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R. E. DI VETTE

2,333,848

CONTROL APPARATUS

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2 Sheets-Sheet 1

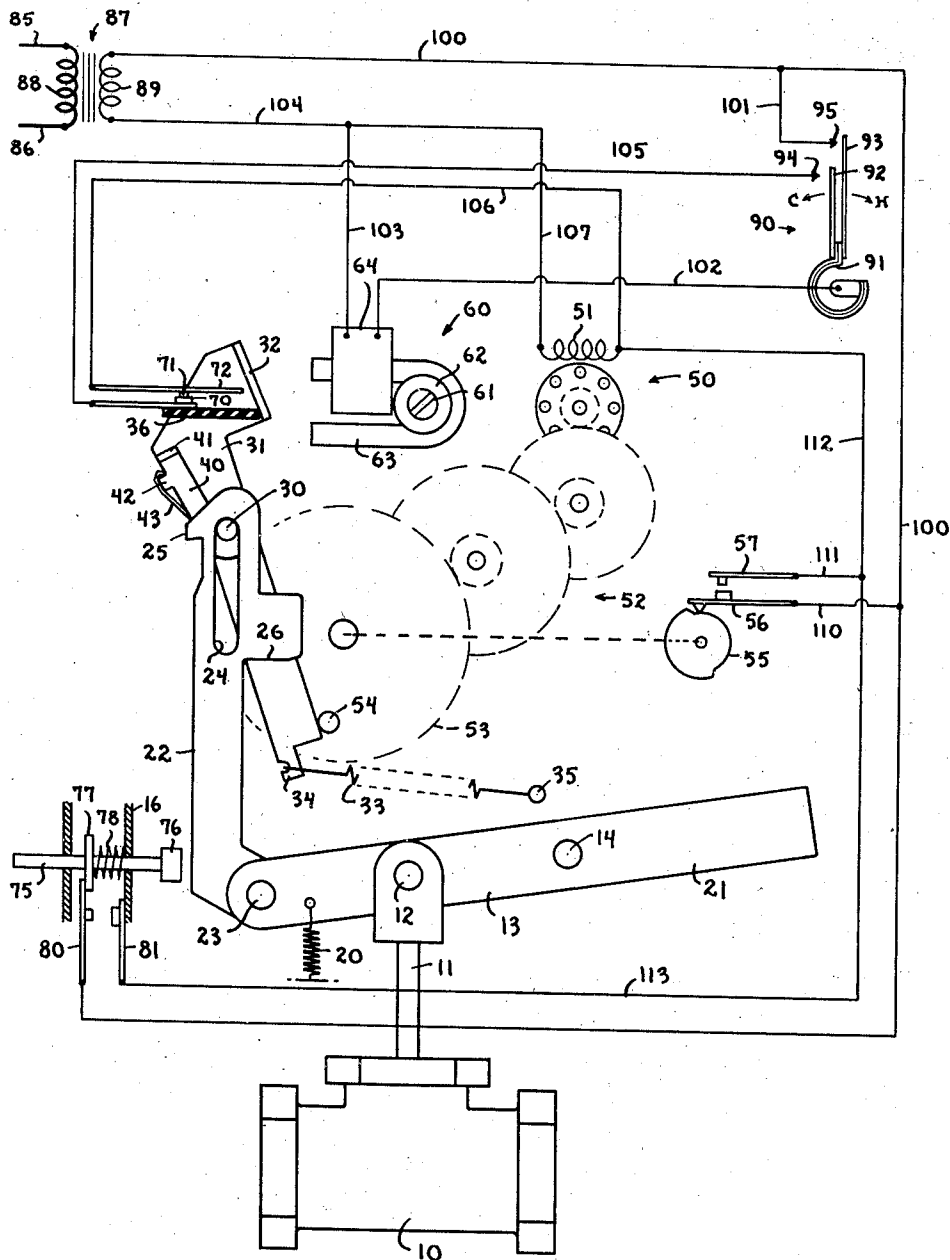


Fig. 1

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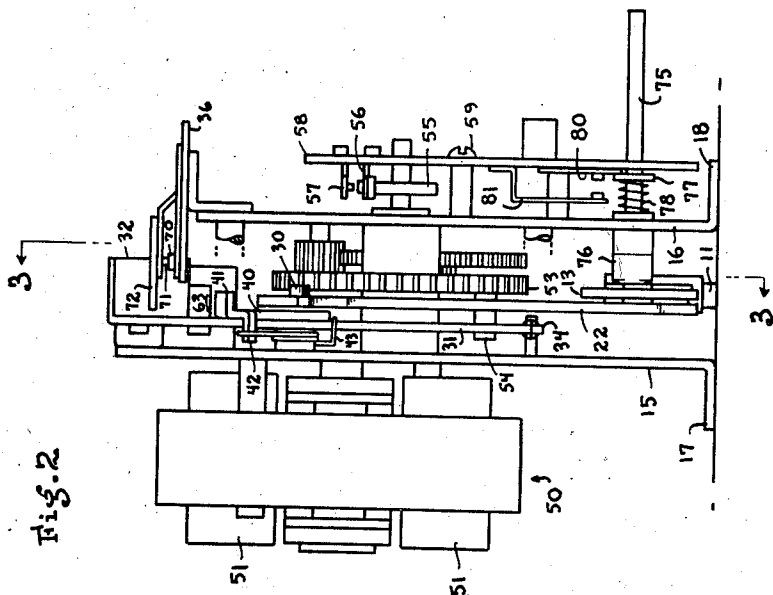
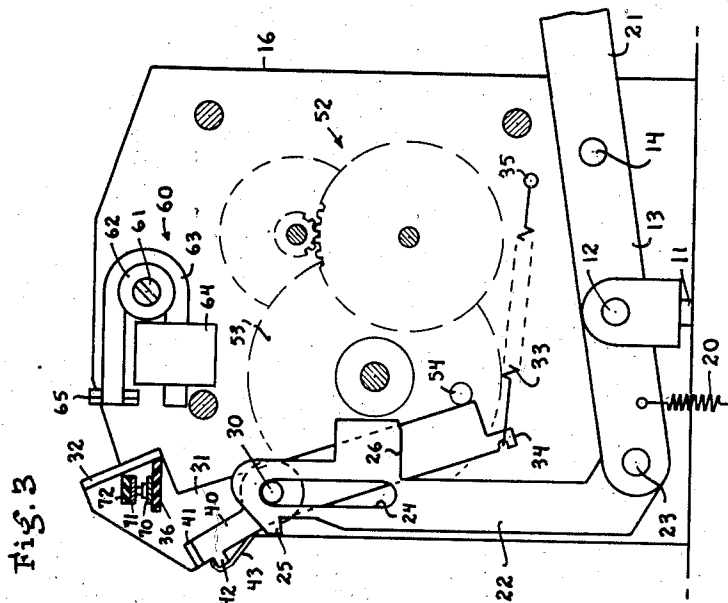
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2 Sheets-Sheet 2



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2,333,848

CONTROL APPARATUS

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Application August 9, 1941, Serial No. 406,233

20 Claims. (Cl. 172-239)

This invention relates to a motor-driven control device, and more particularly to a device adapted to be moved between a first safe position and a second active position.

In many instances it is desirable to utilize a motor to position a device which is movable between a safe normal position and an active position. Thus one typical instance is that of a motorized valve controlling the flow of gas to a gas burner or the flow of other heating fluid to a heating apparatus. In such a case, the valve is biased to closed position to insure the return of the valve to this position in the event of power failure. Another type of device of this character is a switch which is active only when it is closed. It is desirable in case of failure of the switch actuating mechanism for the switch to be moved to its circuit open or its safe position. The present invention is concerned with an arrangement wherein a motor positions such an element, the arrangement being particularly adaptable to the positioning of a valve.

An object of the present invention is to provide improved control apparatus of the type wherein a member is biased to a safe position and is operable from said safe position to an active position by a motor.

A further object is to provide, in such apparatus, an improved connection between the motor and the driven member, whereby the motor is separated from the member after it reaches its active position, so that return movement of the member to its safe position is not impeded by the inertia of the motor and connecting parts.

A further object is to provide in such apparatus, an improved type of releasable electromagnetic latching mechanism for holding said member in its active position.

A still further object is to provide an improved and simplified control circuit for the motor and electromagnet in a device of the type described.

Other objects of the invention will be apparent from a consideration of the accompanying specification, claims, and drawings, in which:

Figure 1 is a somewhat diagrammatic sketch of a control system including a motorized mechanism for controlling a fuel supply valve in accordance with the principles of my invention.

