May 4, 1937. R. G. LOCKETT 2,079,124

CONTROLLER FOR ELECTRIC MOTOR DRIVEN DEVICES

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Fig. 1

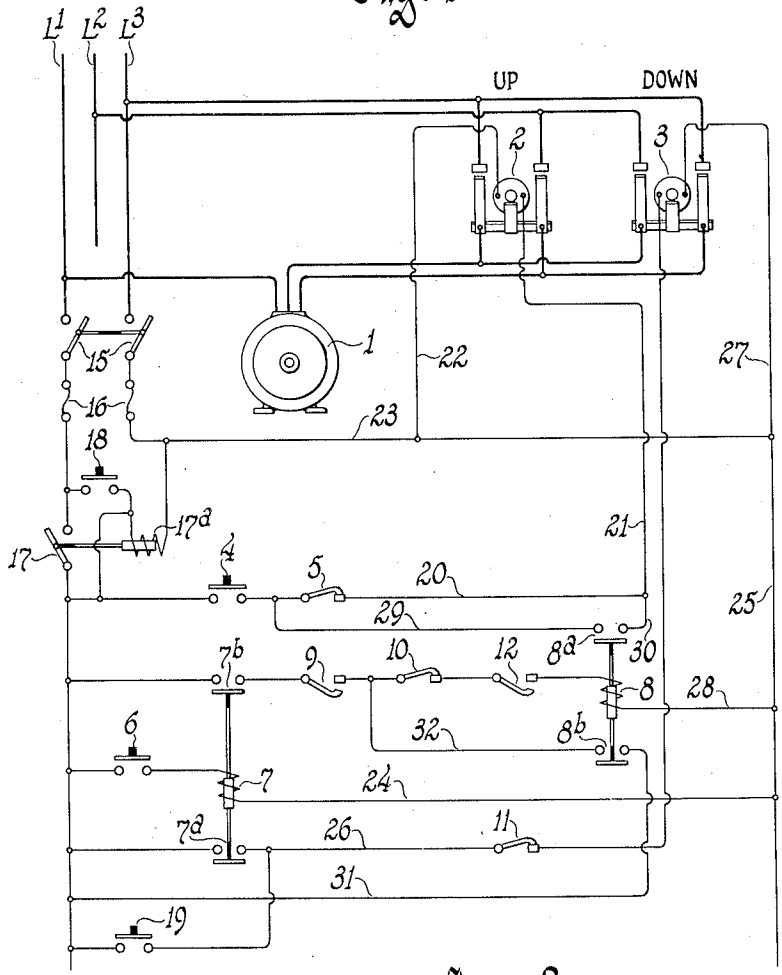
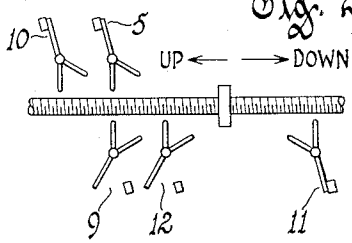


Fig. 2



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CONTROLLER FOR ELECTRIC MOTOR DRIVEN DEVICES

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6 Claims. (Cl. 172—239)

This invention relates to improvements in controllers for electric motor driven devices.

In practice there are instances where it is desired to drive the driven device in a given direction into a limit, then to effect a relatively small reverse movement of the driven device, and thereafter to effect a relatively small movement of the driven device in the first mentioned direction preparatory to effecting return of the driven device to its initial position. Such control is desired in connection with roller dams where for inspection a roller is hoisted to a given position and then lowered slightly on to hooks to relieve the hoisting chains of strain. The hooks are ordinarily manually placed in position beneath the roller when hoisted to the given position, and the roller is customarily again hoisted to allow withdrawal of the hooks.

As in the example of the roller dam it is sometimes necessary to employ geared limit switches as distinguished from those subject to direct actuation, whereas the reverse movement of the driven device to bring it into the desired position of rest is so slight as to render exceedingly difficult resetting of the limit switch relied upon to arrest the initial operation mentioned. Thus where further operation in the initial direction is needed preparatory to further reverse operation great difficulty has been experienced in affording a simple, inexpensive and reliable control.

This invention has among its objects to overcome the difficulties heretofore experienced in such instances, and particularly to avoid need of resetting the limit switch in order to obtain the cycle mentioned.

Another object is to provide simple, inexpensive and reliable means which will afford the aforementioned cycle of operation and which may readily be incorporated in a controller affording such additional control of the roller dam or other device as may be desired.

Various other objects and advantages of the invention will hereinafter appear.

The accompanying drawing illustrates diagrammatically one embodiment of the invention, it being understood that the invention may be embodied in other forms without departing from the scope of the appended claims.

In the drawing,

Fig. 1 is a circuit diagram, while

Fig. 2 is a limit switch diagram.

