Nov. 25, 1930. E. W. STONE ET AL 1,782,945

ELECTRICALLY DRIVEN LOOM

Filed June 28, 1929 2 Sheets-Sheet 1

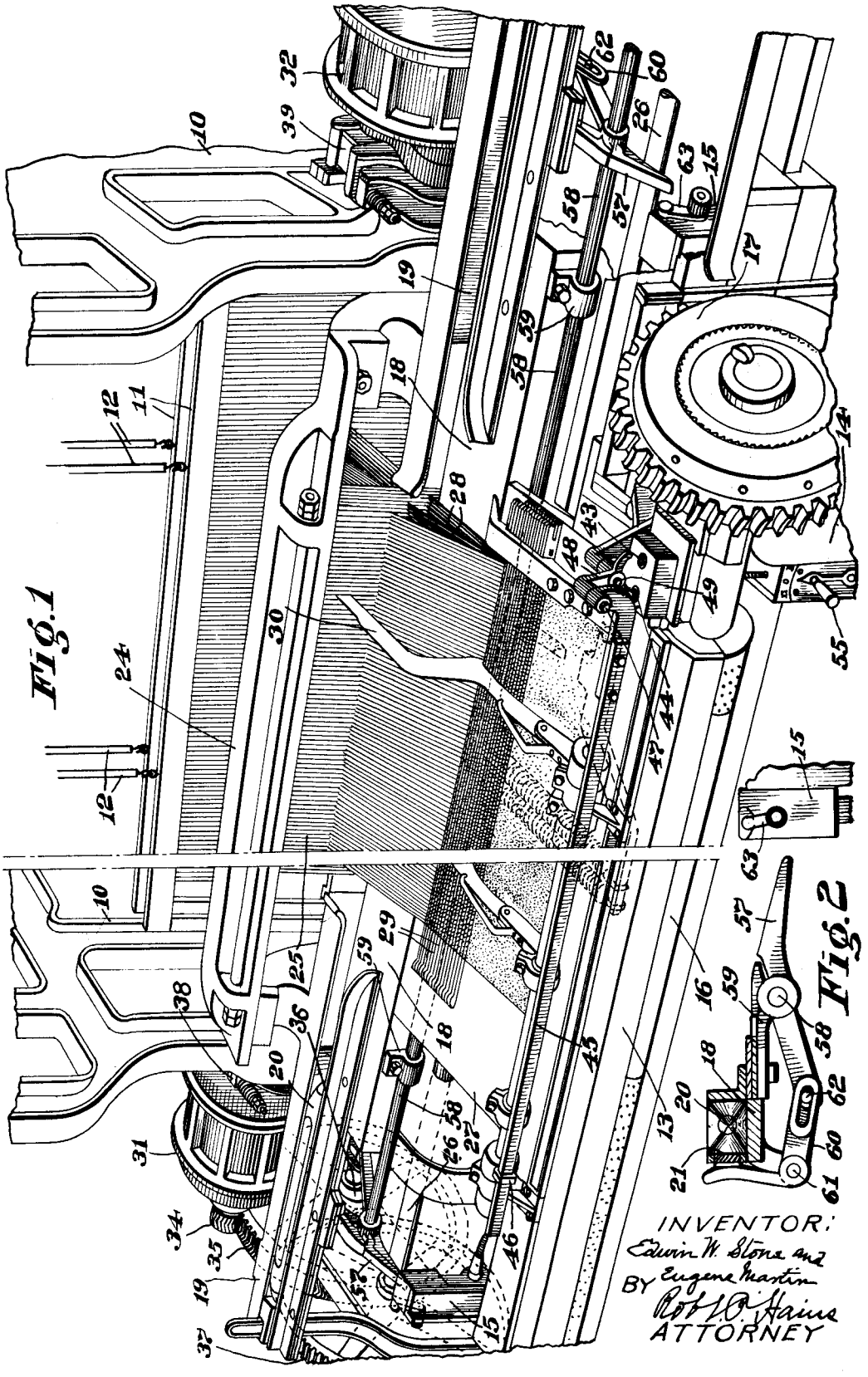


Fig. 1

Fig. 2

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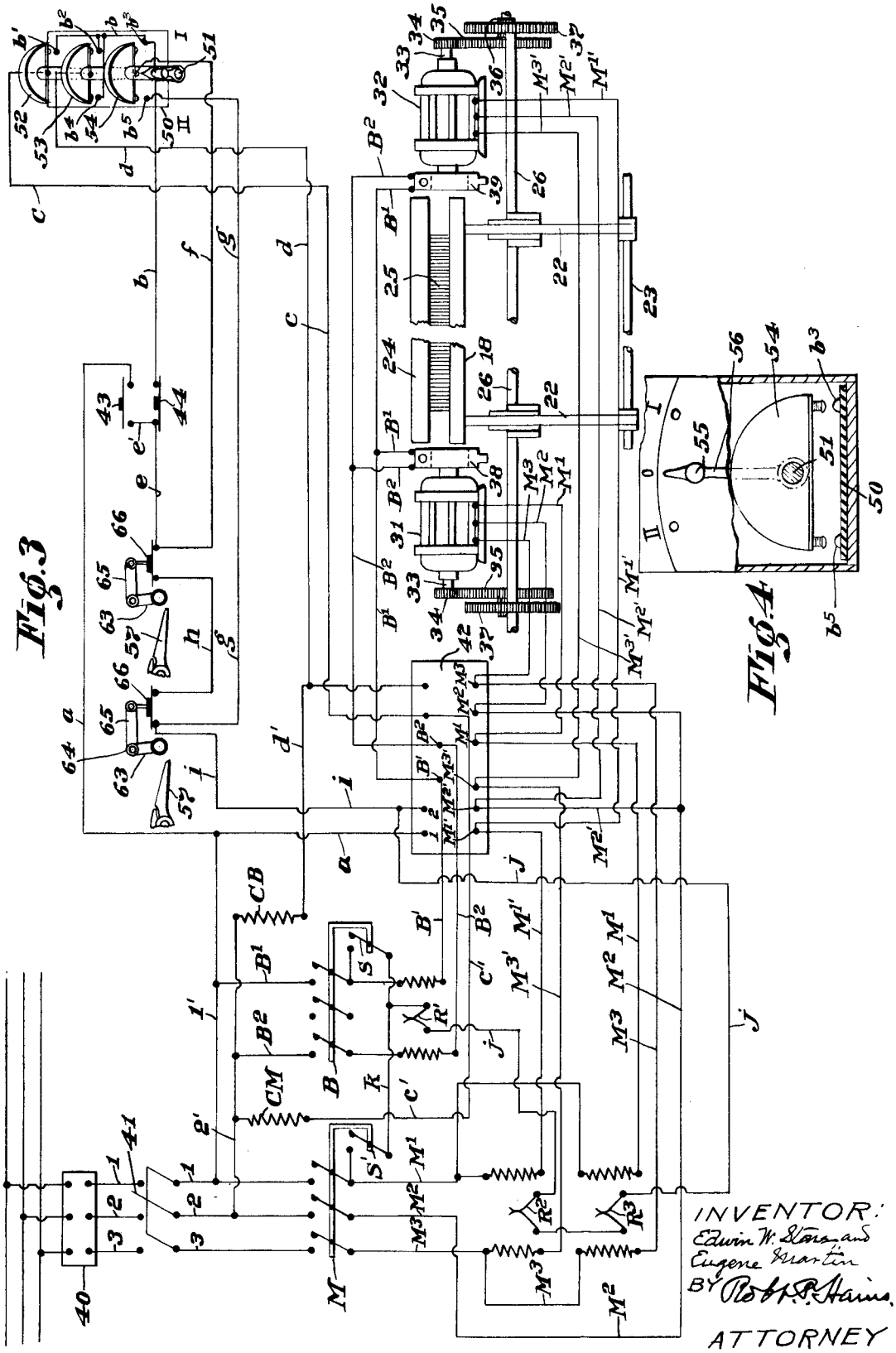


Fig. 3

Fig. 4

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UNITED STATES PATENT OFFICE

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ELECTRICALLY-DRIVEN LOOM

Application filed June 28, 1929. Serial No. 374,375.

This invention relates to looms, and more particularly to electrical driving mechanism for looms and to the control for such driving mechanism.

