Oct. 5, 1948. R. S. SCHEDIN 2,450,488

TWO-SPEED MOTOR DRIVE FOR LOOM LETOFFS

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FIG. 4

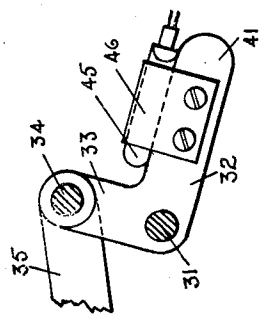

FIG. 2

FIG. 1

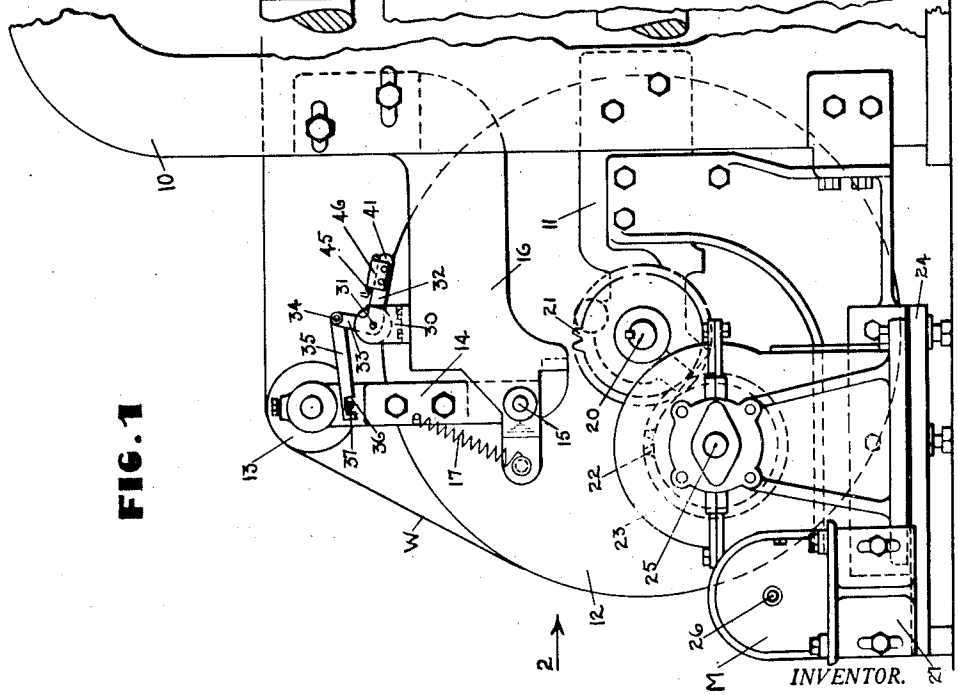

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FIG. 3

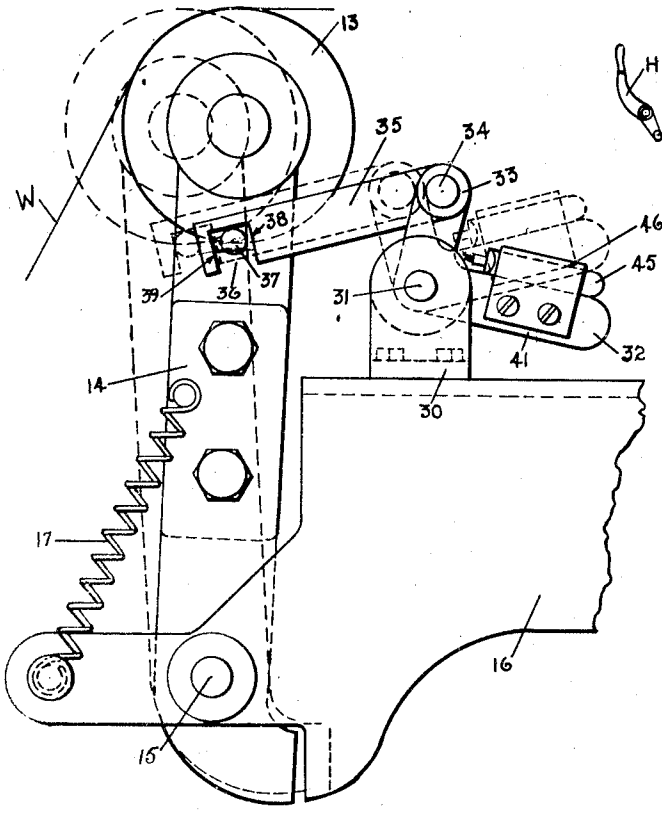


FIG. 5

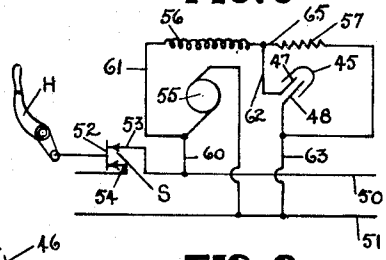


FIG. 6

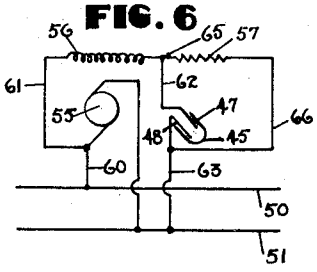


FIG. 7

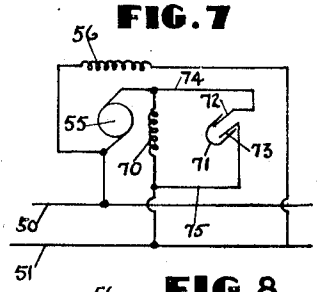
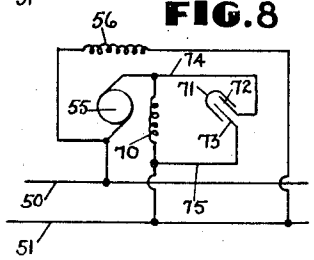


FIG. 8



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UNITED STATES PATENT OFFICE

2,450,488

TWO-SPEED MOTOR DRIVE FOR LOOM LETOFFS

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Application June 30, 1945, Serial No. 602,433

16 Claims. (Cl. 139—110)

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This invention relates to improvements in letoff mechanisms for looms and it is the general object of the invention to provide driving mechanism for the warp beam including a constantly running motor the speed of which is changed dependent upon the tension of the warp.

Looms ordinarily employ a warp beam which rotates during loom operation to supply the warp needed for the weaving operation. When the beam is of large diameter it is quite heavy and has considerable inertia. When the beam is at rest periodically as with the usual letoff mechanism each turning movement thereof requires the input of considerable power to overcome its inertia. It is an important object of my present invention to provide a motor drive for the beam which will turn the latter continuously at a normal speed just below that required to supply the warp needed for the weaving operation and increase the motor speed periodically so that the beam will at such times supply slightly more warp than is needed for the weaving operation. The acceleration incident to increase of speed requires only a slight additional amount of power for the motor. The result of the high and low speeds of the motor is to provide an average turning speed for the beam which will supply the amount of warp needed for the weaving operation.

Many looms operate with a whip roll over which the warp extends and this whip roll moves in response to variations in warp tension, moving forwardly toward the harness mechanism when the warp tension is high and moving rearwardly when the warp tension is low. It is another object of my present invention to provide a switch controlled by the whip roll so that the switch will be in one condition when the whip roll is forward and will be in a different condition when the whip roll is rearward. This switch can be made to control the strength of the magnetic field for the motor in such a way that when the switch is in one condition the field will be strong and the motor speed will be relatively slow, but when the switch is in a different condition the field will be weakened and cause the motor to run at a faster rate. The switch may either control a resistance which can be placed in series with a shunt field coil to increase loom speed, or the switch can control one of the field coils of a compound wound motor. In the latter instance the switch will permit both the shunt and series coils to create the field when the loom is to run at its slow rate, but will short circuit one of the coils, such as the series coil, and thereby weaken the field when the motor is to run at a faster rate.

