

G. W. HART.
ELECTRICALLY OPERATED APPARATUS.
APPLICATION FILED JAN. 2, 1912.

1,058,178.

Patented Apr. 8, 1913.

2 SHEETS—SHEET 1.

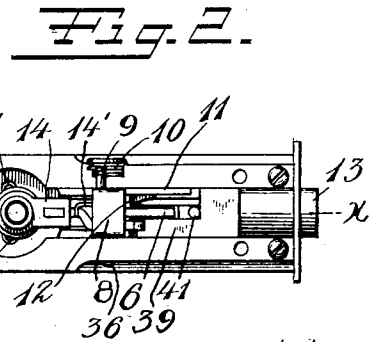
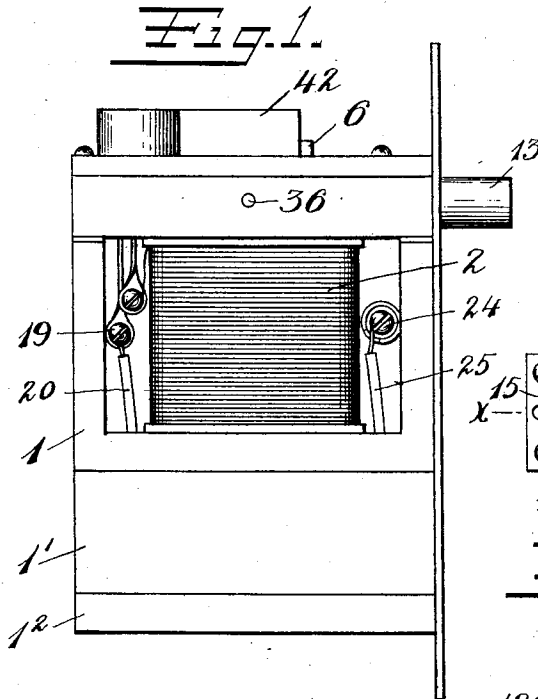


Fig. 6. Fig. 7.

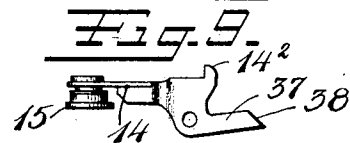
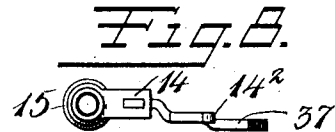
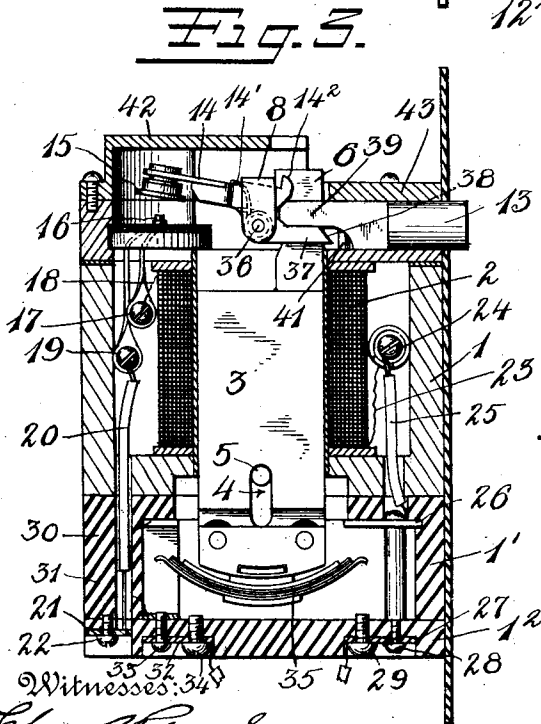
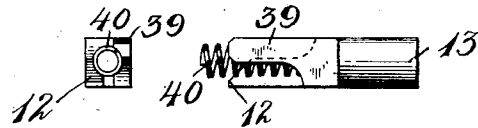


Fig. 10. Fig. 11.