Figure 2 is an elevation of a motor mechanism including an embodiment of my invention, certain parts being omitted for the sake of clarity, and

Figure 3 is a cross-section taken on the line 3-3 of Figure 2, showing certain parts of the motor mechanism in detail.

In Figure 1 is shown a valve 10 which may for example, control the supply of fuel to a furnace (not shown). The valve 10 is operated by a stem 11, to which is pivotally connected, as at

12, a lever arm 13. The lever arm 13 is pivotally mounted on a shaft 14, extending between a pair of bracket plates 15 and 16 (Figure 2).

The bracket plates 15 and 16 support all the various parts of the valve operating mechanism, and are provided with foot portions 17 and 18, respectively, so that they may be mounted on the housing of the valve 10 or on any other suitable support.

The lever arm 13 is biased by a spring 20 or other suitable biasing means, for counter-clockwise rotation about the shaft 14, so as to move the valve 10 to close position. One end of the lever arm 13 is provided with an extension 21 which projects beyond the bracket plates 15 and 16 so that the valve may be manually operated by movement of the extension 21. A link 22 is pivotally connected, as at 23, to the opposite end of the lever arm 13. The link 22 extends vertically from the lever arm 13 and is provided near its upper end with an elongated slot 24. One side of upper end of link 22 is shaped to form a hook 25, and the other side of the link 22 is shaped to form a shoulder 26.

The slot 24 in the link 22 slidably receives a pin 30 which is mounted on the bracket plate 15. Pivotally mounted on the pin 30 is an armature member 31. The upper end of armature member 31 is bent over to form an armature portion 32. A tension spring 33 is stretched between the lower end 34 of the armature member 31 and a suitable point 35 on the bracket plate 15. The tension spring 33 biases the armature member 31 for counter-clockwise rotation about the pivot 30. This counter-clockwise rotation is limited by an insulating member 36 supported on bracket plate 16 and having a portion extending into the path of the armature portion 32 of member 31.

A latch member 40 is also pivotally mounted on pin 30. The latch member 40 is provided with an upstruck finger portion 41 which is adapted under certain conditions to engage the hook 25 on the link 22. The latch member 40 also has a finger portion 42 extending rearwardly, as viewed in Figure 3, and adapted to engage the adjacent portion of the armature member 31. A coil spring 43 surrounds the pin 30 and has one of its ends bent to engage the finger portion 42 of latch member 40 and the other of its ends bent to engage the armature member 31. The purpose of the spring 43 is to bias the finger 42 into engagement with the armature member 31 and to serve as a strain release connection between the armature member 31 and latch member 40.

An electrical motor 50 is mounted on the rear bracket plate 15. The motor 50 has a stator winding 51 and drives the valve operating mechanism through a gear train generally indicated at 52 having a final gear 53 on which a driving pin 54 is mounted.

Fixed on the same shaft with gear 53 is a cam 55 which operates a flexible switch blade 56 into and out of engagement with a stationary switch member 57. The contacts 56 and 57 are supported by an insulating plate 58, attached to bracket plate 15 by suitable means such as bolt 59.

An electromagnet generally indicated at 60, is mounted on the bracket plate 15 by any suitable means, such as a bolt 61 and washer 62. The electromagnet 60 comprises a U-shaped core member 63 and an electrical winding 64. At least one leg of the core member 63 may be provided with a pole shading winding of conventional design as indicated at 65. The strength of the electromagnet 60 and the normal position of the armature portion 32 of armature member 31 are so designed that the electromagnet cannot attract the armature portion 32 when it is in its retracted position as shown in Figures 1 and 3. When the armature portion 32 is moved into engagement with the core 63 by other means, however, the electromagnet 60 is strong enough to retain the armature member in that position.

A stationary contact 70 is mounted on the insulating member 36 and is adapted to cooperate with a movable contact 71 mounted on a flexible switch blade 72, one end of which is positioned in the path of movement of the upper end of link 22.

