

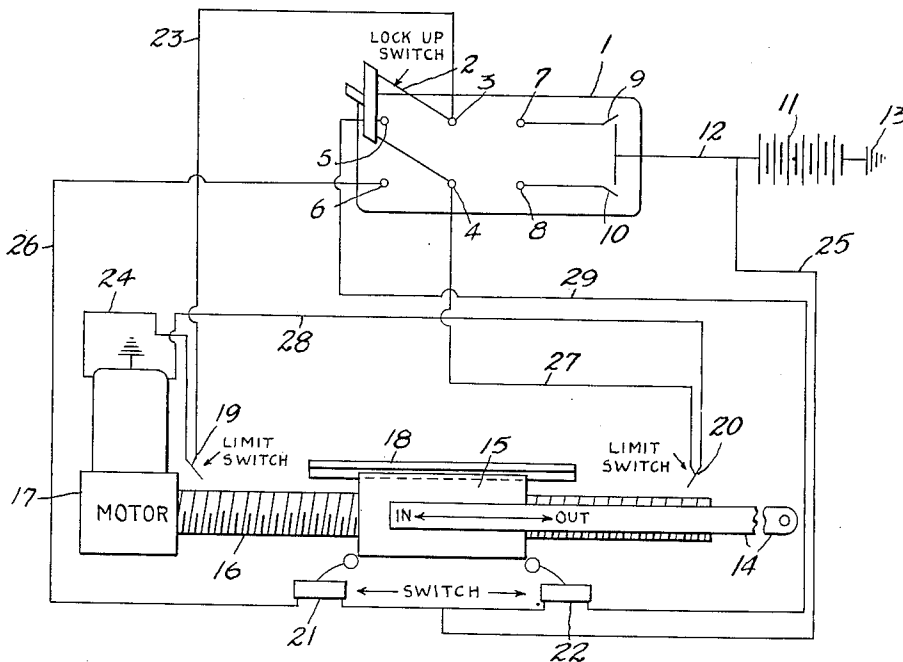
July 4, 1961

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2,991,403

ELECTRICALLY CONTROLLED ACTUATOR

Filed April 21, 1959



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ELECTRICALLY CONTROLLED ACTUATOR

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Filed Apr. 21, 1959, Ser. No. 807,938

5 Claims. (Cl. 318-266)

This invention relates to what I term an actuator for operating mechanisms, apparatus or the like of any type and kind, wherein means is provided to stop movement of the actuator element at any position in its travel and, further, wherein switch means is employed to automatically return and maintain the element in a central or normal rest position.

More particularly, the invention deals with a device of the character described, wherein the means for moving the element in opposed or in and out directions comprises a reversible electric motor.

Still further, my invention deals with a device of the character described, wherein means is provided for limiting travel of the actuator element in both directions.

Still more particularly, the invention deals with a device of the character described employing a lock-up switch spring actuated to normally maintain the element in the central or normal rest position.

The novel features of the invention will be best understood from the following description, when taken together with the accompanying drawing, in which certain embodiments of the invention are disclosed and, in which, the figure comprises a diagrammatic illustration of an actuator and the circuit controlling operation of the actuator.

In illustrating one adaptation and use of my invention, I have diagrammatically illustrated in the drawing at 1 a control panel, upon which is arranged a spring loaded double pole lock-up switch 2 pivoted on the post or terminals 3 and 4 and normally maintained in engagement with companion posts or terminals 5 and 6, respectively. On the panel are other pairs of other posts or terminals 7 and 8, with which the switch 2 is adapted to couple in completing circuits through directional control switches 9 and 10 placed in circuit with a source of electric supply 11 through a wire 12. The circuit 11 is preferably a grounded circuit, as indicated at 13.

At 14 I have shown my actuator element which is fixed to an elongated nut-like member 15, the threaded bore of which operates upon an elongated feed screw 16 driven by a reversible electric motor 17 in controlling the in and out or reverse drives of the element 14. In the diagrammatic showing, the member 15 is shown in its central or normal rest position. To prevent the nut 15 from rotating, suitable elongated key means 18 is employed which operatively engages the nut in its movement longitudinally of the screw 16.

At 19 and 20 are diagrammatically illustrated normally closed limit switches finally checking the in and out motion to the element 14, the switch 19 checking the in motion and the switch 20 checking the out motion. These switches are normally closed and are actuated by the nut member 15 to break the circuit therethrough.

Adjacent the central station of the nut member are arranged two other switches 21 and 22 which, when the member 15 is in the central position, are normally open. However, when the element 14 is moved in either the in or out directions, the switches 21 and 22, respectively, will be closed in completing circuits, later described. Descriptively speaking, the switches 21 and 22 may be termed reversing switches.

