

March 15, 1938.

R. W. GOFF

2,111,424

CONTROL DEVICE

Original Filed Feb. 28, 1935

FIG. 1.

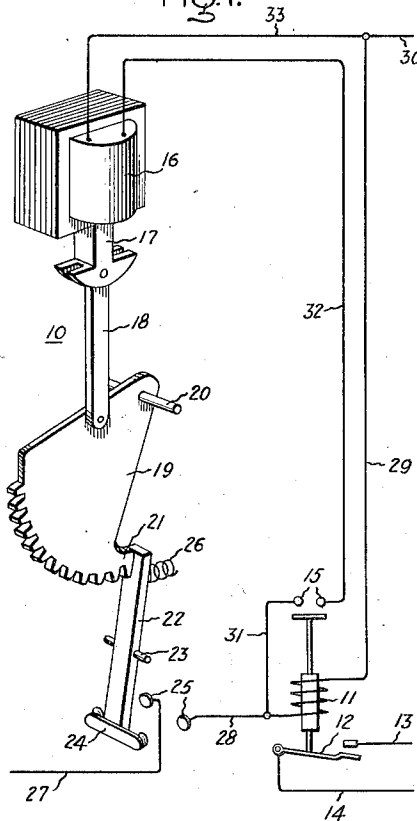


FIG. 2.

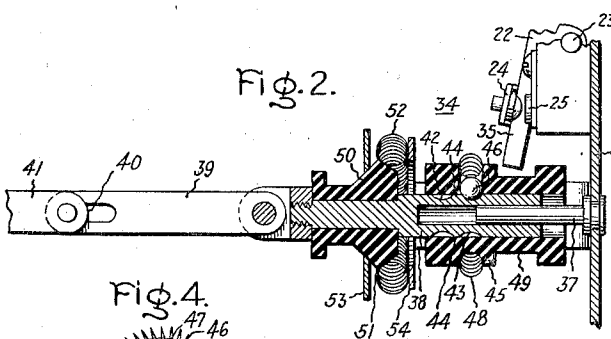


FIG. 3.

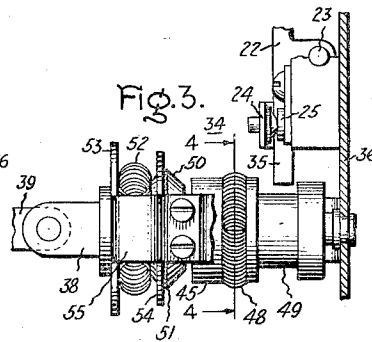
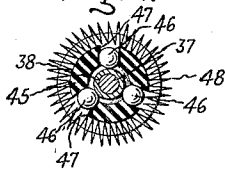


FIG. 4.



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UNITED STATES PATENT OFFICE

2,111,424

CONTROL DEVICE

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Original application February 28, 1935, Serial No.
8,652, now Patent No. 2,064,656. Divided and
this application August 29, 1936, Serial No.
98,468

5 Claims. (Cl. 74-100)

This application is a division of my copending application, Serial No. 8,652, filed February 28, 1935, entitled "Electroresponsive devices", now Patent No. 2,064,656.

5 The present invention relates to control devices, more particularly to control devices which are operable with a snap action in one direction to carry out a predetermined control function and which immediately upon completion of the
10 control function are automatically operable with a snap action in a reverse direction, and has for an object the provision of a simple, reliable, and inexpensive control device of this character.

15 In my above referred to patent, I have described and claimed a combined automatic undervoltage and push-button operated manual control station in which a switch member is automatically operable to its open circuit position with a time delay in response to undervoltage conditions and is manually operable to its
20 open circuit position at will without a time delay. It is sometimes desirable to operate a control station of this type from a remote point, for example by means of a long control lever or shipper rod and it is a further object of my
25 invention to provide a control device which is operable by means of a shipper rod to move a circuit controlling switch member to its closed circuit position to energize a control station of the above referred to type and which is then
30 immediately retracted to free the switch member for automatic operation to its open circuit position while providing for manual operation of the switch member to its open circuit position at will.

35 In carrying out my invention in one form, I provide a control device which is manually operable with a snap action in one direction to close a pair of contacts for energizing an electroresponsive device, the control device being arranged for automatic snap action in a reverse
40 direction to free the contacts for automatic operation to their open circuit position by the electroresponsive device at any time. More specifically, the control device comprises a pair of relatively movable members, means for operating one of the members with a snap action, and means for driving the other member for movement with the first member. Stop means are
45 provided for limiting the movement of the other member and means are provided for operating the other member in a reverse direction with a snap action immediately subsequent to its engagement with the stop means.