Provision is made for maintaining the valve in open position when it has been manually moved there by operation of the extension 21 of the lever arm 13. A rod 75 is mounted through the bracket plate 16 and the insulating plate 58, and carries at its inner end a collar 76 which is normally spaced from the lever arm 13, but which may be moved into the path of lever arm 13 when the rod 75 is pushed inwardly. The rod 75 also carries externally of the plate 16 another collar 77, preferably of insulating material. A coil spring 78 mounted about the rod 75 between the collar 77 and the plate 16, serves to bias the rod 75 to a position where the collar 76 is free of the lever arm 13. A flexible switch contact 80 is self biased for engagement with a stationary switch contact 81. Both contacts 80 and 81 are supported by the insulating plate 58, and the flexible switch contact 80 has a portion extending into the path of movement of the collar 77. When the rod 75 is in its normal position, the collar 77 engages the flexible switch member 80 and holds it against the insulating plate 58 and out of engagement with contact 81. When rod 75 is moved inwardly to hold the valve 10 in open position, the collar 77 moves away from the flexible switch member 80, allowing it to engage the stationary contact 81.

Power is supplied to the system from power lines 85 and 86 through a transformer 87 having a primary winding 88 and a secondary winding 89. The supply of power to the valve operating mechanism is controlled by a thermostat 90 which may be located in a room or space to which heat is being supplied by the furnace whose fuel supply is controlled by the valve 10. The thermostat 90 comprises a bimetallic element 91 operating a pair of movable switch blades 92 and 93 into engagement with stationary contacts 94 and 95, respectively. The arrangement is such that upon a drop in temperature, the switch blades 92 and 93 are moved to the left, as indicated by the legend in the drawing. As this movement to the left continues the switch blade 93 first engages the contact 95. If the temperature continues to drop, switch blade 92 engages

contact 94. If the direction of the temperature change then reverses, the contacts 92 and 94 separate first and the contacts 93 and 95 separate shortly afterwards.

Operation

When the parts are in the position shown in the drawings, the valve 10 is closed and the thermostat 90 is satisfied. Let it be assumed that the temperature adjacent the thermostat 90 now begins to fall. As the temperature falls, the switch blade 93 will move to the left until it engages contact 95.

Engagement of contacts 93 and 95 will complete a circuit to energize the winding 64 of electromagnet 60, which circuit may be traced from the upper terminal of transformer secondary winding 89 through a conductor 100, a conductor 101, contact 95, switch blade 93, bimetallic element 91, a conductor 102, winding 64, a conductor 103, and a conductor 104 to the lower terminal of secondary winding 89. Energization of winding 64 will, however, cause no movement of the valve 10, because as previously stated the armature portion 32 of armature member 31 is positioned at such a distance from the core 63 and the electromagnet 60 that it is not attracted upon energization of winding 64.

If the temperature adjacent the thermostat 90 continues to drop the switch blade 92 will move into engagement with contact 94. Engagement of contacts 92 and 94 completes an energizing circuit for winding 51 of motor 50 which may be traced from the upper terminal of secondary winding 89 through conductors 100 and 101, contacts 95 and 93, contacts 92 and 94, a conductor 105, contacts 70 and 71, a conductor 106, motor winding 51, a conductor 107, and conductor 104 to the lower terminal of secondary winding 89.

Energization of motor winding 51 drives the gear train in such a manner that gear 53 is moved in a clockwise direction. The pin 54 thereupon engages the lower portion of armature member 31 and pivots it about the pin 30 against the tension of spring 33. The pin 54 drives armature member 31 clockwise about the pin 30 until the armature portion 32 moves within the field of electromagnet 60 and is attracted thereby into engagement with the core 63. The latch member 40 follows the movement of the armature member 31. When the armature portion 32 engages core 63 the latching finger 41 is in a position directly above the hook portion 25 of the link 22.

As the gear 53 continues to rotate in a clockwise direction, pin 54 engages the lower side of shoulder 26 on link 22 and drives the link 22 upwardly, thereby pivoting the lever arm 13 about the shaft 14 and opening the valve by means of the valve stem 11. As the link 22 approaches the upper end of its path of travel the upper surface of the hook 25 engages the latching finger 41 and pushes it to the left against the tension of spring 43. As the link 22 continues to move upward the hook 25 passes by the latching finger 41 which thereupon snaps back under the influence of spring 43 to a position underneath the hook 25.

The upper end of link 22 then engages extension 72 which supports the contact 71 and separates the latter from contact 70, thereby opening the motor energizing circuit previously described.

As soon as the gear 53 starts to rotate clockwise from the position shown in the drawings, however, the cam 55 moves switch blade 56 into

engagement with contact 57, thereby completing a second energizing circuit for motor winding 51. This second circuit may be traced from the upper terminal of secondary winding 89 through conductor 100, a conductor 110, switches 56 and 57, a conductor 111, a conductor 112, motor winding 51, and conductors 107 and 104 to the lower terminal of secondary winding 89.