It is now the common practice to employ a clutch drive for operating looms, the clutch being constructed to be controlled by a shipper lever that is movable to one position to engage the clutch elements for operating the loom and is movable to a second position to release the clutch elements and apply a brake to promptly stop the loom.

The clutch form of drive is more or less satisfactory on looms of average size but is not entirely satisfactory when employed to drive wide heavy looms such as are used in weaving wide rugs and carpets. Looms capable of weaving rugs and carpets having a width of 20 feet or over are now in use and these extremely wide looms are difficult to start and stop quickly due to the weight and momentum of the moving parts.

When clutches are employed to operate these wide looms the clutch elements are made exceptionally strong and heavy to withstand the stresses to which they are subjected in starting the looms, and the engagement of these powerful clutch elements to start the loom subjects the operating parts of the loom to more or less severe strains and jars.

The present invention therefore relates to an electrical form of drive for looms whereby the use of mechanical clutches is avoided and a smooth control of the loom is secured. The motor control contemplated by the present invention is well adapted for use in connection with a single motor or with two or more motors, as will be made clear further on.

An important feature of the present invention resides in a pair of driving motors for a loom disposed at the opposite sides of the loom and arranged so that the power shaft of each motor is positively connected to the crank shaft of the loom without the use of clutch mechanism, so that the turning torque of each motor shaft is positively transmitted to the crank shaft of the loom.

The pair of electric motors employed to drive a loom in accordance with the present invention should be similarly wound so that they will run at the same speed and deliver approximately the same amount of power to the loom. A pair of either direct or alternating current motors may be employed, however, to drive the loom.

Since the motors, in accordance with the present invention, are positively connected to the crank shaft, the motor shafts will be prevented from rotating independently of each other. The arrangement is such that the driving action of the electric field of each motor upon its armature constitutes the driving medium for equalizing the turning torque exerted upon the crank shaft by the motors to cause approximately the same amount of power to be delivered to each end of the crank shaft, or the back shaft which in turn may drive the crank shaft.

As a result of this construction a simple form of drive is provided which is easy to control and the motors will serve to start the heavy loom more smoothly than the mechanical clutches employed heretofore, and by imparting part of the driving force to the crank shaft at each side of the loom the parts are subjected to less tortional strains than are produced when the entire driving force is imparted to the crank shaft at one side of the loom.

Another feature of the present invention resides in an electrically controlled brake associated with each motor for stopping the loom promptly when the current to the motors is cut off.

Another feature of the invention resides in electrically operable means for controlling the motors and brakes whereby the brakes are released as the power is applied to the motors and the brakes are applied as the power is cut off, and also in the electrical control whereby the brakes may be released without starting the motors to permit turning the crank shaft by hand.

A further feature of the present invention resides in switch operating mechanism associated with one or both shuttle boxes and adapted to actuate a switch to cut off the current to the motors and apply the brakes upon the occurrence of an improperly boxed shuttle.

A more specific feature of the present invention resides in a pair of electrically operable switches one for controlling the motors, and the other for controlling the brakes, and an operating circuit for these switches including manually controlled start and stop switches for starting and stopping the loom, and also a master switch that is movable to one position to place the motors and brakes under the control of the start and stop switches and movable to a second position to place the brakes but not the motors under the control of the start and stop switches.

Other features of the invention and novel combination of parts in addition to the above will be hereinafter described in connection with the accompanying drawings which illustrate one good practical form of the invention.

In the drawings:—

Fig. 1 is a perspective view of a loom having a pair of driving motors associated therewith in accordance with the present invention;

Fig. 2 is a transverse vertical sectional view through a shuttle box provided with electrical stop mechanism;

Fig. 3 is a diagrammatic view of the electrical control mechanism for the driving motors of Fig. 1; and

Fig. 4 is a front view with parts in section of a master switch to be described.

The features of the present invention may be employed to drive practically any type of loom, and while the invention relates more particularly to the use of a pair of cooperating motors to drive wide looms such as are used in the weaving of wide carpets and rugs, nevertheless the motor control means of the present invention is well adapted for use to control a single driving motor for a loom.