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The whip roll is ordinarily subject to some vibration in a backward and forward direction due to beat-up of the reed and harness opening. This movement of the whip roll continues throughout loom operation and accompanies the progressive forward movement of the whip roll due to consumption of the warp during the weaving operation. It is another object of my present invention to control the aforesaid switch by a connection with the whip roll so constructed that the slight back and forth vibration of the whip roll due to beat-up and harness opening will not effect the switch materially. With such a connection the progressive forward movement of the whip roll due to consumption of warp will move the switch without causing it to vibrate unduly.

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 two forms of the invention are shown,

Fig. 1 is a side elevation of the rear part of the loom having the preferred form of my invention applied thereto,

Fig. 2 is a rear elevation looking in the direction of arrow 2, Fig. 1,

Fig. 3 is an enlarged side elevation of part of the mechanism shown in Fig. 1, particularly the switch, its mounting and connection with the whip roll,

Fig. 4 is a view similar to part of Fig. 3 but illustrating the switch in the position it occupies when the modified form of the invention is used,

Figs. 5 and 6 are diagrams of the circuits used with the preferred form of the invention when the motor is running slow and fast, respectively, and

Figs. 7 and 8 are diagrams of the circuits used with the modified form of the invention when the motor is running slow and fast, respectively.

Referring more particularly to Figs. 1 and 2, I have shown a loom frame 10 on which is mounted a rearwardly extending support 11 providing a mounting for the rotatable warp beam 12. The warp W of the beam extends upwardly and over a whip roll 13 mounted in an upright lever 14 pivoted as at 15 to a second support 16 extending rearwardly from the loom frame. A spring 17 tends normally to move the whip roll rearwardly or to the left as viewed in Fig. 1. When warp tension increases the whip roll moves forwardly or to the right as viewed in Fig. 1, but when the

warp tension is reduced the spring 17 will move the whip roll rearwardly.

The beam has a gudgeon 20 rotatable in the support 11 and having secured thereto a gear 21 which meshes with a second gear 22 driven by a gear reducing unit 23. The latter is mounted on a stand 24 fixed with respect to the loom and has an output shaft 25 to which gear 22 is secured. The reducing unit has an input shaft 26 connected to a direct current motor M which in the preferred form of the invention will have a shunt wound field coil, but in the modified form will have a compound wound field provided with shunt and series coils. This motor is appropriately supported by a bracket 27 secured to the stand 24, as shown in Fig. 2. The motor, reducing unit, and gears 21—22 are so related that when the motor runs the gudgeon 20 will be turned to cause angular movement of the warp beam in such a direction as to supply warp for the weaving operation.

The matter thus far described forms no part of my present invention except as pointed out hereinafter, and may be made as set forth for instance in my copending application Serial No. 588,530, filed April 16, 1945, now abandoned. It is thought sufficient for present purposes to state that during the weaving operation the warp beam must be turned in a clockwise direction as viewed in Fig. 1 to supply the warp needed for the weaving operation, and that the whip roll will be subject to a back and forth vibration due to the beat-up of the reed not shown and the opening and closing of the warp sheds by the harness mechanism not shown. During any period thereof in which the beam 12 is stationary the whip roll will have a slight back and forth vibration, but will also have a progressive forward movement, the latter movement being due to consumption of the warp.