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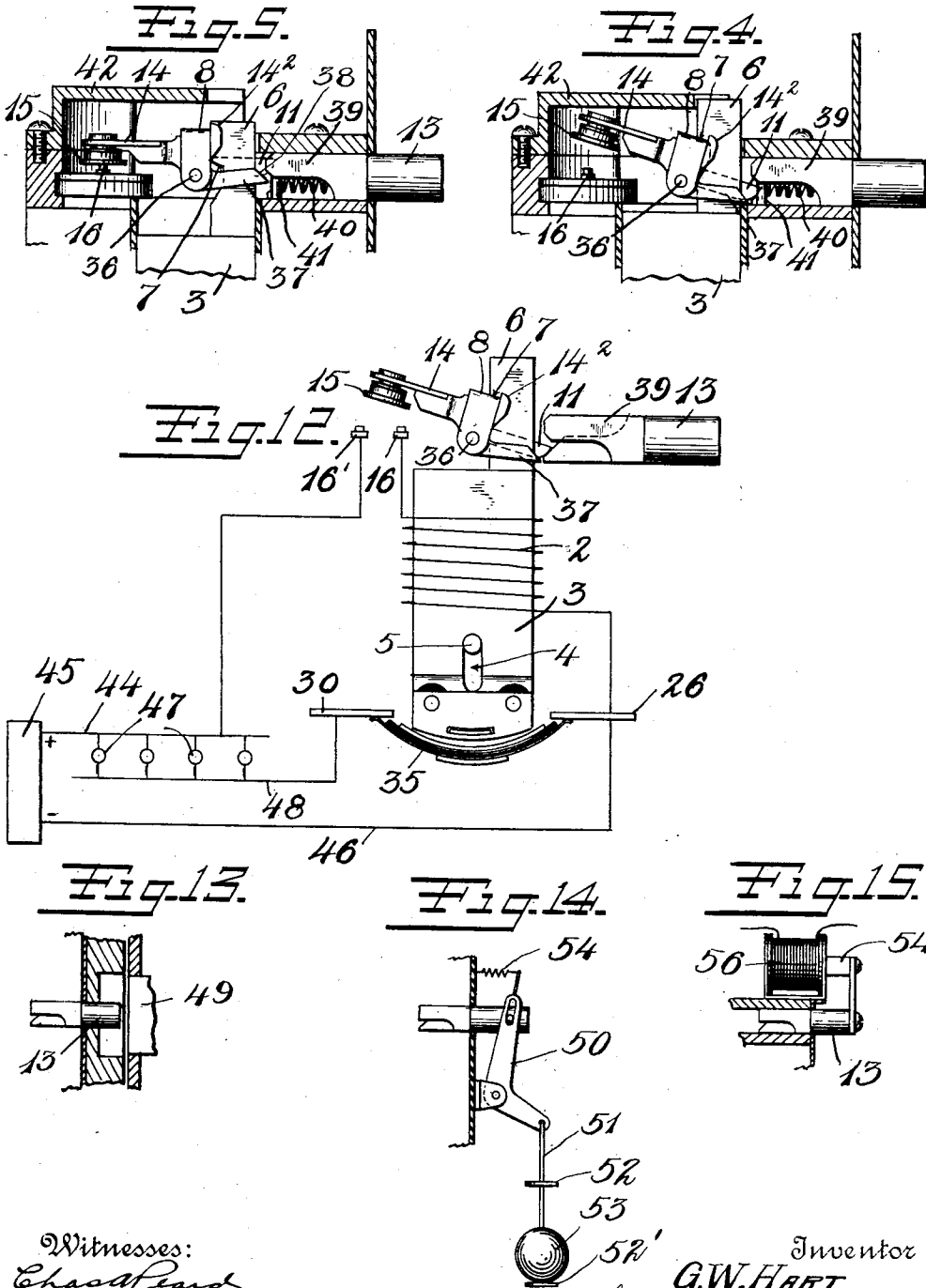
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2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

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ELECTRICALLY-OPERATED APPARATUS.

1,058,178.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, GERALD W. HART, a citizen of the United States, residing at West Hartford, county of Hartford, State of Connecticut, have invented certain new and useful Improvements in Electrically-Operated Apparatus, of which the following is a full, clear, and exact description.

My invention relates to a new electrically operated apparatus, the object of which is, first to provide a solenoid operated device having an actuator whose movement in operating unlocks a member, permitting said member to move, and whose movement in the other direction permits a circuit through said solenoid to be established, whereupon the member is restored by said solenoid to locked position and the circuit through the solenoid is thereafter automatically opened. It further has for its object to provide such a device as above referred to, in which the actuator can be moved in operating direction when the member is either locked or unlocked. It further has for its object to provide such a device as above referred to, in which the operating movement of the actuator will produce a break in the circuit through the solenoid at a definite point if the circuit happens to be closed at that point by reason of its failure to be automatically opened at said point.