The loom shown is of the type of the wide looms used in weaving rugs or carpets and for the most part is or may be of well known construction. The operating parts of the loom are supported by the side frames 10 which may extend upwardly above the shed, as is usual to support the jacquard mechanism not shown, and between these upwardly extending portions of the side frames are mounted any desired number of harness frames 11 adapted to be shifted by the harness 12.

The breast beam 13 at the front of the loom is supported by uprights 14, and at the rear of the breast beam are provided the switch supporting brackets 15.

Below the breast beam is supported the usual take-up roll 16 which is driven by the worm gear 17 from a worm (not shown). The lay 18 is provided with the usual shuttle boxes 19 adapted to receive the shuttle 20, and each shuttle box in the present construction has a yielding rear wall or binder 21. The lay is supported by the lay swords 22 that rock upon the lower shaft 23 (see Fig. 3) and the lay may have the bar 24 adapted to support the upper ends of the reeds 25. The usual back and forth movement is imparted to the lay 18 by the crank shaft 26.

Below the woven fabric extending to the take-up roll 16 is supported the table or plate 27, and the shed is formed as usual by shifting the warp threads 28 to receive the weft thread and the pile forming wires 29. These wires may be held properly beaten up in the shed by the elements 30 as is usual. The mechanism so far described forms no essential part of the present invention but has been briefly set forth to make clear the operation of the mechanism of the present invention which will now be described.

The loom shown is driven in accordance with the present invention by a pair of electric motors 31, 32, which may be of either the alternating or direct current type, but as above stated the pair of motors should be constructed so that they will run at the same speed and deliver practically the same amount of power to the loom. The power shaft 33 of each motor has a gear 34 which meshes with a larger gear 35. To the gear 35 is secured a pinion 36 adapted to drive a large gear 37 that is rigidly secured to the crank shaft 26.

It will be seen from the train of reducing gears just described that the shaft 33 of the motor 31 is in positive driving engagement with one end of the crank shaft 26 and that the power shaft 33 of the motor 32 is in positive driving engagement with the other end of the crank shaft, so that part of the power required to operate the loom is applied at each side of the loom.

Since as above pointed out each motor is placed in positive driving engagement with the crank shaft, rotation of one motor independently of the other will be prevented, but the driving force which the field of each motor exerts upon its armature or rotor will constitute the yielding driving medium for effecting equalization of the turning torque exerted upon the crank shaft by the two motors.

It is important that means be provided for quickly bringing the loom to rest after the power is cut off, and this is accomplished, in accordance with the present invention, by providing the motors 31, 32 with the brakes 38, 39 upon the motor shafts 33. The brakes are preferably so constructed that they are normally applied to hold the motor shafts from rotating but may be released by supplying electric current to a solenoid associated with each brake, the arrangement being such that the brakes are held in their off position as long as current is supplied to the solenoid, but when the current is cut off the brakes will be automatically applied by constantly acting springs or the like to quickly arrest the rotation of the shafts 33 and stop the loom.

It will be seen from the foregoing that when a loom provided with the electrical drive of the present invention is to be started, it is necessary to supply current to the driving motor or motors and also to the solenoid brake or brakes, and that the loom is stopped by cutting off the current to the motors and brakes.

Various means may be employed for controlling the current to the motors and brakes, but it is important that the loom driving mechanism be at all times under the convenient control of the loom attendant. It is also desirable that means be provided for quickly stopping the loom when a shuttle is improperly boxed, and it is also important that means be provided whereby the brakes 38, 39 may be readily released without starting the motor so that the crank shaft may be rotated by hand.

These various conditions are provided for by the electrical connections which will now be described as constituting an important part of the present invention.

The circuits disclosed in Fig. 3 of the drawing are adapted to operate motors employing a three-phase current, but it would be a simple matter to modify the construction shown for the employment of motors requiring only two conductors. The operating current obtained from any suitable source of supply is conducted by the wires shown to the fuse block 40 and from this block it is supplied to the mechanism to be described through the conductors 1, 2, 3 upon closing the hand operated switch 41.

The conductors 1, 2, 3 lead to an electrically operated switch M which is adapted to control the motors 31, 32, and current to the solenoid brakes 38, 39 is controlled by a second electrically operated switch B. Current is supplied to the switch B by the wires 1′ and 2′, and since only two conductors are required for the solenoid brakes, the central contact of the switch B is shown as inactive. These switches M and B may be standard electrical control switches of well known construction having four contacts.