In carrying my present invention into effect I provide electric means by which the motor may be kept in continuous operation so long as the loom is running, and in addition provide means for varying the speed of the motor so that it may accommodate itself to the conditions attending changes in warp tension. A small stand 30 on support 16 is provided with a pivot 31 around which a bell crank lever 32 turns. This lever has an upright arm 33 connected as at 34 to a rearwardly extending link 35 which as shown more particularly in Fig. 3 is provided with a downwardly opening notch 36. A pin 37 on the lever 14 enters this notch and has a diameter slightly less than the length of the notch. The lost motion between the pin and the notch enables the whip roll to have the aforesaid horizontal vibration without substantial effect on the link 35, but as the whip roll moves progressively forwardly it will engage the front shoulder 38 of the notch to move the link forwardly, and similarly when the whip roll moves progressively rearwardly the pin will engage the rear shoulder 39 of the notch and move the link rearwardly. The lever 32 and its link may be used for both forms of the invention.

In the preferred form of the invention I employ a shunt wound direct current motor such as indicated diagrammatically in Figs. 5 and 6. A mercury switch 45 is secured as by a clip 46 to the forwardly extending arm 41 of lever 32 and has two terminals 47 and 48 extending rearwardly as indicated in Figs. 5 and 6. These terminals are unconnected within the switch when the lever 32 is in the position shown in Fig. 3, full line position but when the lever 32 rocks in a counter-clockwise direction as viewed in Fig. 1 due to rearward movement of the whip roll the switch 45 will be tilted to the dotted line position of Fig. 3 and the terminals 47 and 48 will then be connected within the switch.

Referring particularly to Fig. 5, and assuming that the whip roll is in a rearward position due to the fact that the warp tension is relatively low, the switch 45 will be tilted so that its terminals 47 and 48 are connected within the switch. Power for driving the motor is provided by two direct current power lines 50 and 51. The loom will have a shipper handle H which during running conditions will cause blade 52 of a switch S to engage contacts 53 and 54 in line wire 50. The motor armature is designated at 55, the shunt field coil at 56, and a field resistance at 57.

When the shipper handle is in the position shown in Fig. 5, and the previously assumed conditions exist, current will flow through the armature or rotor 55 and will also flow through the following field circuit: power line wire 50, wire 60, wire 61, field coil 56, wire 62, terminal 47 through the switch 45, terminal 48 and wire 63 to the other power line wire 51. Current flows in this field circuit without going through the resistance 57 and the magnetic field is therefore relatively high and the motor will turn at too slow a rate to enable the warp beam to supply all the warp that is needed for the weaving operation. This slow speed of the motor is its normal rate of turning, but since the loom will consume warp faster than the motor at its slow rate will enable the beam to supply warp, the warp tension increases gradually the effect of which is to move the whip roll forwardly and cause tilting of the lever 32 until the terminals of the mercury switch are disconnected within the switch, whereupon the circuit changes to the condition shown in Fig. 6. The resistance is connected across the terminals 47 and 48 by wires 65 and 66, respectively, and when the switch is in the position shown in Fig. 6 current which flows through the field coil must also flow through the resistance 57. The magnetic field of the motor is therefore weakened and the armature 55 will turn faster and at such a rate as will enable the warp beam to supply warp at a rate faster than that needed for the weaving operation.

The normal slow rate of speed of the motor will be slightly less than that required to supply the warp as the latter is consumed in the weaving operation, and the faster speed of the motor will turn the warp beam to supply slightly faster than it is required for the weaving operation. The result of the variable motor speed as it fluctuates between its slow and fast rates is to provide an average rate of turning of the beam to supply the warp required. When the motor is turning at its fast rate the whip roll will be forward and the excess warp delivered by the beam over that required for the weaving will be taken up by rearward movement of the whip roll until switch 45 is tilted to such a position that it will again short-circuit the resistance 57. It will therefore be seen that during loom operation the motor is running continuously but part of the time it runs at a normal slow rate and at other times it runs at a faster rate. The increase in warp tension due to the slow rate of the motor opens switch 45, and the decrease in warp tension due to the fast turning of the motor closes the switch 45.

