the resistance and closed when the detector indicates weft exhaustion, and a condenser in parallel with said resistance and having a capacitance greater than said given capacitance, the detector circuit when closed affording means of escape of the electrons from the grid, whereupon said source and tube cooperate to energize said electronic circuit.

6. In an electric weft detecting system for a loom having an electromagnetic device which when effectively energized initiates a change in loom operation, the loom having also a weft detector capable of giving indication of weft exhaustion, an electronic circuit including a source of alternating current and an electronic tube having a cathode and a control grid, said circuit when energized causing effective energization of said electromagnetic device, inductance means connected across said source, means connecting an intermediate part of said inductance means to the grid, means connecting said source to the cathode independently of the inductance means, the latter creating a phase displacement of potential between the cathode and the grid sufficient to enable the latter to prevent operation of the tube, and means effective upon indication of weft exhaustion by the detector to shortcircuit part of said inductance means and thereby alter the phase displacement between the potentials of the cathode and grid sufficiently to permit operation of the tube, whereupon the source and the tube cooperate to energize said electronic circuit.

7. In an electric weft detecting system for a loom having an electromagnetic device which when effectively energized initiates a change in loom operation, the loom having also a weft detector capable of giving indication of weft exhaustion, an electronic circuit including a source of alternating current and an electronic tube having a cathode and a control grid, said circuit when energized causing effective energization of said electromagnetic device, means connecting said source to the cathode, inductance means connected across said source, means connecting the grid to a point in said inductance to effect a phase displacement of the potential of the cathode relatively to the grid to enable the latter to prevent operation of said tube, and means effective when indication of weft exhaustion is given by the detector to vary the phase displacement of the potential of the grid relatively to the cathode sufficiently to permit operation of said tube, whereupon said source and tube cooperate to energize said electronic circuit.

8. In an electric weft detecting system for a loom having an electromagnetic device which when effectively energized initiates a change in loom operation, the loom having also a weft detector capable of giving indication of weft exhaustion, an electronic circuit including a source of alternating current and an electronic tube having a cathode connected to said source and a control grid, said circuit when energized causing effective energization of said electromagnetic device, two inductances in series across said source, means connecting the grid to a point between said inductances, said inductances normally effecting a phase displacement between the potentials of the cathode and the grid enabling the latter to prevent operation of said tube, and means effective when the detector indicates weft exhaustion to vary the inductance of the second inductance for the purpose of altering the phase relation of the potential of the grid relatively to the potential of the cathode sufficient to permit operation of said tube, whereupon said source and tube cooperate to energize said electronic circuit.

9. In an electric weft detecting system for a loom having an electromagnetic device which when effectively energized initiates a change in loom operation, the loom having also a weft detector capable of indicating weft exhaustion, an electronic circuit including a source of alternating current and an electronic tube having a cathode connected to said source, and a control grid, said circuit when energized causing effective energization of said electromagnetic device, inductance means connected across said source, means connecting the grid to a point intermediate the ends of said inductance, said inductance normally effecting a phase displacement between the potentials of the cathode and the grid enabling the latter to prevent operation of said tube, and a normally open detector circuit including part of said inductance and effective when the detector indicates weft exhaustion to short circuit said part of said inductance and thereby alter the phase relation of the potential of the grid relatively to the cathode sufficient to permit operation of said tube, whereupon said source and tube cooperate to energize said electronic circuit, said detector circuit other than said part of the inductance having a capacitance and said part of the inductance being sufficient to offset the capacitance of the detector.

10. In an electric weft detecting system for a loom having an electromagnetic device which when effectively energized initiates a change in loom operation, the loom having also a weft detector capable of indicating weft exhaustion, an electronic circuit including a source of power and an electronic tube having a control grid, said circuit when energized causing effective energization of said electromagnetic device, an electric resistance connected to said source and to said grid and acting to prevent escape of electrons from the grid and thereby enable the latter to prevent operation of the tube and energization of said circuit, a second resistance, and means by which the weft detector when indicating weft exhaustion causes said resistances to be in series across said source of electric power, the grid being connected to said resistances at a point between them and the resistances being so related that upon indication of weft exhaustion by the detector the potential of the grid is altered to permit energization of said electronic circuit.

11. In an electric weft detecting system for a loom having an electromagnetic device which when effectively energized initiates a change in loom operation, the loom having also a weft detector capable of indicating weft exhaustion, an electronic circuit including a source of power and an electronic tube having a control grid, said circuit when energized causing effective energization of said electromagnetic device, two electric resistances to be connected in series across said source of electric power when the detector indicates weft exhaustion, one of said resistances being connected permanently to said source and said grid and effective to prevent escape of electrons from said grid and thereby cause the latter to prevent operation of said electronic circuit, means causing said grid to be connected to said resistances at a point between them when the

detector indicates weft exhaustion and said resistances being so related that the potential of said grid is altered to permit operation of said electronic circuit when the detector indicates weft exhaustion.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,026,146	Turner	Dec. 31, 1935
2,146,611	Young	Feb. 7, 1939
2,377,102	Payne	May 29, 1945
2,330,212	Hayes	Sept. 28, 1943
2,346,240	Thomas	Apr. 11, 1944
2,228,225	Brown	Jan. 7, 1941

FOREIGN PATENTS

Number	Country	Date
400,132	Great Britain	Oct. 19, 1933