

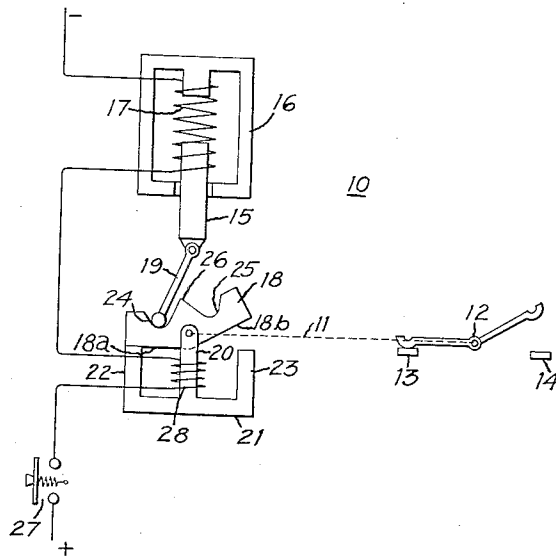
Aug. 17, 1937.

E. SIPPEL

2,090,522

ELECTRICAL CONTROL DEVICE

Filed March 7, 1935



Inventor:
Eugen Sippel,
by *Harry E. Dunham*
His Attorney.

UNITED STATES PATENT OFFICE

2,090,522

ELECTRICAL CONTROL DEVICE

Eugen Sippel, Berlin, Germany, assignor to General Electric Company, a corporation of New York

Application March 7, 1935, Serial No. 9,891
In Germany April 4, 1934

7 Claims. (Cl. 175—375)

My invention relates to electrical control devices and has for an object the provision of a simple, inexpensive and reliable device of this character which carries out its controlling function independently of the source of electrical power.

In accordance with my invention a solenoid when energized stores up energy in its plunger, an armature being held in a given position by a coil connected in series with the solenoid. As soon as the solenoid is deenergized, the stored energy is expended as work in moving the armature from the given position to a second position. Consequently, the armature is not carried along by the plunger and there is no possibility of a partial or premature operation of the control device.

For a more complete understanding of my invention, reference should now be had to the accompanying drawing wherein I have shown diagrammatically my invention applied to a control device.

Referring to the drawing, I have shown my invention in one form as applied to a control device 10 provided with an operating shaft 11 arranged to rotate a switch member 12 in a clockwise direction from its position in contact with a stationary contact 13 into engagement with a stationary contact 14.

Normally the switch member is biased to one or the other of its positions by means of a plunger 15 of a solenoid 16, the plunger being slidably mounted within a solenoid operating coil 17. If desired, the biasing force due to the weight of the plunger can be supplemented by a spring located between the plunger and the upper end of the magnetic frame of the solenoid. This biasing force is applied to an armature or operating element 18 formed of magnetic material by means of a member 19 pivoted to the lower end of the plunger 15. Since the armature 18 is secured to the shaft 11 which extends through the center pole 20 of an E-shaped magnet or magnet frame 21, formed of magnetizable material, the switch member 12 is biased by the plunger 15 to the position shown in the drawing and in engagement with the contact 13. The armature 18 when in contact with an outer pole 22 of the magnet completes a closed magnetic circuit through the left-hand portion of the magnet. A wide air gap exists between the armature 18 and the opposite outer pole 23, however, due to the angular relation of the surfaces 18a and 18b of the armature located on opposite sides of the shaft 11. The side of the armature 18 opposite the magnet 21 is

provided with a pair of recesses 24 and 25, the two adjacent walls of which form cam surfaces which terminate at the crest 26.

In order to operate the switch member 12 into engagement with the contact 14 a push button 27 is depressed to complete an energizing circuit for a coil 28 surrounding the center pole 20 of the magnet 21 and the coil 17, the two coils being connected in series circuit relation with each other. The solenoid coil 17 immediately lifts its plunger 15 and the operating member 19 to a position such that the member 19 due to the force of gravity swings from the recess 24 across the crest 26 to a position above the recess 25. As the member 19 moves upwardly, it will be seen that the free end thereof moves along the right-hand side of the recess 24, and accordingly, the counterclockwise biasing force exerted on the armature 18 decreases, a clockwise force, in fact, being exerted by the end of the member 19 as it approaches the crest 26. At the same time, however, the coil 28 produces a strong magnetic flux through the left-hand portion of the magnet 21 and thereby securely locks the armature against movement. This additional bias or locking action exerted by the coil 28 prevents improper operation of the armature 18 and at the same time maintains good contact pressure between the contacts 12 and 13. As soon, however, as the push button switch 27 is released to open the energizing circuit both coils are deenergized. The plunger 15 thereupon drops from its elevated position and operates the member 19 against the recess 25. Since deenergization of the coil 28 releases the armature for movement, the energy stored in the plunger and the member 19 is then given up as work in operating the switch member 12 into engagement with the stationary contact 14. The plunger 15 and member 19 then serve to bias the armature 18 and the switch member 12 in their new positions.

