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CONTROL MEANS FOR MOTOR DRIVEN LETOFFS

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FIG. 1

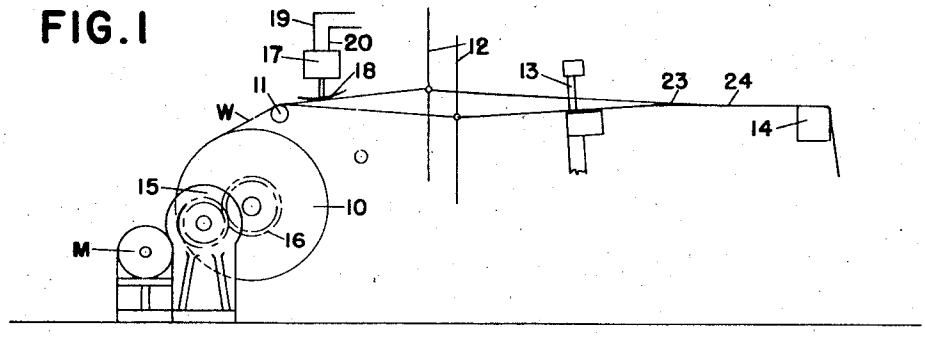
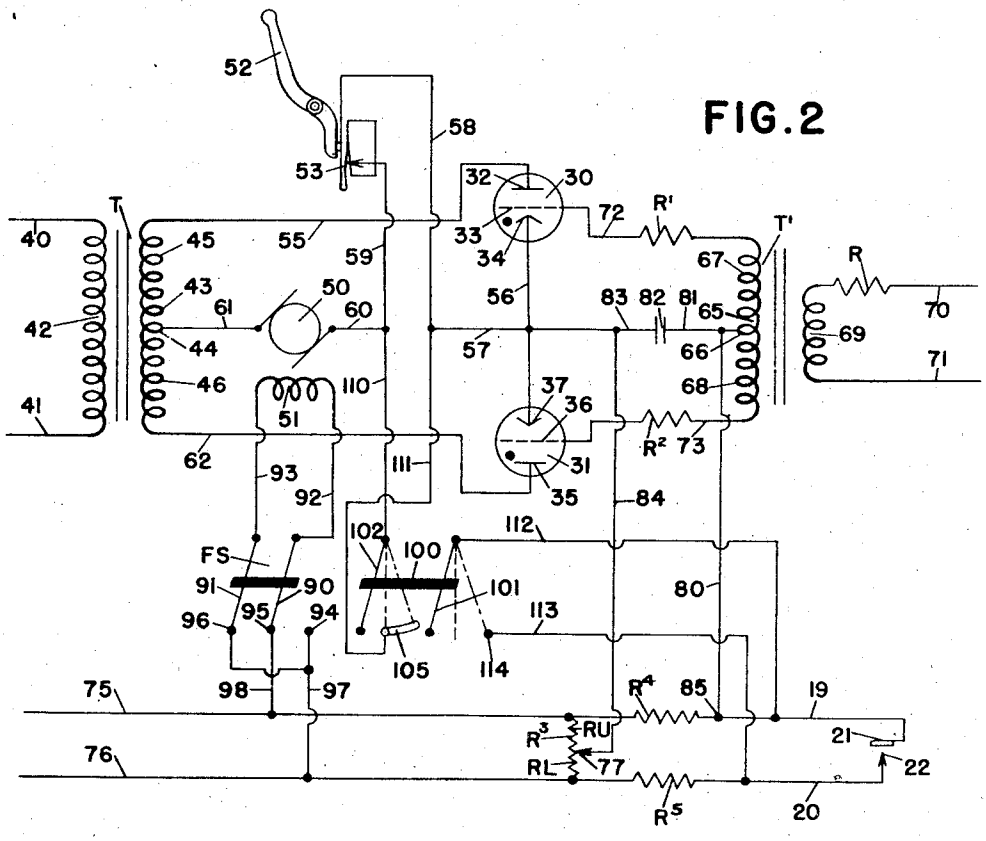


FIG. 2



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CONTROL MEANS FOR MOTOR-DRIVEN LETOFFS

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5 Claims. (Cl. 139—110)

1

This invention relates to improvements in loom letoff mechanisms and it is the general object of the invention to provide control means for a motor which effects turning of the warp beam.