In the modified form of the invention I provide a compound wound motor having the armature

55 and shunt field coil 56, but having in addition a second field coil 70 in series with the armature. Also, in the modified form of the invention the position of the mercury switch on lever 32 will be reversed from the position used with the preferred form. Referring to Fig. 7 the mercury switch 71 will have its terminals 72 and 73 connected across the series field winding 70 by wires 74 and 75, respectively. When the whip roll is in rearward position due to low warp tension the switch 71 will be in the position shown in Fig. 7 and current passing through the rotor will also pass through the series field coil 70, and the latter together with the shunt field will provide the motor with a relatively strong magnetic field the effect of which is to cause slow turning of the armature or rotor. As the whip roll moves forwardly due to increasing warp tension the switch 71 will be tilted so that its terminals 72 and 73 are connected within the switch, whereupon the series field coil 70 is shortcircuited, and the strength of the magnetic field of the motor is due solely to the current flowing through the shunt field coil. The magnetic field of the motor is therefore weakened and the armature speed will increase. This condition is shown in Fig. 8.

The relation between the fast and slow speeds of the motor with respect to the average turning of the warp beam and the rate of consumption of the warp due to the weaving operation will be substantially the same in the modified form as that described in connection with the preferred form. In both forms it will be noted that when the whip roll obtains a given point in its forward movement it moves a switch in such a way as to weaken the magnetic field of the motor, and when the whip roll moves rearwardly the switch has the effect of causing a stronger magnetic field.

From the foregoing it will be seen that I have provided a letoff mechanism for a loom employing a motor connected permanently to the warp beam and running continuously during loom operation, but having two rates of speed one of which is slightly below the average rate needed to supply warp as it is consumed, and the other being slightly above the average rate. The whip roll controlled switch determines at which rate the motor shall turn. Since there is not very much difference between the slow and fast rates of the motor, only a small amount of power must be put in the warp beam to turn it at the increased rate of speed, and at no time is the motor required to start the beam from a condition of rest except when the loom is restarted after a period of idleness. In the preferred form of the invention the mercury switch is so mounted that it controls a resistance which can be shortcircuited or placed in series with the shunt field coil, while in the modified form of the invention the switch is so mounted as to control the series coil of the compound wound field, permitting the series coil to be in series with the armature when slow speed is desired and shortcircuiting the field when higher speeds are required. Although the shipper handle is illustrated only in Fig. 5, it is to be understood that it will be used in the circuits for both forms of the invention, hence the motor will be stopped whenever the loom stops and the warp beam will not continue to unwind excess warp during periods of loom idleness. It will further be seen that the lever 32 can be used for both forms of the invention and that the same mercury switch can be used merely by reversing its position. Furthermore, it will be seen that the notch 36 provides a limited lost motion connection between the whip roll and the switch so that the latter is not subject to the vibrations of the whip roll incident to beatup and shed opening.

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 a letoff mechanism for a loom having a warp beam rotatable to supply warp which extends over a whip roll mounted to move forwardly and rearwardly when the tension of the warp increases and decreases, respectively, an electric motor running continuously during loom operation and having a rotor operatively connected to the beam and causing the latter to turn in a direction to supply warp when the rotor is turning, field coil means for the rotor, electric means controlled by the whip roll and normally operative when the whip roll is in a rearward position to cause said field means to be relatively strong and cooperate with said rotor to turn the warp beam at a rate too slow to supply the warp required for the weaving operation, and said electric means effective when the whip roll moves forwardly to a given position to cause said field means to be relatively weak and cooperate with said rotor to turn the warp beam at an increased rate of speed to supply more warp than that required for the weaving operation.

2. In a letoff mechanism for a loom having a warp beam rotatable to supply warp which extends over a whip roll mounted to move forwardly and rearwardly when the tension of the warp increases and decreases, respectively, an electric motor running continuously during loom operation and operatively connected to the beam to cause the latter to turn in a direction to supply warp when the motor is turning, an electric switch operatively connected to the whip roll and being in one condition when the whip roll is in a given rearward position and being in another condition when the whip roll is in a given forward position, electric means controlled by the switch and effective when the latter is in said one condition to cause the motor to turn the beam at a rate insufficient to supply the warp needed for the weaving operation and effective when said switch is in the other condition thereof to cause the motor to run at an increased speed to supply more warp than is needed for the weaving operation.