In order to return the switch member 12 to its first position the push button switch 27 is again operated to energize the coils 17 and 28, the coil 17 again operating the plunger 15 against the force of gravity to its elevated position. The coil 28 in this case, however, produces a strong magnetic flux through the right half of the magnet 21 or through the closed magnetic circuit provided by the armature 18 and the poles 20 and 23 of the magnet. Only a relatively small flux acts on the armature from the outer face of the pole 22 due to the large air gap between them.

As soon as the switch 27 is released to deenergize the coils, the member 19 is driven into the

recess 24 to return the armature 18, the shaft, and the switch member 12 to their original positions. The described operations can be repeated at any time by successive operations of the push button or the control means 22. During each operation the crest 26 of the armature is rotated from one side to the other of the longitudinal axis of the solenoid. The member 19 therefore automatically swings from one recess to the other, to reverse the direction of rotation of the shaft 11.

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 an operating element movable from a first position to a second position, a member biased to a position to engage and move said element from one to the other of said positions, an operating coil energizable to move said member against its bias to store energy for operation of said element, means for biasing said element to one of said positions when said coil is energized to store energy, and a member jointly controlling said operating coil and said biasing means operable to a predetermined position to simultaneously effect the deenergization of said operating coil and the release of said element for movement by said member.
2. A control device comprising an armature movable from a first position to a second position, electro-responsive means for storing energy preparatory to movement of said armature, electromagnetic holding means energizable simultaneously with said electro-responsive means for holding said armature in said first position during the storing of said energy, and means for engaging said armature after deenergization of said electro-responsive means for operating said armature from said first to said second position, said holding means releasing said armature upon deenergization of said electro-responsive means.
3. A control device comprising a magnetizable frame, an armature forming in conjunction with said frame a normally open and a normally closed air gap, means mounting said armature for movement from one position to a second position to open and close alternately said air gaps, an operating coil associated with said frame for holding said armature in said one position, operating means normally engaging said armature to hold it in one or the other of its positions, control means for simultaneously energizing said coil and for causing said operating means to disengage itself from said armature, and means operable by said operating means when said coil is deenergized for moving said armature from said one position to said second position.
4. A control device comprising a switch member, an armature for moving said switch member from one position to a second position, means for biasing said armature to one of its positions, circuit controlling means, operating means controlled by said circuit controlling means for operating said biasing means to remove the bias from said armature and to store energy in said biasing means, means controlled by said circuit controlling means simultaneously with said op-

erating means for applying an additional bias to said armature while said first-mentioned biasing means is ineffective to hold said armature in said one position, and means associated with said first-mentioned biasing means for operating said armature from said one position to a second position.

5. A control device comprising a magnet having a magnetizable frame provided with a center pole and oppositely disposed outer poles, an armature pivoted to said center pole and normally forming in conjunction with one or the other of said outer poles a normally closed magnetic circuit, a solenoid provided with a plunger, rigid means connected to said plunger for engaging said armature to bias it to one or the other of its positions, an operating coil for said magnet for holding said armature in a closed magnetic circuit position, means for simultaneously energizing said coil and said solenoid whereby energy is stored in said plunger as it is operated to its retracted position and said armature is magnetically held in said one position, said rigid means operating automatically to reverse the bias applied thereby to said armature when said solenoid and said magnet are deenergized, said deenergization of said magnet releasing said armature for operation by said plunger to said other position.

6. A control device comprising a magnet having a magnetizable frame, an armature forming in conjunction with said frame a normally open and a normally closed magnetic circuit, means pivotally mounting said armature for movement from one position to a second position to open and close alternately said magnetic circuits, energy storing means including a movable member normally engaging said armature on one side of said pivot means for biasing said armature in one position, an operating coil for operating said member out of engagement with said armature, said member automatically shifting its position with respect to said armature preparatory to engagement with said armature on the other side of said pivot means, an operating coil for said magnet for holding said armature in a closed magnetic circuit position, and means for simultaneously energizing and then deenergizing said coils whereby energy is stored in said energy storing means and is then given up as work in operating said armature from said one position to said second position.

7. A control device comprising a magnetizable frame, an armature forming in conjunction with said frame a normally open and a normally closed magnetic circuit, means pivotally mounting said armature for movement from one position to a second position to open and close alternately said magnetic circuits, an operating coil associated with said frame for holding said armature in a closed magnetic circuit position, operating means normally engaging said armature on one side of its pivot to hold it in one of its positions and automatically operable to engage said armature on the opposite side of its pivot to operate it to said second position, control means for simultaneously energizing said coil and for causing said operating means to disengage itself from said armature, and energy storing means rendered effective by said operating means after said coil is deenergized for operating said armature from said one position to said second position.

EUGEN SIPPTEL.