In our copending application Serial No. 592,986 filed May 10, 1945, we have shown a motor driven letoff operated by electronic circuits which are under control of the warp tension in such manner that when the tension attains a given maximum the motor comes into action to turn the beam slightly to reduce the tension. This control of the motor exists during loom operation, but it is desirable to be able to turn the beam either backwardly or forwardly when the loom is stopped. It is accordingly an important object of our present invention to provide control means by which the letoff motor can be caused to turn either forwardly or backwardly during loom stoppage by means of switch mechanism under manual control of the weaver.

Under certain conditions it may also be desirable to be able to advance the warp at a faster rate than that provided for by the warp tension controlled contactor and in order to accomplish this result it is a further object of our invention to provide means by which said contact can be manually closed during loom operation. Likewise, it may be desirable at times to reverse the letoff motor during loom operation and it is a further object of our invention to provide for such reversal.

Our improved control is therefore seen to be effective to drive the warp beam either forwardly or backwardly either during loom operation or loom stoppage.

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

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

Fig. 1 is a diagrammatic view of the warp system of a loom controlled by our invention, and

Fig. 2 is a diagrammatic view of the electric circuits by which the aforesaid letoff motor is controlled.

Referring particularly to Fig. 1, the letoff beam 10 supplies warp W which passes over the usual whip roll 11 and then forwardly through the harness frames 12 and reed 13 toward the breast beam 14. The warp beam is under control of a motor M which drives a reduction unit 15 operatively connected to a gear 16 turning with the beam. The unit 15 is a speed reducer and permits the use of a cheap and efficient motor.

2

A contactor mechanism 17 has a foot 18 which presses down against the warp but is raised by the warp as the tension of the latter increases, and when a given maximum warp tension is attained a contact within the mechanism 17 is closed to electrically connect two wires 19 and 20. The movable contact is not shown in Fig. 1, but is indicated at 21 in Fig. 2, while the stationary contact is indicated at 22 and will be also located in the mechanism 17.

When the motor M turns in a forward direction the beam will be turned in a clockwise direction as view in Fig. 1 to supply warp for the weaving process and also relieve tension in the warp. After the tension has been temporarily relieved the motor comes to rest until the maximum tension is again attained. The details of the structural connections between the motor and the beam do not form a part of the present invention and these details may if desired be similar to those set forth in our aforesaid copending application. It is thought sufficient for present purposes to state that when the motor M moves in a forward direction beam 10 will be turned to deliver warp, and when the motor is reversed the beam will be turned backwardly to increase warp tension or change the position of the fell 23 of the cloth 24 being woven. Such a reversal may be necessary after a pickout operation.

The motor is controlled by the circuits shown in Fig. 2. These circuits include two gas filled or power electronic tubes 30 and 31, the former having a plate 32, a grid 33 and a cathode 34, and tube 31 having a plate 35, a grid 36 and a cathode 37. Alternating current is supplied by wires 40 and 41 which are connected to primary 42 of a transformer T. The latter has a secondary 43 provided with a center tap 44 and has upper and lower windings 45 and 46, respectively.

The motor is preferably of the direct current shunt wound type and includes an armature 50 and a field 51. The armature circuit is under control of shipper handle 52 by means of a switch 53. When the loom is running the shipper handle is in the running position and closes switch 53, and under these conditions current will flow through the armature whenever the grids 33 and 36 are in a permissive condition and enable current to pass through their respective tubes.

Thus, on one alternation when plate 32 is positive, the following circuit tends to energize the armature and will do so when grid 33 permits current to flow through tube 30: center tap 44, winding 45, wire 55, plate 32, through the tube, cathode 34, wires 56, 57 and 58, switch 53, wires

58 and 66, armature 50, and wire 61 back to the center tap. On the next alternation plate 35 is positive and current tends to flow in the following circuit: center tap 44, winding 46, wire 62, plate 35, through the tube, cathode 37, wire 57, and thence through switch 53 and the armature as previously traced back to the center tap. The motor armature will therefore be supplied with pulsating unidirectional current whenever current can pass through the tubes 30 and 31.