When the switch B is closed current is supplied to the solenoids of the brakes 38, 39 by the conductors B', B^2 as will be apparent from the drawing, to hold the brakes in their released or inactive position, but the brakes will be automatically applied by constantly tensioned springs or the like as soon as the current is cut off.

When the switch M is closed current will be supplied to the motor 31 by the conductors M^1, M^2, M^3, and to the motor 32 by the conductors $M^{1'}$, $M^{2'}$, $M^{3'}$, and each of these wires may be connected to a terminal board 42 located between the switch M and the motors.

The electrically actuated switch M is controlled by a solenoid or control coil CM and the electrically actuated switch B is similarly controlled by a solenoid or control coil CB. These two coils may be excited by circuits to be described to thereby close the switches M, B, and the closing of either of these switches serves to complete another control circuit to be described. This is accomplished by providing the switch B with the auxiliary contact switch S and the switch M with the auxiliary contact switch S′ which auxiliary switches are connected by the conductor *k*.

It will be seen from the electrical mechanism so far described that when it is desired to start the loom the coil CB is excited to close the switch B and release the brakes, and the coil CM is excited to close the switch M for supplying current to the motors.

The coil CB is included in the circuit 1′, *a*, control switch (to be described), *b*, master switch (to be described), *d*, *d′*, CB, 2′. The coil CM is included in the circuit 1′, *a*, control switch, *b*, master switch, *c*, terminal board 42, *c′*, CM, 2′.

The control switch consists of a start button switch 43 that is normally open and a stop button switch 44 that is normally closed and these two switches are connected in series in the circuit *a*, *b*, as will be apparent from Fig. 3. It is desirable that the start and stop buttons 43 and 44 be so arranged that they may be easily actuated by the loom operative from either side of the loom, and this is accomplished as will be apparent from Fig. 1 by providing the shipper rod 45 that extends transversely of the loom and is supported by a bracket 46 for movement in the direction of its length. One end of the rod 45 is connected by a pivot pin 47 to a rocking lever 48 which is pivotally mounted at 49 upon a fixed bracket, and the lever 48 is provided with the downwardly extending fingers which are positioned to depress the stops 43 and 44 as will be apparent from Fig. 1.

The arrangement is such that the shipper rod normally remains in an intermediate position, but when shifted to the right, viewing Fig. 1, it will move the start switch 43 to its closed position, but this switch will again open as soon as the shipper rod is released, and if this rod is moved to the left it will open the stop switch 44 which switch will close automatically as soon as the shipper lever is released.

The master switch above mentioned is shown as consisting of a base plate 50 having the contact b', b^2, b^3, located at one side of the rocking shaft 51 and the contacts b^4, b^5, located at the opposite side of said shaft, as shown. The shaft 51 is provide with the circuit closers 52, 53, 54, and the closer 52 has one contact adapted to engage the upper fixed contact b' while the closer 53 has two contacts adapted to engage b^2, b^4 and the closer 54 has two contacts adapt-

ed to engage b^3, b^5. The switch shaft 51 is manually shifted by a handle 55 upon the operating arm 56.

If the master switch is moved to the central or "o" position in which it is shown in Figs. 1, 3 and 4, all circuits will be opened and the loom will stand at rest with the brakes applied. If the switch arm 56 is shifted to the "I" position then the loom may be started by closing the start switch 43, and stopped by opening the stop switch 44. If the switch arm 56 is shifted to the "II" position then the brakes may be applied or released by operating the start and stop buttons but the motors will not be started, this being desirable to permit the loom to be operated by hand.

As above stated, it is desirable to provide means for stopping the loom when a shuttle is improperly boxed and this is accomplished by providing each shuttle with a switch actuator 57. The actuators may be rigidly secured to the dagger shaft 58 which extends transversely of the loom and is supported by the brackets 59 for rocking movement. Each actuator is controlled by a bell-crank lever 60 that is pivotally supported by the lay at 61, and one arm of this lever engages the movable rear wall or binder 21 of the shuttle box while the other arm is connected by a pin 62 to the actuator 57.