It further has for its object to provide an electrically operated electric switch, having one or more of the features above referred to, such switch being adapted to control translating devices, such as lamps, or a motor, or the like.

The invention is particularly applicable for use in switches actuated by door bolts so that a lighting circuit will be interrupted whenever a door is locked from the outside, or for use in connection with tanks fed by electrically operated pumps for stopping the pump when the tank is full and starting it when the water falls to a predetermined point.

The following is a description of my invention, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation of an electric switch embodying my invention. Fig. 2 is a plan view of the same with the cover or cap removed. Fig. 3 is a vertical section on the line $x-x$ Fig. 2 with the actuator in

operated position. Fig. 4 is a vertical section of the upper part on the line $x-x$, Fig. 2 with the actuator retracted to normal position and the solenoid core raised. Fig. 5 is a similar section with the actuator in retracted position, and the solenoid core depressed. Fig. 6 is a left-hand end view of the actuator and its retracting spring. Fig. 7 is a side elevation of the actuator and its retracting spring. Fig. 8 is a plan view of the circuit controller. Fig. 9 is a side elevation of the circuit controller. Figs. 10 and 11 are a side elevation and a right-hand end view of the detent. Fig. 12 is a diagram of circuits. Fig. 13 shows the application of the device as a door jamb switch. Fig. 14 shows the application of the device as a tank controlled switch. Fig. 15 shows the device with electro-magnetic means for operating the actuator.

Referring more particularly to the drawings, 1 is a frame or support, preferably of metal, carrying a solenoid 2.

1' 1² are parts of a base of insulating material.

3 is a solenoid core having a slot 4 through which passes a pin 5 carried by the frame 1, so as to limit the downward movement of the core 3. This core has on its upper end a projection 6, having a notch forming a shoulder 7.

8 is a detent having a pin 9 engaged by one end of a spring 10, whose other end engages the frame 1 so that it causes the detent 8 to tend to move toward the projection 6, and to lock the core 3 in elevated position when the shoulder 7 is high enough, so that the detent 8 can pass beneath it. This detent has a projection 11 having a suitable end adapted to be engaged by the slanting face 12 of an actuator 13. When the actuator is pushed inward, the face 12 engages the curved surface of the end of the projection 11, lifting the same and causing the detent 8 to move out of engagement with the shoulder 7.

14 is a circuit controller having a metallic connecting piece 15 insulated therefrom and adapted to electrically connect the two contacts 16—16'. The controller 14 is actuated in one direction by a spring 14', which tends to throw the controller into engagement with the contacts 16—16'. The controller is provided with a projection 14², which is engaged by the detent 8 when the detent is in

locking position, or is turning to such position, and is thus held by the detent away from the contacts 16—16', or withdrawn from said contacts by the movement of the detent into locking position. One of the contacts 16—16' is provided with a binding screw 17, to which one terminal 18 of the solenoid winding is connected. The other contact has a binding screw 19, to which a conductor 20, connected with the terminal plate 21, is connected. This terminal plate 21 has a binding screw 22. The other terminal 23 of the solenoid 2 is connected to a terminal provided with a binding screw 24, to which is connected an insulated conductor 25, which in turn is connected to a contact plate 26. This contact plate is electrically connected to a terminal plate 27 by the screw 28. The plate 27 is provided with a binding screw 29. Opposite the contact plate 26 is a contact plate 30 which forms a portion of a U-shaped piece having a lower plate 31, which is electrically connected to a terminal plate 32 by the screw 33. The terminal plate 32 is provided with a binding screw 34.

The core 3 is provided with a switch arm or connecting piece 35 insulated from the core 3 and adapted when raised, to make electrical contact with the contact plates 26 and 30.

The circuit controller 14, and also the detent 8 are pivoted so as to move about the pin 36 carried by the frame 1. The controller 14 is provided with a projection 37 having an inclined face 38 adapted to be engaged by the end of the portion 39 of the actuator 13. A spring 40 bearing against the pin 41, mounted on the frame 1, tends to retract the actuator 13 from operated position to normal position.