This second energizing circuit for motor winding 51 is maintained by the cam 55 until pin 54 has driven link 22 to its uppermost position and is then moved on to the right out of engagement with shoulder 26. After pin 54 moves out of engagement with shoulder 26, the link 22 would start to fall back downwardly, but it is prevented by engagement with hook 25 with latching finger 41. The valve 10 is therefore held latched in its open position.

The valve remains in this position until such time as the winding 64 on the electromagnet 60 is deenergized by opening of contacts 93 and 95. When winding 64 is deenergized, armature member 31 is returned to the position shown in the drawings by the spring 35, carrying latch member 40 and finger 41 to their corresponding disengaged positions. Spring 20 is then effective to return link 22 and lever 13 to their downward positions, thereby closing valve 10.

It will be noted that this circuit provides for a temperature differential between the opening of the valve and the closing of the valve. That is the valve is opened due to closure of contacts 92 and 94. The closure of the valve does not take place, however, until the temperature adjacent thermostat 90 has risen sufficiently to cause switch blade 93 to separate from contact 95.

It should also be observed that this system provides for closure of the valve upon the opening of a contact rather than upon the closing of a contact. It has been found, in systems where the closure of the valve depended upon the making of a contact, that unsafe conditions could prevail in the event that the contacts failed to make properly because of dust or other foreign particles between them. Furthermore, in the present circuit, the valve is always moved to closed position in the event that the power fails while the valve is opened.

Provision is made in the present system for opening the valve manually during periods of power failure, and for automatically returning the valve to control of the thermostat when the power returns. The valve may be manually opened by pushing the lever extension 21 downwardly, until the valve has reached an open position. The valve may be held in that position by pushing in on the rod 75 and moving the collar 76 into the path of the lever 13 so that it cannot return to closed position. If the extension 21 is then released, the lever arm 13 will move downwardly until it engages collar 76. This engagement of collar 76 with lever 13 will bind the rod 75 and prevent its return to its normal outward position by the spring 78. The valve will then remain in a position intermediate its closed and full open positions. The movement of the rod 75 to its inward position will allow closure of contacts 80 and 81, thereby completing an energizing circuit for motor winding 51. This circuit may be traced from the upper terminal of secondary winding 89 through conductor 100, contacts 80 and 81, a conductor 113, conductor 112, motor winding 51, and conductors 107 and 104 to the lower terminal of transformer secondary winding 89.

If power is returned to the system while the valve is just latched open, the motor winding 51 will be energized through the circuit just traced and will drive the gear 53 so that pin 54 will act through link 22 to move the lever arm 13 upwardly and open the valve to full open position. As the lever arm 13 moves away from collar 76, the latter will be released and will return to its normal position under the influence of spring 58. If the thermostat 90 is not calling for heat at this time, the armature 32 will not be held in engagement with electromagnet 60, and the latching finger 41 will not be held in its effective position. Therefore the valve will close immediately as soon as pin 54 moves out of engagement with shoulder 26 on link 22. The valve will then be operated as before under control of the thermostat 90.

While I have shown and described a preferred embodiment of my invention, other modifications will readily occur to those skilled in the art, and I wish to be limited only by the scope of the appended claims.

I claim as my invention:

1. In combination, a member biased to a first safe position, a driven element connected to said member, a fixed electromagnet, an armature biased to a position wherein said electromagnet cannot attract said armature, latch means mounted on said armature and positioned when said armature engages said electromagnet so as to be engageable with said element to retain said member in a second active position, an electrical motor, means for establishing a first releasable one-way driving connection between said motor and said armature whereby said motor may drive said armature into proximity with said electromagnet and for releasing said connection upon continued operation of said motor after said armature moves into proximity with said electromagnet, and means for establishing a second releasable one-way driving connection between said motor and said element whereby said motor may drive said member from said first position to said second position and said element into engagement with said latch, and for releasing said connection upon continued operation of said motor after said member reaches said second position.
2. In combination, a member biased to a first safe position, a driven element connected to said member, a fixed electromagnet, an armature biased to a position wherein said electromagnet cannot attract said armature, latch means mounted on said armature and positioned when said armature engages said electromagnet so as to be engageable with said element to retain said member in a second active position, an electrical motor, means for establishing a first releasable one-way driving connection between said motor and said armature whereby said motor may drive said armature into proximity with said electromagnet and for releasing said connection upon continued operation of said motor after said armature moves into proximity with said electromagnet, and means for establishing a second releasable one-way driving connection between said motor and said element whereby said motor may drive said member from said first position to said second position and said element into engagement with said latch, and for releasing said connection upon continued operation of said motor after said member reaches said second position, said two connection establishing means being positioned with respect to a driving element operated

by said motor so that said first and second connections are sequentially established upon continued rotation of the motor in one direction.