3. In a letoff mechanism for a loom having a warp beam rotatable to supply warp which extends over a whip roll mounted to move forwardly when the tension of the warp increases, an electric motor running continuously during loom operation and operatively connected to the beam causing the latter to turn in a direction to supply warp when the motor is running, electric means normally operative to cause the motor to run at a normal rate which turns the beam at too slow a rate to supply sufficient warp for the weaving operation, speed changing electric means normally disconnected from the motor when the latter is running at said normal rate and effective when electrically connected to the motor to increase the speed thereof, and switch means operatively connected to the whip roll and effective when the latter moves forwardly to a given point to electrically connect the speed changing means to said motor to cause the latter to turn at an increased rate of speed.

4. In letoff mechanism for a loom having a warp beam rotatable to supply warp which ex-

tends over a whip roll mounted to move forwardly when the tension of the warp increases, an electric motor running continuously during loom operation and operatively connected to the warp beam to cause turning of the latter in a direction to supply warp when the motor is running, a source of electric power, a switch operatively connected to the whip roll and moved from closed position to open position when the whip roll moves forwardly to a given point, electric circuit means including said source, switch and said motor closed during loom operation to effect normal running of the motor at a rate which causes the beam to supply insufficient warp for the weaving operation when said switch is closed, and an electric speed changing element connected electrically to said switch and caused to be inoperative relatively to the motor when the switch is closed and connected electrically to the motor when the switch is open to effect an increase in the speed of the motor.

5. In a letoff mechanism for a loom having a warp beam rotatable to supply warp which extends over a whip roll mounted to move forwardly when the tension of the warp increases, an electric motor running continuously during loom operation and having a rotor operatively connected to the beam to cause turning of the latter in a direction to supply warp when the rotor is turning, a field coil for said motor, a resistance, a switch operatively connected to the whip roll and closed when the whip roll is in rearward position and open when the whip roll moves forwardly to a given position, electric circuit means including said field coil and switch and causing the rotor when said switch is closed to turn at a rate too slow to enable the warp beam to supply the warp needed for the weaving operation, and electric connections between the switch and the resistance effective when the switch is open to connect said resistance in series with the field coil and thereby cause the rotor to turn at an increased rate of speed.

6. In a letoff mechanism for a loom having a warp beam rotatable to supply a warp which extends over a whip roll mounted to move forwardly, when the tension of the warp increases, a motor having a rotor operatively connected to the beam and turning the latter to supply warp when the rotor is running, a field coil for the rotor, a switch controlled by said whip roll and closed when the whip roll is in rear position and open when the whip roll is in forward position, a resistance connected across said switch, and electric circuit means including said field coil and switch and effective when the whip roll is in rearward position and the switch short circuits said resistance to cause the field coil and rotor to act independently of the resistance to cause the rotor to turn the beam at a rate too slow to supply warp at the rate needed for the weaving operation, said switch when open due to movement of the whip roll to said forward position causing the rotor, field coil and resistance to cooperate to turn the rotor at an increased rate of speed.

7. In a letoff mechanism for a loom having a warp beam rotatable to supply warp which extends over a whip roll mounted to move forwardly when the tension of the warp increases, a direct current motor having a rotor operatively connected to the beam to turn the latter in a direction to supply warp when the rotor is running, a shunt field coil for the motor, a resistance, a source of direct current electric power across which the rotor is connected, circuit means under control of the whip roll and effective when the latter is in rearward position to connect said shunt field coil to said source independently of the resistance to cause the rotor to turn the beam at a rate too slow to supply warp needed for the weaving operation and effective when the whip roll moves forwardly to a given position to connect said resistance in series with the field coil to cause the rotor to turn at an increased rate of speed.