The grids 33 and 36 are under control of a grid circuit the condition of which is altered by closure of the contacts within contactor mechanism 17. The grid circuit includes the secondary 65 of a transformer T' having a center tap 66 dividing the secondary into upper and lower windings 67 and 68, respectively. The primary 69 of transformer T' is supplied with alternating current by wires 70 and 71 which may be connected to the wires 40 and 41. Wire 70 contains a resistance R which together with the inductance of the primary 69 changes the phase of the latter with respect to the phase of the alternating current in wires 40 and 41. The secondary 65 is therefore out of phase with the secondary 43. Winding 67 is connected through protective resistance R' to grid 33 by wire 72, and in similar manner the lower winding 68 is connected through resistance R2 to grid 36 by wire 73. The grids are therefore out of phase with the plates and cathodes of their corresponding tubes.

The grid control circuits are connected to a source of direct current supplied by wires 75 and 76. These wires are bridged by a resistance R3 having an adjustable contact 77 which divides resistance R3 into upper and lower parts RU and RL.

When contact 21 is out of engagement with contact 22 the following direct current circuit is closed. Wire 75, resistance R4, wires 80 and 81, the latter being connected to center tap 66, condenser 82, wires 83 and 84, adjustable contact 77, and resistance RL to wire 76. This circuit imposes a constant direct current bias on the center tap 66 at a voltage which is determined by the values of resistances R4 and RL. This imposed or impressed direct current voltage depresses the voltage of the windings 67 and 68 so that the zero level of the fluctuating voltage of the grids is below the zero level of the cathodes.

If it is desired to operate the motor at two different speeds, as set forth in the aforesaid copending application, the contact 77 will be set so that the difference between the zero levels of the potentials of the grids and cathodes will be such that the potential of the grids will rise to the firing potential of the tubes during the latter part only of the electric alternations. It should be understood, however, that the contact 77 can be so set that when contacts 21 and 22 are separated the armature 50 will receive practically no current or an insufficient amount to cause turning thereof, in which case the motor is idle for all practical purposes.

The conditions just described with respect to the grid circuit will exist when warp tension is below a given maximum, whether the motor be idle or turning very slowly. When the warp tension attains the given maximum contact 21 will be moved into engagement with contact 22, whereupon the following circuit will be placed in electric parallel with resistance RL: wire 19 connected at junction 85 to wire 80, contacts 21 and 22, wire 20, resistance R5, and wire 76. Closure of this circuit affords an additional path

for the flow of current from junction 85 to wire 76 resulting in a change in the potential of junction 85, which reduces the depressive effect of the direct current on the voltages of the windings 67 and 68, whereupon the grids 33 and 36 rise in potential and produce a change in the tubes the effect of which is to increase motor speed, or start operation of the motor, depending upon the setting of contact 77. This change will persist so long as contact 21 engages contact 22, but with the reduction in warp tension incident to turning of warp beam 10 contact 21 will eventually move away from contact 22 and the grid circuit will be changed from its permissive condition back to its preventive condition.

Much of the matter thus far described is set forth in the aforesaid copending application and is not specifically claimed herein, but is set forth in sufficient detail to indicate how the circuits operate.

Our present invention is concerned more particularly with manual controlled switch means for the motor. The field switch FS has two blades 90 and 91 permanently connected to wires 92 and 93 leading to the field 51. Switch FS has three binding posts 94, 95 and 96 the first and third of which are connected by wire 97 to the direct current source wire 76, and the intermediate post 95 of which is connected by wire 98 to the other direct current source wire 75.

When switch FS is to the left, or in the normal position shown in Fig. 2, current will flow through field 51 in such a direction as to cause forward turning of the armature, but when switch FS is thrown to its other or reverse position current through the field is reversed and the armature turns in a reverse direction.

A second hand switch 100 independent of switch FS has blades 101 and 102 and is for the purpose of closing the armature circuit when the shipper handle 52 is in the off position, and also for the purpose of shortcircuiting contacts 21 and 22. Switch 100 is capable of assuming three positions and will ordinarily be in the normal open position in full lines shown in Fig. 2. When moved to the right to its first operative position, dotted lines, blade 101 will still be idle, but blade 102 will electrically engage elongated contact post 105 and switch 53 will be bridged by wire 110 connected to wire 60, blade 102, post 105 and wire 111 connected to wire 57. Movement of switch 100 to its first operative, or intermediate position, will therefore establish the circuit through the armature even though the shipper handle be in non-running position. If contact 77 is set for continuous slow running of the motor the latter will turn when blade 102 engages contact 105, otherwise the motor will be idle.