3. In combination, a member biased to a first safe position, a driven element connected to said member, a fixed electromagnet, an armature biased to a position wherein said electromagnet cannot attract said armature, latch means mounted on said armature and positioned when said armature engages said electromagnet so as to be engageable with said element to retain said member in a second active position, a pin pivotally supporting said armature, said element having a slot for slidably receiving said pin, an electrical motor, and a driving element operated by said motor, said driving element, said armature and said driven element being positioned relative to each other so that upon continued rotation of the motor in one direction said driving element first engages said armature and rotates it about said pin to a position within the field of said electromagnet and then engages said driven element and translates it with respect to said pin so that said link engages said latch.

4. In combination, a member biased to a first safe position, a driven element connected to said member, a fixed electromagnet, an armature biased to a position wherein said electromagnet cannot attract said armature, latch means mounted on said armature and positioned when said armature engages said electromagnet so as to be engageable with said element to retain said member in a second active position, a pin pivotally supporting said armature, said element having a slot for slidably receiving said pin, an electrical motor, a gear driven by said motor, a driving element mounted on said gear for movement in a circular path upon rotation of said gear, said armature and said driven element being positioned relative to said circular path so that upon continued rotation of the motor in one direction said driving element first engages said armature and rotates it to a position within the field of said electromagnet, then engages said driven element and translates it with respect to said pin so that said driven element engages said latch, and then moves out of engagement with both said armature and said driven element.

5. In combination, a member biased to a first safe position, electrical motor means for driving said member from said first safe position to a second active position, means including an electrical circuit for energizing said motor, electrical holding means for retaining said member in said second position, means including an electrical circuit for energizing said holding means, means for rendering the holding means ineffective even though energized until said member reaches said second position, a pair of switches, and means operable in one sense to sequentially close said switches and in an opposite sense to open said switches in reverse sequence, the first of said switches to close being included in said holding means energizing circuit, and the second switch to close being included in said motor energizing circuit.

6. In combination, a member biased to a first safe position, electrical motor means for driving said member from said first safe position to a second active position, means including an electrical circuit for energizing said motor, electrical holding means for retaining said member in said second position, comprising an electromagnet and an armature therefor, said armature being biased to a position wherein the electromagnet

is ineffective to attract the armature, means operated by said motor to drive said armature into proximity with said electromagnet, means including an electrical circuit for energizing said electromagnet, a pair of switches, and means operable in one sense to sequentially close said switches and in an opposite sense to open said switches in reverse sequence, the first of said switches to close being included in said electromagnet energizing circuit, and the second switch to close being included in said motor energizing circuit.

7. In combination, a member biased to a first safe position, electrical motor means for driving said member from said first safe position to a second active position, means including an electrical circuit for energizing said motor, electrical holding means for retaining said member in said second position, comprising an electromagnet and an armature therefor, said armature being biased to a position wherein the electromagnet is ineffective to attract the armature, means operated by said motor to drive said armature into proximity with said electromagnet, means including an electrical circuit for energizing said electromagnet, a pair of switches, and means operable in one sense to sequentially close said switches and in an opposite sense to open said switches in reverse sequence, the first of said switches to close being included in said electromagnet energizing circuit, and the second switch to close being included in said motor energizing circuit, a third switch operated by said motor, and a second energizing circuit for said motor including said third switch to securely maintain energization of said motor during driving of said member until after said member has attained its second position.

8. In combination, a member biased to a first safe position, electrically operated latch means for holding said member in a second active position, an electrical motor, means for establishing a releasable one-way driving connection between said motor and said member whereby said motor may drive said member from said first position to said second position and for releasing said connection upon continued operation of said motor after said member reaches said second position, switch means for energizing said motor and said latch means, manually operable means for moving said member and retaining it in a third active position intermediate said first and second position, second switch means connected to said manual means to be closed while said member is held in said third position, a circuit controlled by said second switch means for energizing said motor, third switch means operated by said motor, and a second energizing circuit for said motor including said third switch to securely maintain energization of said motor during driving of said member until after said member has attained its second position.