42 is a cap or cover inclosing the detent 8 and the controller 14, and having a portion 43 which engages the upper surface of the actuator 13 forming the top portion of a channel, within which the actuator 13 moves. The surface 12 is carried by a longitudinal projection from the body of the actuator on one side of the pin 41, the projection 39 being on the other side of said pin.

Referring to the diagram, it will be seen that the switch arm 35 is in engagement with the terminal plates 26 and 30, the detent 8 being in engagement with the shoulder 7 so as to hold the armature 3 in elevated position. One end of the solenoid winding is connected with the contact 16, and the other is connected with the terminal plate 26. The contact 16' is connected with a lead 44 from a source of current 45. The other terminal of the source of current is connected by a lead 46, with the contact plate 26.

47 are translating devices interposed be-

tween the lead 44 and the conductor 48, which is connected to the contact plate 30.

The operation of the apparatus is as follows:—When the actuator 13 is moved in operating direction, that is, to the left, the surface 12 engages the rounded end of the projection 11 of the detent, moving the detent until it is withdrawn from the shoulder 7. At the same time, the projection 39 of the actuator passes above the projection 37 of the circuit controller, holding the circuit controller out of engagement with the contacts 16—16'. The withdrawal of the detent 8 permits the core 3 to fall and, if these features are embodied in an electric switch, the electrical connection between the plates 26 and 30 is thus opened by the disengagement of the arm 35 with the plates 26 and 30. The controller 14, when the core 3 is thus depressed, remains out of engagement with the contacts 16—16', as long as the actuator 13 is in operated position. When, however, the actuator 13 is released so as to be retracted to normal position, the portion 39 of the actuator is withdrawn from the arm 37 of the controller, permitting the controller to move into engagement with the contacts 16—16' under the influence of the spring 14'. As soon as an electrical connection is thus established between the terminals 16—16', the solenoid 2 becomes energized, and the core 3 is immediately raised to its elevated position. The detent 8 is then thrown by the spring 10 into engagement with the shoulder 7, locking the core in elevated position, and also withdrawing the controller 14 from the contacts 16—16' by reason of the engagement of the detent 8 with the shoulder 14'. Fig. 4 shows the parts before the actuator is moved to operated position the controller and detent being movable independently of the actuator. Fig. 3 shows the parts with the actuator in operated position, the core 3 being depressed and the controller 14 being out of engagement with the contacts 16—16'. When the actuator is released, it is retracted to normal position, as shown in Fig. 5, by the spring 40. The spring 14' thereupon throws the controller to the position shown in Fig. 5, in engagement with the contacts 16—16'. As soon as these contacts 16—16' are electrically connected, the solenoid 2 is energized and the core 3 is raised to the elevated position shown in Fig. 4, whereupon the detent 8 engages the shoulder 7 and retracts the controller 14, as above described.

If by any chance the current in the system fails, or is off, when the actuator is, or has been moved into operated position, and stays off until the actuator is returned to normal position and until the actuator has been operated a second time, the inclined surface 38 of the controller upon such second operation of the actuator, is engaged by the projection

39 of the actuator, and being slightly depressed by the movement of the actuator, the projection 39 passes over the arm 37. The movement of the actuator is, therefore, not in any way interfered with by reason of the fact that the parts have not been restored to normal position by the action of the solenoid 2, such as would be the case if at least one of the two engaging surfaces of the controller and actuator were not inclined, as in the construction shown. Moreover, the engagement of the inclined surface 12 of the controller by the actuator, causes the controller to move so that it is disengaged from the contacts 16—16', when the actuator is operated, thus breaking the circuit through the solenoid 2 at the points 16—16' restoring the parts to the position shown in Fig. 12, which is the proper position whenever the actuator is in operated position.

It will be seen that by having the projection 39 of the actuator pass above the projection 37, not only can the actuator be moved into operated position under all conditions, but the movement of the actuator when there is no current, does not in any way interfere with the subsequent operation of the apparatus, and moreover, restores the controller to the position it ought to be when the actuator is in actuated position.

My invention may be applied to various useful purposes. Fig. 13 shows it applied to a door for opening a local lighting circuit when the door is locked from the outside, and automatically restoring the circuit when the door is unlocked from the outside. It is particularly adapted for use with locks having separate bolts for locking the door from the outside and inside respectively. In the drawing, 49 is a door bolt that is thrown into locking position from the outside only. When thrown into locking position, the bolt 49 moves the actuator 13 so that it releases the detent 8 permitting the core 3 to fall and the switch to open. When the door is subsequently unlocked the actuator returns to normal position with the result that all lights which were on when the door was originally locked, are automatically restored upon reentering the room.