In order to render the actuator foolproof in operation in the drive of a mechanism or apparatus through the medium of the element 14, the switch 2 must be manually

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moved into and held against its spring loading, not shown, into position where the two poles of the switch engage the posts 7 and 8 in completing the circuit to the switches 9 and 10, these latter switches being normally open and manually controlled. The switch 2, by virtue of its spring loading, normally completes the circuit through the posts 5 and 6.

With the switch 2 held in engagement with 7 and 8, to start actuation of the element 14 in either one of the in or out directions, one of the switches 9 and 10 must be manually operated and held in position to complete the circuit therethrough. Let us say, for example, that the switch 9 is actuated, this switch controlling the in motion of the element 14. It will, thus, be apparent that the circuit is completed through the wire 23 to the closed limit switch 19 and, thus, to the motor 17 through the wire 24 and, then, to ground, causing the motor to actuate the screw 16 in a direction to feed the nut member 15 to the left or the in direction. At any time during this operation, the breaking of the circuit through switch 9 will cause the motor to stop, thus locating the nut member 15 and the element 14 in this predetermined or desired stop position, it being understood that the switch 2 is manually held in engagement with the posts 7 and 8 during this operation.

In the foregoing operation, the movement of the member 15 to the left, or the in direction, will cause the switch 21 to be actuated to close the circuit through the wires 25 and 26, the latter being connected with the post 6. Now, at this time, if manual pressure on the switch 2 should be accidentally or otherwise released, the switch 2 will automatically move into position contacting the posts 5 and 6 and, thus, completing the circuit through a wire 27 through the closed limit switch 20 and through a wire 28 coupled with the motor 17 to reverse rotation of the screw 16 in returning the member 15 to its central position, as shown in the drawing. During this latter operation, the switch 21 keeps the circuit closed, until 15 reaches the central position; whereupon, the circuit will be broken automatically through the switch 21.

In the reverse operation, in other words, in manually actuating the out switch 10, the circuit is completed through the wire 27, limit switch 20 and wire 28 to the motor to actuate the element 14 to the right or in the out direction. This operation will, as will be apparent, close the circuit through the switch 22.

Now, if the circuit is broken through the switch 10, the element 14 can stop in any desired position. However, upon movement of the switch 2 into engagement with the posts 5 and 6, the circuit will then pass through wire 25, switch 22, wire 29 to the post 5, through the switch 2, wire 23, through the limit switch 19 and wire 24, thus reversing rotation of the motor 17 to cause the member 15 to move in the in direction to its central position; whereupon, circuit through the switch 22 is broken.

From the foregoing, it will be apparent that, when the switch 2 is held in engagement with the posts 7 and 8 and either one of the switches 9 and 10 are held closed, when the member 15 reaches the limit of its in or out travel, the circuit through the switches 19 or 20 will be broken, thus stopping operation of the member 17. At this interval, the switch 2 is released to allow the same to automatically return into position completing the circuit through posts 5 and 6; whereupon, the switch 21, or 22, which is held closed with 15 at the end of its in or out travel will complete the circuit to the motor through the opposed switch 19 or 20 to cause the member 15 to be moved in the opposed direction until it reaches the neutral position.

In the foregoing operation, it will be apparent that the manual closing of one of the switches 9 or 10 has also

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been released and the apparatus is now ready for a next successive operation in the direction desired by repeating operations of the switches 2 and 9 or 10.

Having fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. An electrically controlled actuator, comprising an actuator element, means for moving said element in opposed directions, two manually and independently actuated switches, a lock-up switch and two reversing switches in electric circuits to said means, one manually actuated switch controlling actuation of the element by said means in one direction, the other manually actuated switch controlling actuation of said element by said means in the second or opposed direction, and said lock-up switch being manually held in closed circuit with said first named manually operated switches, whereby breaking the circuit through either of the first named switches will control degree of movement of said element in either of said directions of operation, and means whereby release of said lock-up switch will complete circuits to said reversing switches and said means to automatically return said element from its moved direction to a neutral stop position in either directional movement of said element.

2. An actuator as defined in claim 1, wherein said first named means comprises a reverse drive electric motor actuating a feed screw, and a member in threaded engagement with said screw, in connection with which said element is coupled.

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3. An actuator as defined in claim 1, wherein said circuits include a pair of normally closed limit switches automatically controlling actuation of the reversing switches in returning the element to neutral position upon completing the limit of travel of the element in either direction.

4. An actuator as defined in claim 1, wherein said manually actuated switches and lock-up switch are arranged on a control panel having two pairs of posts, and said lock-up switch comprises a double pole switch operatively engaging one pair of posts in completing electric circuits to said manually actuated switches and engaging the other pair of posts in completing electric circuits to said reversing switches.

5. An actuator as defined in claim 2, wherein said member extends sufficiently along the screw to close the circuit through said reversing switches for the limit of travel of the element in both directions, and said reversing switches are sufficiently spaced to clear said member in the normal stop motion position of the member intermediate said reversing switches.

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