9. In combination, a member biased to a first safe position, a link connected to said member and translatable along a substantially linear path to move said member from said first position to a second active position, releasable latch means for engaging said link when it reaches the end of its path corresponding to said second position, a driving member movable along a circular path substantially tangential to said linear path and engageable with a portion of said link to drive said link along said linear path, said driving member moving along said circular path so as to disengage from said link after the link has been

driven into engagement with said latch, whereby said link is free to return to the end of its path corresponding to said safe position upon release of said latch means, and means for stopping said driving member after its disengagement from said link, said stopping means being effective to prevent further operation of said driving member until said latch is released.

10. In combination, a member biased to a first position, electrically operated stationary holding means for retaining said member in a second position, an arm associated with said member and movable into cooperative relationship with said holding means, an electric motor, means for transmitting motion from said motor to said member in a direction to drive said member from said first position to said second position, a connection between said transmitting means and said member including separable driving and driven elements, said connection permitting independent movement of said transmitting means and said member when said elements are separated, a main control switch, a second switch operable in accordance with the position of said member, and means including said motor controlled by said switches and operative upon closure of said main control switch to cause movement of said member from first to second position, thereby moving said arm into cooperative relationship with said holding means, and then to cause movement of said motion-transmitting means to a position wherein said elements are separated and said member is free to return to said first position upon release by said holding means without moving said motion-transmitting means.

11. In combination, a member biased to a first position, holding means for retaining said member in a second position comprising a fixed electromagnet and an armature cooperating therewith, said armature being associated with said member and biased to a position wherein energization of said electromagnet is not sufficient to attract said armature, an electric motor, means for transmitting motion from said motor to said member and said armature in a direction to drive said member from said first position to said second position and said armature into engagement with said electromagnet, a connection between said transmitting means, said member, and said armature including separable driving and driven elements, said connection permitting independent movement of said transmitting means and said member when said elements are separated, a main control switch, a second switch operable in accordance with the position of said member, and means including said motor controlled by said switches and operative upon closure of said main control switch to cause movement of said member from first to second position, thereby engaging said armature with said electromagnet, and thereafter to cause movement of said motion-transmitting means to a position wherein said elements are separated and said member is free to return to said first position upon release by said electromagnet without moving said motion-transmitting means.

12. In combination, a member biased to a first position, electrically operated stationary holding means for retaining said member in a second position, an arm associated with said member and movable into cooperative relationship with said holding means, a rotary electrical motor, means including a gear train for transmitting motion from said motor to said member in a

direction to drive said member from said first position to said second position, a connection between said transmitting means and said member including separable driving and driven elements, said connection permitting independent movement of said transmitting means and said member when said elements are separated, a main control switch, a second switch operable in accordance with the position of said member, and means including said motor controlled by said switches and operative upon closure of said main control switch to cause movement of said member from first to second position, thereby moving said arm into cooperative relationship with said holding means, and then to cause movement of said motion-transmitting means to a position wherein said elements are separated and said member is free to return to said first position upon release by said holding means without moving said motion-transmitting means and said gear train and rotating said motor.

13. In combination, a member biased to a first position, holding means for retaining said member in a second position comprising a fixed electromagnet and an armature cooperating therewith, an electric motor, means for transmitting motion from said motor to said member in a direction to drive said member from its first position to its second position, a connection between said motion transmitting means and said member including separable driving and driven elements, said connection permitting independent movement of said transmitting means and said member when said elements are separated, circuit means for energizing said motor and said electromagnet, switch means for controlling said circuit means, said motor being operative upon energization thereof to drive said member from said first position to said second position and thereafter to drive said motion transmitting means to a position wherein said elements are separated and said member is free to return to said first position upon release by said electromagnet without causing engagement of said elements.

14. In combination, a member biased to a first safe position and movable to a second active position, a driven element connected to said member and effective when moved along a predetermined path to move said member from said first to said second position, releasable holding means for maintaining said element at the end of its path corresponding to said second position, a driving element movable along an arcuate path so as to operate said driven element, said driving element moving along said arcuate path so as to move said driven element to the end of its path corresponding to said second position, and thereafter to move along said arcuate path so as to separate from the path of said driven element, whereby said driven element is free to return to the end of its path corresponding to said first position upon release of said holding means, and means for stopping said driving element after its separation from the path of the driven element, said stopping means being effective to prevent further operation of said driving element until said holding means is released.