50 For a more complete understanding of my

invention, reference should now be had to the drawing in which Fig. 1 is a somewhat diagrammatic view of an undervoltage control station provided with an electroresponsive device of the type described and claimed in my above referred
5 to patent, only so much of the electroresponsive device being shown as is necessary for an understanding of the present invention; Fig. 2 is a fragmentary sectional view of a snap acting control device embodying my invention applied to
10 the electroresponsive device shown in Fig. 1; Fig. 3 is an elevational view of the device shown in Fig. 2 with certain parts broken away more clearly to illustrate the constructional details; and Fig. 4 is a sectional view taken along the
15 line 4-4 of Fig. 3.

Referring now to Fig. 1, I have shown, in order to facilitate a complete understanding of the present invention, an undervoltage control station comprising an electroresponsive device
20 10 for controlling the energizing winding 11 of a contactor 12 which is connected in a load circuit represented by a pair of conductors 13 and 14 and which is provided with a pair of interlock contacts 15. For the purposes of the present
25 invention, the electroresponsive device 10 may be described as comprising an energizing winding 16 and a movable magnetic element 17 normally biased by gravity to its unattracted position and connected by means of a link 18 to a segmental
30 gear 19 which is pivoted on a pin 20. When the segmental gear 19 is in the position shown in the drawing, an end portion 21 thereof engages a switch member 22 which is mounted on a pivot pin 23 and provided with a bridging member 24
35 in cooperating relation with a pair of contacts 25, the segmental gear 19 being effective in this position to maintain the bridging member 24 in its open circuit position against the biasing force exerted on the switch member 22 by a spring 26.

40 When the switch member 22 is operated to its closed circuit position to engage the bridging member 24 with the contacts 25, an energizing circuit for the winding 11 of the contactor 12 is completed which may be traced from the supply conductor 27 through the contacts 25, a conductor 28, the winding 11, and by way of a conductor 29 to a supply conductor 30. Simultaneously with the closing of the contactor 12, the interlock contacts 15 are closed to establish an
50 energizing circuit for the electroresponsive device 10, which circuit may be traced from the supply conductor 27 through the contacts 25, the conductors 28 and 31, the interlock contacts 15, a conductor 32, the energizing winding 16, and by
55

way of a conductor 33, to the supply conductor 30. Upon the energization of the winding 16, the magnetic element 17 is moved to its attracted position and the segmental gear 19 is moved about its pivot so that the portion 21 thereof is disengaged from the switch member 22.

Upon the occurrence of a predetermined decrease in the voltage existing across the supply conductors 27 and 30, winding 16 will be substantially deenergized and the movable magnetic element 17 will be freed for movement to its unattracted position. Movement to this position however will be restrained, as is fully described in my above referred to patent, by engagement of the segmental gear 19 with suitable time delay mechanism (not shown). Therefore, after a predetermined time delay, the portion 21 of the gear 19 engages the switch member 22 to interrupt the holding circuit for the energizing winding 16 and the contactor 12. Thereafter, the contactor 12 and the electroresponsive device 10 may be reenergized only by manually operating the switch member 22 to its closed circuit position.

In my above referred to patent, suitable push-button means are provided for initially energizing the contactor 12 and the electroresponsive device 10 and for manually operating the switch member 22 to its open circuit position. In some cases, however, for example in the control of manufacturing machinery, it is desirable to operate the electroresponsive device from a remote point and this may be advantageously accomplished by means of the snap acting control device 34 shown in Figs. 2, 3 and 4.

As shown, the snap acting control device 34 is arranged to operate directly on the switch member 22 and for convenience the switch member is extended a short distance below the operating member 24, this extension being identified by the reference numeral 35.

Secured to a base 36 of the electroresponsive device 10 is a pin 37 on which is slidably mounted a reciprocal member 38 to which is pivotally connected a link 39 arranged to be operated through a lost motion connection 40 by any suitable operating lever such as a shipper rod, one end of which is indicated by the reference numeral 41. The reciprocal member 38 is provided with two longitudinally spaced circumferential depressions 42 and 43, the adjacent walls of which meet in a crest 44, and a control member 45 preferably formed of insulating material is slidably mounted on the reciprocal member 38 and normally held in one or the other of two positions by spring-pressed driving means comprising a plurality of steel balls 46 disposed in guides 47 in the control member 45. The control member 45 is also provided with an annular groove in which is mounted a circular spring 48 for urging the balls 46 into one or the other of the depressions 42 and 43.

In order to operate the switch member 22 between open and closed circuit positions, the control member 45 is provided with a circular groove 49 into which projects the extension 35 of the switch member, the sides of the groove 49 serving as the sole operating connection between the operating lever 41 and the switch member 22. Secured to the reciprocal member 38 is a cam 50 having oppositely inclined faces meeting in a crest 51, and a circular spring 52 is provided for engaging one or the other of the inclined faces of the cam 50 in order to move the reciprocal member 38 with a snap action, the spring 52 being

held against movement by a pair of spaced plates 53 and 54 secured to the base 36 by means of a supporting arm 55.