The arrangement is such that upon failure of the shuttle to become properly boxed at either side of the loom both actuators 57 will be moved by the dagger shaft 58 and other mechanism just described into position to shift the operating levers 63 which may be mounted at the opposite sides of the loom on the brackets 15. Each lever 63 rocks about a fixed pivot 64 and when an actuator 57 shifts a lever 63, the connected arm 65 is moved to open the limit switch 66. The two switches 66 are connected in series as shown by the conductor h. The object in providing two limit switches 66, each capable of stopping the loom, is to insure loom stoppage even if one switch should fail to function properly.

It is desirable to stop the loom in case either an overload or under-voltage occurs in the brake or motor circuits. This is accomplished by providing the three thermal relays R', R^2, R^3, of well known construction, and which are adapted to open the circuit in which they are included upon the occurrence of an overload in an adjacent circuit. The relays R', R^2, R^3, are connected in series by the wire j which is connected to the auxiliary contact switches S, S' by the conductor k. The thermal relay R', it will be noted, is placed between a pair of coils included in the circuit B', B^2, for the brakes, the relay R^2 is positioned between the coils included in the circuit $M^{1'}$, $M^{3'}$ to protect the motor 32 and the relay R^3 is between the coils included in the circuits M^1, M^3 to protect the motor 31.

The conductor j leads from the relay R^3 to the conductor i and from i through 66, h, 66 and c to e'. It may sometimes be desirable to release the brakes in working on the loom when a limit switch 66 is opened, and in order to accomplish this the shunt wires f, g are provided so that this shunt circuit is normally open but may be closed to shunt both switches 66 by moving the master switch to position "II".

Having described the construction of the various electrical elements shown and the circuits in which they are included, the results produced by operating the various switches will now be described.

Let it be assumed that the various switches described are in the position in which they are shown in Fig. 3, now in order to start the loom, switch 41 is first closed, and the master switch is moved to the "I" position. If the shipper rod 46 is now moved to the right to close the start button 43, current will flow through the conductors 1, 1', a, 43, e', 44, b, b^3, b^2, 53, d, d', CB, 2'; this will excite the coil CB to close the switch B. At the same time current will be supplied by the wire b through the circuit just traced to b', 52, c, 42, c', CM, and 2'; this will excite the coil CM and close the switch M. The closing of the switch M will start the motors 31, 32, to drive the loom, while the closing of the switch B will release the brakes.

Current will flow through the circuits just traced only so long as the start button 43 is held depressed by the shipper rod 45, and as soon as the shipper rod is released the switch 43 will open to interrupt the flow of current from the conductor a to the conductor b. However, as soon as the switches B and M are closed, current is permitted to reach the conductor b by flowing through the auxiliary switches S or S', k, relays R', R^2, R^3, j', i, the closed switch 66, h, second closed switch 66, e, closed switch 44 to b and thence to coils CB and CM in the manner above pointed out. The loom will continue to run as long as the switches just mentioned remain undisturbed, but should any one of the thermal relays act to interrupt the circuit in which they are included through the occurrence of an overload, or should either switch 66 be opened as a result of a shuttle being improperly boxed, or should the stop switch 44 be opened by manually moving the shipper rod 46, the circuit in which all of these switches are included in series would be broken, whereupon current would be cut off to the coils CB, CM, and the switches B and M will automatically open, thus cutting off the current to the motors and applying the brakes.

All of the switches just mentioned as included in series in the circuit leading from conductor k to b tend to close automatically so

that as soon as the condition which opened any one of these switches to stop the loom has been corrected, the loom may be again started by depressing the start button 43 as above described.

It sometimes is desirable to release the brakes when the loom is not running, so that the crank shaft may be turned over by hand. This may be accomplished by closing the magnetic switch B without closing the switch M, and in order to accomplish this the master switch is moved to the "II" position; then, if the shipper rod is now actuated to close the start button 43, current will flow through 1, 1′, *a*, 43, *e*′, 44, *b*, *b*⁴, 53, *d*, *d*′, CB, 2′; thus exciting CB to close the switch B and as soon as the switch B is closed current will flow through the various thermal relays, conductor *j*, *i*, 66, *h*, 66, provided these switches are closed, or through the shunt wires *g*, *f* if either or both these switches are open, then through *e*, 44, to *b*, and through the remaining portion of the circuit just described. When it is desired to again apply the brakes it is merely necessary to open the stop switch 44 to interrupt the supply of current to the conductor *b*, and this will deenergize the coil CB to thereby cause the switch B to open.