Fig. 14 shows the device applied to a tank. In this case the actuator is connected to a bell crank 50 to which is connected a rod 51 having stops 52—52' and a float 53. The effect of the spring 40 and of the weight of the rod 51 are counteracted by a spring 54. As the float 53 rises and falls it engages the stops 52 or 52', moving the actuator so as to open the switch when the water in the tank has risen to the desired point, and closing the switch when it has fallen to a point where the tank ought to be refilled, thus controlling the supply.

Fig. 15 shows the actuator connected to the core 55 of an auxiliary solenoid 56 by

which the actuator can be electromagnetically operated from a distance to release the core 3.

As will be evident to those skilled in the art, my invention permits of various modifications without departing from its spirit or the scope of the appended claims. The form shown is, however, the form now preferred by me.

What I claim is:—

1. In a device of the character described, the combination of a solenoid core tending to move in one direction, a solenoid adapted when energized to move said core in the other direction, a detent for holding said core after it has been moved in said other direction, an actuator for retracting said detent from core holding position and a circuit controller for making and breaking the circuit through said solenoid, said controller normally tending toward circuit making position and being withdrawn when said detent is in holding position and also when said actuator is in detent retracting position, and being free to complete the circuit through said solenoid when both said detent and said actuator are in retracted position.

2. In a device of the character described, the combination of a core normally tending to move in one direction, a solenoid adapted when energized to move said core in the opposite direction, a detent for locking said core when moved by said solenoid and normally tending toward core locking position, contacts in series with said solenoid, a circuit for said contacts and said solenoid, a circuit controller adapted to establish an electrical connection between said contacts and tending to follow the movements of said detent, and an actuator for releasing said detent, said actuator, when in detent releasing position, restraining the closing action of said controller until said actuator has been retracted, said controller having a projection adapted to be engaged by said actuator so that said controller will be withdrawn when said actuator is moved to detent releasing position at a time when said detent is in released position.

3. In a device of the character described, the combination of a core normally tending to move in one direction, a solenoid adapted when energized to move said core in the opposite direction, a pivoted detent for locking said core when moved by said solenoid and normally tending toward core locking position when removed therefrom, contacts in series with said solenoid, a circuit for said contacts and said solenoid, a pivoted circuit controller adapted to establish an electrical connection between said contacts, and tending to follow the movements of said detent, and a sliding actuator for releasing said detent, said actuator when in detent releasing position engaging said

controller and restraining its closing action until said actuator has been retracted.

4. In a device of the character described, the combination of a core normally tending to move downward under the action of gravity, a solenoid adapted when energized to move said core upward, a detent for locking said core when moved by said solenoid and normally tending toward core locking position when removed therefrom, contacts in series with said solenoid, a circuit for said contacts and said solenoid, a circuit controller adapted to establish an electrical connection between said contacts and tending to follow the movements of said detent, and an actuator for releasing said detent, said actuator and controller having surfaces engaging when said actuator is in detent releasing position, restraining the closing action of said controller until said actuator has been retracted.

5. In a device of the character described, the combination of a core normally tending to move in one direction, a solenoid adapted when energized to move said core in the opposite direction, a detent for locking said core when moved by said solenoid, a spring normally tending to move said detent toward core locking position, auxiliary contacts in series with said solenoid, a circuit for said contacts and said solenoid, a circuit controller adapted to establish an electrical connection between said auxiliary contacts, and having an engagement with said detent so as to be retracted thereby, a spring tending to cause said controller to connect said contacts, and an actuator for releasing said detent, said controller having a restraining projection engaged by said actuator when operated so that said controller is withheld from said contacts until said actuator is retracted.

6. In a device of the character described, the combination of a core normally tending to move in one direction, a solenoid adapted when energized to move said core in the opposite direction, a detent for locking said core when moved by said solenoid, a spring normally tending to move said detent toward core locking position, auxiliary contacts in series with said solenoid, a circuit for said contacts and said solenoid, a circuit controller adapted to establish an electrical connection between said auxiliary contacts, and having an engagement with said detent so as to be retracted thereby, a spring tending to cause said controller to connect said contacts, and an actuator for releasing said detent, said controller having a restraining projection engaged by said actuator when operated so that said controller is withheld from said contacts until said actuator is retracted, and is withdrawn from said contacts when said actuator is operated with said detent in released position.