When switch 100 is moved to the extreme right to its second operative position shown in dot and dash lines, blade 102 will remain in engagement with contact 105, but in addition, contacts 21 and 22 will be bridged by wires 112 and 113, and blade 101 which will be in contact with post 114. This causes the grid control circuit to become permissive and enables current to flow through the armature if the motor is idle, or enables more current to flow through it if the motor is running at a continuous slow rate. Provided contact 77 is set for continuous running of the motor, the weaver can first cause a rapid reverse motion of the fell after a long pickout, and then reduce the motor speed as the fell approaches its correct position.

Since switches FS and 100 are independent of

each other they can be moved from their normal positions to their other positions either during loom operation, or while the loom is stopped. Shifting of switch FS will reverse the motor field 51, and shifting of switch 100 will cause flow of current through the armature should conditions require motor reversal during loom operation. This same reversal can be effected when the loom is stopped. Also, while the loom is running switch 100 can be thrown to alter the grid control circuit during loom operation and the motor can be caused to turn to cause additional advance movement of the warp beam if this condition is desirable in the weaver's judgment.

From the foregoing it will be seen that we have provided means by which the motor of a motor driven letoff can be manually controlled to run either forwardly or backwardly either during loom operation or loom stoppage. Switch 100 when thrown to its extreme temporary position has the effect of altering the potential of the grids in such manner as to affect turning of the motor, either to start it or increase its speed, but the direction of turning is under control of switch FS. The switches FS and 100 will normally tend to remain in the full line positions shown in Fig. 2 to cause forward running of the motor and permit control of the contacts 21 and 22 by warp tension only.

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 letoff mechanism for a loom having a warp beam operatively connected to a motor which when running effects turning of the beam, electric circuit means for the motor capable of causing the latter to run at two different rates of speed, and manual control means for the electric circuit means normally in inoperative position relatively to said electric circuit means but movable to two different operative positions in one of which said electric circuit means is caused to turn the motor at one of said speeds thereof, and said manual means when in the other operative position thereof causing the electric circuit means to effect running of the motor at the other speed thereof.

2. In letoff mechanism for a loom having a warp beam operatively connected to a motor which when running effects turning of the beam, electronic circuit means including an electronic tube having a grid, said electric circuit means normally tending to cause running of the motor, control means for the grid effective when the warp tension is less than a given maximum to enable the grid to prevent the electric circuit means from causing running of the motor but operative when the tension of the warp attains said given maximum to alter the grid in such manner as to enable the electric circuit means to cause running of the motor, and manual switch means connected to said control means for the grid and effective when the warp tension is less than said given maximum to alter the grid to

enable the electric circuit means to cause running of the motor.

3. In letoff mechanism for a loom having a warp beam operatively connected to a motor which when running effects turning of the beam, electric circuit means in operative condition during loom operation and effective when warp tension attains a given maximum to cause running of the motor, means to render said electric circuit means inoperative when the loom stops, and normally open manual switch means closable during loom stoppage to restore the electric circuit means to operative condition.

4. In letoff mechanism for a loom having a warp beam operatively connected to a motor which when running effects turning of the beam, electric circuit means including a switch normally effective when the latter is closed and the warp tension attains a given maximum to cause running of the motor, loom shipper mechanism maintaining said switch closed during loom operation, said switch opening during loom stoppage to render said electric circuit means ineffective to cause running of the motor, and normally open manual swicth means connected in parallel with the first named switch and effective when closed during loom stoppage to cause said electric circuit means to effect running of the motor, provided the warp tension is at said given maximum.

5. In letoff mechanism for a loom having a warp beam operatively connected to a motor which when running effects turning of the beam, operating electric circuit means for the motor, a control circuit means for the operating electric circuit means which when in one condition causes the operating electric circuit means to effect running of the motor and when in another condition prevents said operating electric circuit means from causing running of the motor, said operating electric circuit means normally being inoperative during loom stoppage, and normally open manual switch means effective when closed during loom stoppage to cause said control circuit means to be in said one condition thereof to cause said operating electric circuit means to effect running of the motor.

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