Referring to Fig. 1 of the drawing, the same shows an alternating current motor 1 which it may be assumed is employed to raise and lower a roller dam. As will be understood, it is customary to provide for various operations of the dam roller, but for simplicity of illustration many of the provisions of the usual control have been omitted from the drawing.

As illustrated the motor is supplied from lines L^1, L^2 and L^3 through reversing switches 2 and 3. The left hand terminal of the motor is connected directly to line L^1 while the right hand terminal of the motor is adapted to be connected to line L^2 through the right hand pole of switch 2, or alternatively to line L^3 by the right hand pole of switch 3. The center terminal of the motor is adapted to be connected to line L^3 through the left hand pole of switch 2, or alternatively to line L^2 through the left hand pole of switch 3. As will be understood, it is customary to provide an additional contactor for interrupting all line connections of the motor, but such contactor has been omitted for simplicity of illustration. It may be assumed that closure of switch 2 effects operation of the motor to raise the dam roller, while closure of switch 3 effects reverse operation of the motor to lower the dam roller.

The additional control means illustrated comprises a push buttom switch 4 to complete an energizing circuit for the up reversing switch 2 through a limit switch 5, and a push button switch 6 to effect energization of down reversing switch 3. The switch 6 effects energization of reversing switch 3 by energizing a relay 7 which in turn closes the energizing circuit of reversing switch 3, through a limit switch 11. The relay 7 has contacts 7^a to complete the connections described, and also has contacts 7^b which complete an energizing circuit for a relay 8 through limit switches 9, 10 and 12, and relay 8 has contacts 8^a to short-circuit limit switch 5, and contacts 8^b to establish for itself a maintaining circuit through limit switches 10 and 12.

Referring to Fig. 2, the limit switches which in practice may be of any preferred type are arranged to be actuated by the driven device in any preferred manner as through a screw and traveling nut so that when the dam roller is raised to a given position limit switch 5 will open and when the roller is raised to a second given position the limit switch 10 will open. The limit switch 9 which is shown open is arranged to be closed when limit switch 5 opens, while the limit switch 11 is arranged to be opened when the dam roller is moved downward to some given position below its aforementioned hooked position. The limit switch 12 which is shown open is arranged to be closed slightly ahead of limit switch 9 as the dam roller is raised and to be reopened after reclos-

ing of limit switch 10 and reopening of limit switch 9 when the dam roller is lowered.

The control circuits above mentioned are supplied from lines L^1 and L^3 through a suitable knife switch 15 and fuses 16. Also the connection to line L^1 includes a low voltage switch 17 having an operating and holding winding 17^a connected across lines L^1 and L^3 below the switch 17. To initially energize the winding 17^a to close the switch 17 there is provided a push button switch 18 in accordance with the usual practice.

As will appear, use of the means controlled by push button switch 6 to lower the dam roller below its hooks effects needless operations of certain of the instrumentalities, and as illustrative of otherwise providing for lowering below the hooks there is shown a push button switch 19 which directly energizes reversing switch 3 subject to deenergization by limit switch 11.

Considering now in further detail the control afforded by the instrumentalities illustrated, and assuming the dam roller to be lowered to the limit set by limit switch 11 it may be raised by pressing push button 4. Closure of push button switch 4 completes circuit from line L^1 through switch 15, a fuse 16 and switch 17 to and through the limit switch 5, by conductors 20 and 21 through the winding of reversing switch 2 by conductors 22 and 23 through a fuse 16 and switch 15 to line L^3. Thus assuming continued depression of the push button switch 4 the motor is started and raises the dam roller until the limit switch 12 is closed and the limit switch 5 is opened. During this roller raising operation the relay 8 remains ineffective to close the short-circuit around the limit switch 5, due to the fact that the limit switch 9 in circuit with the winding of the relay 8 is open.

After the roller has been arrested by opening of the limit switch 5 which as aforestated effects closure of limit switch 9, the roller may be lowered on to its supporting hooks by operation of push button switch 6. Closure of switch 6 completes circuit from line L^1 though the winding of relay 7 by conductors 24, 25 and 23 to line L^3. Relay 7 then responds, completing circuit from line L^1 through its contacts 7^a by conductor 26 through the winding of reversing switch 3, by conductors 27 and 23 to line L^3. This effects lowering of the dam roller and when the roller engages its supporting hooks the push button switch 6 is released to deenergize reversing switch 3 to stop the motor.

At the same time that the relay energizes the reversing switch 3 it completes a circuit from line L^1 through its contacts 7^b to and through the now closed limit switch 9 and limit switches 10 and 12 to and through the winding of relay 8 by conductors 28, 25 and 23 to line L^3. Relay 8 thereupon responds to establish through conductors 29 and 30 a short-circuit for limit switch 5, and furthermore to establish for itself a maintaining circuit which extends from line L^1 by conductor 31 through contacts 8^b by conductor 32 through limit switches 10 and 12 to and through its winding as already traced. Thus relay 8 is maintained energized to maintain the limit switch 5 short-circuited after the switch 6 is released and relay 7 is deenergized, and as will be apparent this short-circuit of limit switch 5 again renders push button switch 4 effective when depressed to energize reversing switch 2.