It will be seen from the foregoing that the loom motors and brakes can be readily controlled as desired by manually shifting the shipper rod as above described, and by moving the master switch to the different positions, I, *o*, II, as above pointed out, and if a shuttle is improperly boxed, or should either motor or the brakes be subjected to an overload or under-voltage, the loom will be promptly stopped. It will also be seen that by providing motors at the opposite sides of the loom so that each will help drive the crank shaft and other operating parts, the crank shaft of a wide loom will be subjected to less tortional strains than when the entire driving force is developed at one side of the loom, with the result that the loom may be easily started and stopped and will operate more smoothly than in the constructions employed heretofore.

What is claimed is:—

1. In a loom, in combination, a lay provided with shuttle boxes, a crank shaft for moving the lay towards and from the front of the loom, an electric motor, gearing connection between the motor and loom for driving the crank shaft, an electrically controlled brake for the motor, a pair of electrically operable switches one for starting and stopping the motor and the other for controlling the application and release of the brake, an electric circuit for actuating said switches, and manually operable switch mechanism in said circuit and adapted to shift either a single control switch to actuate the brake, or both of said switches simultaneously to control the brake and motor.

2. In a loom, in combination, a lay provided with shuttle boxes, a crank shaft for moving the lay towards and from the front of the loom, an electric motor, gearing connection between the motor and loom for driving the crank shaft, an electrically controlled brake for the motor, a pair of magnetic switches one for controlling the loom operating motor and the other for controlling the application and release of the brake, an electric circuit including electro-magnets for operating said switches, and switch mechanism in said circuit for shifting either one or both of said magnetic switches including starting and stopping switches mounted on the loom, and a master switch mounted on the loom and operable to place the brake alone or the brake and motor under the control of the starting and stopping switches.

3. In a loom, in combination, a lay provided with shuttle boxes, a crank shaft for operating the lay, an electric motor geared to the lay to drive the same, an electrically controlled brake for the motor, a pair of electrically operable switches one for controlling the motor and the other for controlling the brake, an electric circuit for controlling said switches, and cooperating manually operable switches mounted upon the loom in said circuit and operable to either shift said automatic switches simultaneously or one switch independently of the other to thereby control the brake and motor or the brake alone.

4. In a loom, in combination, a lay provided with shuttle boxes, a crank shaft for operating the lay, an electric motor for driving the loom, a normally applied brake that acts upon the motor to stop the loom and adapted to be electrically released, a pair of electrically operable switches one for controlling the operation of the motor and the other for releasing the normally applied brake, an electric circuit for controlling said switches, and manually operable switches mounted on the loom and selectively movable to either actuate the electrically operable switches for simultaneously releasing the brake and starting the motor to drive the loom, or releasing the brake without starting the motor.

5. In a loom, in combination, a lay provided with shuttle boxes, a crank shaft for operating the lay, a motor geared to the crank shaft to positively drive the loom, an electrically controlled brake for the motor, an electric circuit for controlling the motor and brake, a manually operable switch in said circuit for releasing the brake and starting the motor and also operable to release the brake without starting the motor, a shipper rod at the front of the loom for actuating said switch, and a switch operable by a movable part of the loom to stop the motor and apply the brake upon the occurrence of an abnormal condition in the operation of the loom.

6. In a loom, in combination, a lay provided with shuttle boxes, a crank shaft for operating the lay, an electric motor for rotating the crank shaft, an electrically controlled brake for the motor, a pair of electrically operable switches one for controlling the motor and the other for controlling the brake, an electric circuit for actuating said switches, manually operable switch mechanism in said circuit including starting and stopping switches and a skipper rod for actuating said switches to either release the brake and start the motor or release the brake without starting the motor, and a switch operable by a movable part of the loom to stop the motor and apply the brake upon the occurrence of an abnormal condition in the operation of the loom.