8. In a letoff mechanism for a loom having a warp beam rotatable to supply warp which extends over a whip roll mounted to move forwardly when the tension of the warp increases, an electric motor operatively connected to the beam to cause the latter to turn to supply warp when the motor is running, an electric switch operatively connected to the whip roll and closed when the latter is in rearward position and open when the whip roll reaches a given position in the forward movement thereof due to increase in warp tension, a resistance connected to the switch and short-circuited thereby when the switch is closed, and electric circuit means including the motor and switch normally operative when the whip roll is rearward to cause the motor to turn the beam at a rate too slow to supply the warp required for weaving and effective when the switch is open to connect the resistance to said motor in such manner as to cause increased speed of the motor to turn the warp beam faster.

9. In a letoff mechanism for a loom having a frame on which a warp beam is rotatable to supply warp which extends over a whip roll movable forwardly with respect to the frame when the tension of the warp increases and movable rearwardly with respect to the frame when the warp tension decreases, a source of direct current electric power, an electric motor having an armature connected to said source and operatively connected to the beam to cause the latter to supply warp when the armature is turning, a lever pivotally mounted with respect to the frame and operatively connected to the whip roll and moving in one direction when the whip roll moves rearwardly and moving in the opposite direction when the whip roll moves forwardly, an electric switch controlled by the lever closed when said whip roll reaches a given position in the rearward movement thereof and open when the whip roll reaches a given position in the forward movement thereof, a field coil for the armature, a resistance connected across said switch, and electric circuit means including said source, said field coil and said switch, said switch when closed short circuiting the resistance and causing the field coil and armature to cooperate to turn the warp beam at a rate insufficient to supply the warp required for the weaving operation, and said switch when open causing the resistance to be in series with the field coil, whereupon the latter cooperates with the armature to turn the warp beam at a faster rate.

10. In a letoff mechanism for a loom having a frame on which a warp beam is rotatable to supply warp which extends over a whip roll movable forwardly with respect to the frame when the tension of the warp increases and movable rearwardly with respect to the frame when the warp tension decreases, a source of direct current electric power, an electic motor having an armature connected to said source and operatively connected to the beam to cause the latter to turn in a direction to supply warp when the armature turns, a field coil for the armature, a lever pivot-

ally mounted with respect to said frame and operatively connected to the whip roll and moving in one direction when the whip roll moves forwardly and moving in the opposite direction when the whip roll moves rearwardly, a mercury switch mounted on said lever having two terminals which are electrically connected to each other within the switch when the whip roll reaches a given position in the rearward movement thereof and are electrically disconnected from each other within the switch when the whip roll reaches a given position in the forward movement thereof, a resistance electrically connected across said terminals, and electric circuit means including said source, said field coil and said terminals, said field coil and armature cooperating when the terminals are electrically connected to each other within the switch to short circuit the resistance to cause the motor to turn the beam at a rate insufficient to supply the warp needed for the weaving operation, said switch operative when the terminals thereof are electrically disconnected within the switch to put said resistance in series with said circuit means and cause the field coil and armature to cooperate to turn the beam at a faster rate.

11. In a letoff mechanism for a loom having a warp beam rotatable to supply warp which extends over a whip roll mounted for movement forwardly when the tension of the warp increases, an electric motor having a rotor operatively connected to the beam causing the latter to turn in a direction to supply warp when the rotor turns, an electric switch operatively connected to the whip roll and open when the whip roll is in rearward position and closed when the whip roll is in forward position, a shunt field coil for the rotor, a series field coil for the rotor connected across said switch, a source of electric power having the rotor and series field coil connected thereto in series, and electric circuit means controlled by the switch and effective when said switch is open to cause both the shunt and the series field coils to produce a relatively strong magnetic field causing the rotor to turn the beam at a rate insufficient to supply the warp needed for the weaving operation, said electric circuit means effective when said switch is closed and said series field coil is short-circuited by the switch to cause the shunt field coil acting alone to produce a relatively weak magnetic field to increase the speed of the rotor and cause the beam to supply more warp than is required for the weaving operation.