Thus when it is desired to lift the dam roller from its hooks preparatory to lowering said roller it is only necessary to again depress switch 4 to energize reversing switch 2. Assuming the push button 4 to be held depressed, the roller will be raised until limit switch 10 is opened whereupon relay 8 will be deenergized to interrupt the circuit of reversing switch 2, said relay remaining deenergized until switch 6 is again operated.

After the dam roller has been raised from its hooks and arrested by the opening of the limit switch 10 the roller may be lowered by depressing push button switch 19. This establishes a circuit paralleling the contacts 7^a of relay 7, thus completing the energizing circuit of reversing switch 3 subject to interruption thereof by limit switch 11. Should the switch 6 be depressed instead of switch 19 it also would energize reversing switch 3 but in so doing would energize relay 7 which in turn would again energize relay 8. However, relay 8 would be deenergized upon opening of limit switch 12 which as explained opens upon resetting of the limit switches used in placing the dam roller on its hooks and removing it therefrom, whereby interference with subsequent hooking operations is prevented.

If after response of the relay 8 to short-circuit limit switch 5 as hereinbefore set forth there should be a failure of voltage said relay will not respond automatically upon restoration of voltage. However, the relay may be reset by momentarily closing push button switches 18 and 6 to reset the low voltage relay and to energize momentarily the relay 7, the latter in turn reenergizing relay 8 which upon responding reestablishes its maintaining circuit.

What I claim as new and desire to secure by Letters Patent is:

1. In a controller for a motor utilized to drive a device in one direction to a given limit, then return it a slight distance to a given position, and thereafter drive it in the direction first mentioned to a second limit, in combination, means for effecting operation of the motor in reverse directions selectively, a limit switch to stop the motor when the driven device is driven as aforestated to the first limit, and a limit switch to stop the motor when the driven device is subsequently driven to said second limit, said means comprising means to effect after tripping of the first limit switch completion of the aforestated cycle while said first limit switch remains tripped.

2. In a controller for a motor employed to drive a device in one direction to a first limit, then return it a relatively slight distance to a given position, and thereafter continue its drive in the direction first mentioned to a second limit, in combination, means for effecting operation of the motor in reverse directions selectively, a limit switch to stop the motor when the driven device is driven as aforestated to said first limit, and a limit switch to stop the motor when the driven device is driven to said second limit, said means comprising means to shunt the first mentioned limit switch when the motor is reversed following the tripping of said first limit switch and for maintaining said shunt pending motor operation to trip the second mentioned limit switch.

3. In a controller for a motor employed to drive a device in one direction to a first limit, then return it a relatively slight distance to a given position, and thereafter continue its drive in the direction first mentioned to a second limit, in combination, means for effecting operation of the motor in reverse directions selectively, a limit switch to stop the motor when the driven device

is driven as aforestated to said first limit, and a limit switch to stop the motor when the driven device is driven to said second limit, said means comprising a relay responsive upon reversal of the motor after tripping of the first mentioned limit switch to shunt the latter and to establish for itself a maintaining circuit including the second mentioned limit switch.

4. In a controller for a motor employed to drive a device in one direction to a first limit, then return it a relatively slight distance to a given position, and thereafter drive it in the direction first mentioned to a second limit, in combination, means comprising two push button switches to effect reverse operation of the motor, the direction being determined by the push button pressed, a limit switch to stop the motor when the driven device is driven as aforestated to said first limit, a second limit switch to stop the motor when the driven device is subsequently driven to the aforementioned second limit, said means comprising means rendering said two push button switches effective to direct the full cycle aforementioned and to render non-essential to continuance of the cycle resetting of the first limit switch.

5. In a controller for a motor employed to drive a device in one direction to a first limit, then return it a relatively slight distance to a given position, and thereafter continue its drive in the first mentioned direction to a second limit, in combination progressively operated limit switches and means for effecting motor operation in reverse directions, said means comprising means to shunt the first tripped limit switch when reversing the motor operation and to stop the motor while maintaining said shunt, and further comprising means to interrupt said shunt upon tripping of the second limit switch.

6. In a controller for a motor employed to drive a device in one direction to a first limit, then return it a relatively slight distance to a given position, and thereafter continue its drive in the first mentioned direction to a second limit, in combination progressively operated limit switches and means for effecting motor operation in reverse directions, said means comprising means to shunt the first tripped limit switch when reversing the motor operation, and to maintain said shunt subject to interruption by tripping of another of said limit switches and further comprising a push button switch effective to start the motor for arrest by one of said limit switches and to restart the motor for arrest by another of said limit switches.

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