7. In a loom, in combination, a lay provided with shuttle boxes, a crank shaft for operating the lay, an electric motor for rotating the crank shaft, an electrically controlled brake for the motor, a pair of electrically operable switches upon the loom one for controlling the motor and the other for controlling the brake, an electric circuit for actuating said switches, a switch in said circuit operable by a movable part of the loom to stop the motor and apply the brake upon the occurrence of an abnormal condition in the operation of the loom, manually controlled switch mechanism in said circuit for simultaneously operating said electrically operable switches to release the brake and stop the motor and also operable to release the brake without starting the motor, and a shunt in said circuit controlled by said switch mechanism for shunting the switch that is actuated by said abnormal condition of the loom.

8. In a wide loom, in combination, a lay, a crank shaft for operating the lay, power driving mechanism for the loom, comprising a pair of electric motors mounted at the opposite sides of the loom and constructed to operate at the same speed, a positive driving connection between each motor shaft and the crank shaft whereby rotation of one motor shaft independently of the other is prevented by the loom crank shaft, an electric brake for each motor, and switch mechanism for controlling the brakes and motors.

9. In a wide loom, in combination, a lay, a crank shaft for operating the lay, power driving mechanism for the loom, comprising a pair of electric motors geared to the opposite ends of the crank shaft, a positive driving connection between each motor shaft and the crank shaft whereby the turning torque of each motor is positively imparted to the crank shaft, an electric brake upon each motor shaft, and switch mechanism mounted on the loom for releasing the brakes and starting the motors and for stopping the motors and applying the brakes.

10. In a wide loom, in combination, a lay, a crank shaft for operating the lay, power driving mechanism for the loom, comprising a plurality of electric motors, a positive driving connection between each motor shaft and the crank shaft whereby the turning torque of each motor is positively imparted to a different portion of the crank shaft, an electric brake associated with each motor to stop the loom, a switch for controlling the motors, a second switch for controlling the brake mechanism, and means for operating said switches simultaneously and also adapted to operate one switch independently of the other including starting and stopping switches and a master switch operable to place the brakes alone or the brakes and motor under the control of the starting and stopping switches.

11. In a wide loom, in combination, a lay, a crank shaft for operating the lay, power driving mechanism for the loom, comprising a plurality of electric motors, a positive driving connection between each motor shaft and the crank shaft of the loom for transmitting the turning torque of each motor to the crank shaft and arranged so that the driving action of each electric field of a motor upon its armature constitutes the yielding driving medium for equalizing the turning torque exerted upon the shaft by each motor, an electric brake for each motor, and switch means controlling the motors and brakes for starting and stopping the motors.

12. In a loom, in combination, a lay provided with shuttle boxes, a crank shaft for operating the lay, power driving mechanism for the loom, comprising a pair of electric motors disposed at the opposite sides of the loom, a positive driving connection between each motor shaft and the crank shaft of the loom for transmitting the turning torque of each motor to the crank shaft and arranged so that the driving action of each electric field of a motor upon its armature constitutes the yielding driving medium for equalizing the turning torque exerted upon the shaft by each motor, an electric brake for each motor, and switch mechanism for effecting the simultaneous release of the brakes and starting of the motors.

13. In a loom, in combination, a lay provided with shuttle boxes, a crank shaft for operating the lay, power driving mechanism for the loom, comprising a pair of motors, a driving connection between each motor shaft and the loom crank shaft of the loom, an electrically controlled brake for each motor, an electrically operable switch for controlling the motors, a second electrically operable switch for controlling the brakes, an electric circuit for actuating said switches, starting and stopping switches included in said circuit, a shipper rod at the front of the

loom for actuating said switches and a master switch upon the loom and operable in connection with the shipper rod to either open or close said electrically operable switches simultaneously or for operating one independently of the other.

14. In a loom, in combination, a lay provided with shuttle boxes, a crank shaft for operating the lay, a driving motor for the loom, an electrically controlled brake for the motor, a pair of electrically operable switches one for controlling the motor and the other for controlling the brake, an electric circuit for actuating said switches, a manually controlled start switch and a manually controlled stop switch in said circuit for starting and stopping the motor, and a master switch in said circuit and shiftable to one position to place both electrically operable switches under the control of the start and stop switches and movable to a second position to place the brake but not the motor under the control of the start and stop switches.

In testimony whereof, we have signed our names to this specification.

EDWIN W. STONE.
EUGENE MARTIN.