15. In combination, a member biased to a first safe position, electrical motor means for driving said member from said first safe position to a second active position, means including an electrical circuit for energizing said motor, electrical holding means for retaining said member in said second position, comprising an electromagnet

and an armature therefor, said armature being biased to a position wherein the electromagnet is ineffective to attract the armature, means operated by said motor to drive said armature into proximity with said electromagnet, means including an electrical circuit for energizing said electromagnet, means for establishing a releasable one-way driving connection between said motor and said armature, whereby said motor may drive said armature into proximity with said electromagnet and for releasing said connection upon continued operation of said motor after said armature moves into proximity with said electromagnet, means for establishing a second releasable one-way driving connection between said motor and said member whereby said motor may drive said member to said second position, and for releasing said connection upon continued operation of said motor after said member has reached said second position, and switch means operated by said motor for discontinuing the energization thereof after said connections are released.

16. In combination, a member biased to a first safe position, electric motor means for driving said member from said first position to a second active position, latch means for holding said member in said second position, a releasable driving connection between said motor and said member, said connection including means effective to release said motor therefrom upon continued energization of said motor after said member is latched in said second position, a first switch for controlling operation of said member, a second switch responsive to the position of said member and operated to open position when said member reaches said second position, a first circuit for energizing said motor including said first and second switches in series, a third switch operated by said motor to open position after said member has reached said second position, and a second circuit for energizing said motor including said third switch to securely maintain energization of said motor during driving of said member and for a predetermined time after said member is latched so as to release said connection.

17. In combination, a device biased to a first safe position, a driven element connected to said device, a fixed electromagnet, an armature member biased away from engagement with said electromagnet, latch means mounted on said armature member and positioned when said armature engages said electromagnet so as to be engageable with said element to retain the device in a second active position, means including an electrical motor for driving said armature into engagement with said electromagnet and said element into engagement with said latch, means for controlling the energization of said motor including a switch operable by said element, said switch being mounted relative to said element so that the switch is operatively engaged by the element when the element is in latch engaging position, said switch also being mounted relative to said armature member to limit the movement of said armature member away from said electromagnet.

18. In combination, a device to be operated to a plurality of positions, means for actuating said device from one of said positions to another thereof comprising electric motor means, means for returning said device to said one position,

means for controlling the energization of said motor means comprising a pair of switches connected in parallel circuits, and means including said motor means for opening and closing said switches in accordance with the relative positions of said motor means and said device, said last-named means being operable to close both said switches while said device is in said one position, thereby energizing said motor means, and operating during the consequent movements of said motor means and said device to sequentially open both said switches, at least the last of said switches to open being opened after said device has reached said other position.

19. In combination, a device to be operated between a safe position and an active position, electric motor means, a one-way driving connection between said motor means and said device whereby said motor means may move said device from said safe position to said active position, means for latching said device in said active position, electromagnetic means for controlling said latching means, means operable when said latching means is released by said electromagnetic means for actuating said device from said active position to said safe position without moving said motor means, means for controlling the operation of said motor means including two switches connected in parallel circuits, and means including said motor means for operating said switches in accordance with the relative positions of said motor means and said device, said last-named means being operable to close both of said switches while said device is in said safe position, and operating during the consequent movements of said motor means and device to sequentially open both said switches, at least the last of said switches to open being opened after said device has reached said active position.

20. In combination, a device to be operated between a safe position and an active position, electric motor means, a one-way driving connection between said motor means and said device whereby said motor means may move said device from said safe position to said active position, means for latching said device in said active position, electromagnetic means for controlling said latching means, means operable when said latching means is released by said electromagnetic means for actuating said device from said active position to said safe position without moving said motor means, a first switch, means for operating said first switch to open position when said device moves to said active position and for operating said first switch to closed position when said device moves to said safe position, means including an electrical circuit controlled by said first switch and operable when said first switch is closed to initiate energization of said motor, a second switch, means including said motor for closing said second switch only after closure of said first switch and effective to maintain said second switch in closed position during operation of said device by said motor and to open said second switch only after said device has been driven to said active position by said motor, and second electrical circuit means including said second switch to maintain energization of said motor as long as said second switch is closed.

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