When it is desired to energize the device 10 and the contactor 12, the shipper rod 41 is operated in a right-hand direction as viewed in the drawing, to take up the lost motion provided by the connection 40 and operate the link 39, the reciprocal member 38 and the cam 50 carried thereby toward the base 36. Longitudinal operation of the reciprocal member 38 in this direction urges cam 50 against the spring 52 which engages the plate 54, and the spring 52 is thus forced up the right-hand inclined face of the cam 50 as the cam moves. As soon as the crest 51 of the cam 50 passes through the spring 52, the spring contracts and exerts a force on the left-hand face of the cam 50, whereupon the reciprocal member 38 is operated with a snap action in a right-hand direction, the lost motion connection 40 permitting snap action independently of the control lever 41. As the reciprocal member 38 moves to the right the control member 45 is carried therewith, the spring pressed balls 46 being maintained in the depression 43 to maintain a driving connection, and the left-hand shoulder of the circular groove 49 engages the extension 35 of the switch member 22 to operate the switch member against the force exerted thereon by the segmental gear 19. An energizing circuit is thereby completed for the winding 16 of the contactor 12 and for the energizing winding 16 of the device 10, which circuits have already been traced in connection with Fig. 1.

In order that the switch member 24 may be free, for automatic operation to its open circuit position by the electroresponsive device 10, the manually operable control device includes means for automatically freeing the switch member 22 as soon as the contacts 25 are closed.

When the bridging member 24 on the switch member 22 engages the contacts 25, continued movement of the control member 45 in a right-hand direction is prevented the switch member serving as stop means to limit the movement of the control member 45 and the force exerted by the spring 52 is thereupon sufficient to overcome the driving connection established by the balls 46 and the spring 48. Accordingly, the reciprocal member 38 continues to move to the right and the balls 46 are forced outwardly by the inclined face of the depression 43 toward the crest 44. As soon as the balls 46 pass over the crest 44, the control member 45 is moved in a left-hand direction with a snap action by the spring 48 to the position shown in Fig. 3, thereby freeing the end 35 of the switch member 22 for operation to the open circuit position at any time. During this reverse movement of the control member 45 the spring 48 forces the balls 46 down the right-hand face of the depression 42.

The switch member 22 may be manually operated to the open circuit position at any time simply by moving the control rod 41 in a left-hand direction, the operation of the control device being exactly the same as when the rod 41 is actuated to close the switch member 22, that is, the spring 52 passes over the crest 51 and engages the right-hand face of the cam 50 to move the reciprocal member 38 to the left with a snap action and when the switch member 22 reaches its extreme open position, the load imposed upon the control member 45 thereby will be sufficient to overcome the driving connection

established by the balls 46 and the spring 48, and the balls 46 will move out of the depression 42 and pass over the crest 44 to operate the control member with a snap action to the reset position shown in Fig. 2.

While I have shown a particular embodiment of my invention, it will be understood, of course, that I do not wish to be limited thereto since many modifications may be made and I, therefore, contemplate by the appended claims to cover any such modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. A control device comprising a pair of relatively movable members, means for operating one of said members with a snap action, means for driving said other member with said first member, stop means for limiting the movement of said other member, and means including said driving means for operating said other member in a reverse direction with a snap action upon engagement of said other member with said stop means.

2. A control device comprising a reciprocal member, a control member slidably mounted thereon, means for operating said reciprocal member with a snap action, a driving connection between said reciprocal member and said control member, means for limiting the movement of said control member, and means including said driving connection and said motion limiting means for operating said control member in a reverse direction with a snap action.

3. A control device comprising a reciprocal member, a control member slidably mounted thereon, means including a double-faced cam for operating said reciprocal member with a snap action, driving means including a spring pressed member for operating said control member in the same direction as said reciprocal mem-

ber against a predetermined load, and means responsive to a greater load on said control member for operating said control member in a reverse direction with a snap action.

4. A control device comprising a reciprocal member provided with a cam having oppositely inclined faces meeting in a crest and with a pair of longitudinally spaced depressions the adjacent walls of which meet in a crest, spring means encircling said reciprocal member engageable with said cam faces, lost motion means for moving said reciprocal member relative to said spring whereby said spring rides over said crest to operate said reciprocal member with a snap action, a control member slidably mounted on said reciprocal member, driving means comprising a spring pressed member carried by said control member and engaging one of said depressions for operating said control member with said reciprocal member, and means for limiting the movement of said control member with said reciprocal member, said spring pressed member being arranged to move over said crest between said depressions when said control member is affected by said movement limiting means to operate said control member in the opposite direction with a snap action.

5. A control device comprising an operating member, resilient snap means cooperating with said member so as to cause it to move with a snap action, a second operating member, a driving connection between said members including a second resilient snap means having less strength than said first snap means, and a stop engaged by said second member during its movement by said first snap means whereupon continued movement of said first member by said first snap means causes said second snap means to move said second member in a reverse direction.

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