12. In motor driven letoff mechanism for a loom having a warp beam rotatable to supply warp which extends over a whip roll mounted to move forwardly when the tension of the warp increases and move rearwardly when the tension of the warp decreases, an electric motor having a rotor operatively connected to the beam causing the latter to turn in a direction to supply warp when a rotor is turning, shunt and series field coils for said motor, an electric switch connected across said series field coil and operatively connected to the whip roll and open when the whip roll is in rearward position and closed when the whip roll is in forward position, a source of electric power, an electric circuit permanently connecting said rotor and series field coil in series with said source, and electric circuit means connected to said source and including said shunt field coil and including and controlled by said switch and effective when said switch is open to cause both of said field coils to cooperate to create a relatively strong magnetic field the effect of which is to cause a relatively slow rate of rotation of the rotor which causes the beam to supply insufficient warp for the weaving operation, said switch when closed shortcircuiting said series field coil so that said shunt field coil acting alone creates a weaker magnetic field the effect of which is to increase the speed of the motor and cause the warp beam to supply more warp than is required for the weaving operation.

13. In motor driven letoff mechanism for a loom having a warp beam which rotates to supply warp passing over a whip roll which is subject to back and forth vibration incident to loom operation and is also subject to progressive forward movement due to consumption of warp in the weaving operation, an electric motor running continuously during loom operation and operatively connected to the warp beam to turn the latter in a direction to supply warp when the motor is running, an electric switch, electric means including the switch and motor effective to increase the speed at which the motor runs when the switch changes from one condition thereof to another condition, and connections operatively interposed between the whip roll and the switch including a lost motion means so constructed that said vibration of the whip roll is without material effect in changing the position of the switch, but said progressive forward movement of the whip roll is effective to change the switch from one condition thereof to the other condition thereof.

14. In motor driven letoff mechanism for a loom having a warp beam which rotates to supply warp passing over a whip roll which is subject to back and forth vibration incident to loom operation and is also subject to progressive forward movement due to consumption of warp in the weaving operation, an electric motor operatively connected to the warp beam, a switch controlling said motor, a mounting for said switch movable to effect a change in the condition of the switch for the purpose of controlling the motor, a link connected to said mounting and having spaced shoulders, an actuator moving with the whip roll between said shoulders, the distance between said shoulders being such that when the whip roll has said back and forth vibration said actuator is without substantial effect in moving the connector, said actuator due to the progressive movement of the whip roll causing progressive movement of the connector to change the condition of the switch.

15. In a motor driven letoff mechanism for a loom having a warp beam which rotates to supply warp passing over a whip roll which is subject to back and forth movement incident to loom operation and is also subject to progressive forward movement due to consumption of warp in the weaving operation, an electric motor operatively connected to the warp beam, an electric switch, an electric circuit means including the motor and switch and controlling the motor by means of the switch, and connections operatively interposed between the switch and the whip roll and including a pin moving back and forth with the whip roll and a link extending over the pin and having a downwardly opening notch receiving the pin.

16. In motor driven letoff mechanism for a loom having a warp beam which rotates to supply warp passing over a whip roll which is subject to back and forth movement incident to loom operation and is also subject to progressive forward

movement due to consumption of warp in the weaving operation, an electric motor operatively connected to the warp beam, a switch controlling said motor, and connections operatively interposed between the switch and the whip roll and including an actuator moving back and forth with the whip roll and a link formed with a downwardly opening notch receiving the actuator and normally held by gravity in operative relation with the actuator to transmit a force from the latter to the switch.

ROBERT S. SCHEDIN.

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