7. In a switch, the combination of a core normally tending to move in one direction, a solenoid adapted when energized to move said core in the opposite direction, a detent for locking said core when moved by said solenoid and normally tending toward core locking position when removed therefrom, auxiliary contacts in series with said solenoid, a circuit for said contacts and said solenoid, a circuit controller adapted to establish an electrical connection between said auxiliary contacts, and tending to follow the movements of said detent, an actuator for releasing said detent, said actuator when in detent releasing position engaging said controller and restraining its closing action until said actuator has been retracted, a switch arm actuated by said core and terminals adapted to be connected and disconnected by said switch arm.

8. In a switch, the combination of a core normally tending to move in one direction, a solenoid adapted when energized to move said core in the opposite direction, a detent for locking said core when moved by said solenoid and normally tending toward core locking position when removed therefrom, auxiliary contacts in series with said solenoid, a circuit for said contacts and said solenoid, a circuit controller adapted to establish an electrical connection between said auxiliary contacts tending to follow the movements of said detent, an actuator for releasing said detent, said actuator when in detent releasing position engaging said controller and restraining its closing action until said actuator has been retracted, said controller having a projection adapted to be engaged by said actuator so that said controller will be withdrawn when said actuator is moved to detent releasing position at a time when said detent is in released position, a switch arm actuated by said core and terminals adapted to be connected and disconnected by said switch arm.

9. In a switch, the combination of a core normally tending to move in one direction, a solenoid adapted when energized to move said core in the opposite direction, a pivoted detent for locking said core when moved by said solenoid and normally tending toward core locking position, auxiliary contacts in series with said solenoid, a circuit for said contacts and said solenoid, a pivoted circuit controller adapted to establish an electrical connection between said auxiliary contacts tending to follow the movements of said detent, a sliding actuator for releasing said detent, said actuator engaging said controller and restraining its action until said actuator has been retracted, a switch arm actuated by said core and terminals adapted to be connected and disconnected by said switch arm.

10. In a switch, the combination of a core normally tending to move downward under

the action of gravity, a solenoid adapted when energized to move said core upward, a detent for locking said core when moved by said solenoid and normally tending toward core locking position when removed therefrom, auxiliary contacts in series with said solenoid, a circuit for said contacts and said solenoid, a circuit controller adapted to establish an electrical connection between said auxiliary contacts tending to follow the movements of said detent, an actuator for releasing said detent, said actuator when in detent releasing position engaging said controller and restraining its closing action until said actuator has been retracted, a switch arm actuated by said core, and terminals adapted to be engaged by said arm when the same is lifted by said solenoid, and to be disengaged thereby when said core falls to downward position.

11. In a device of the character described, the combination of a member tending to move in one direction, a solenoid for moving it in the opposite direction, a detent for holding said member after it has been moved by said solenoid and tending to move to holding position when removed therefrom, a circuit controller for said solenoid normally tending to close when said detent is in non-holding position, and an actuator for releasing said detent and holding said controller in open position whenever said actuator is in detent releasing position.

12. In a device of the character described, the combination of a member tending to move in one direction, a solenoid for moving it in the opposite direction, a detent for holding said member after it has been moved by said solenoid and tending to move to holding position when removed therefrom, a circuit controller for said solenoid normally tending to close when said detent is in non-holding position, and an actuator for releasing said detent and holding said controller in open position whenever said actuator is in detent releasing position, said actuator when moving to detent releasing position engaging said controller and moving it, if it is in closed position, to open position.

13. In a device of the character described,

the combination of a member tending to move in one direction, a solenoid for moving it in the opposite direction, a detent for holding said member after it has been moved by said solenoid and tending to move to holding position when removed therefrom, a circuit controller for said solenoid normally tending to close when said detent is in non-holding position, and an actuator for releasing said detent and holding said controller in open position whenever said actuator is in detent releasing position, and a spring engaging said detent and tending to move it to holding position.

14. In a device of the character described, the combination of a member tending to move in one direction, a solenoid for moving it in the opposite direction, a detent for holding said member after it has been moved by said solenoid and tending to move to holding position when removed therefrom, a circuit controller for said solenoid normally tending to close when said detent is in non-holding position, and an actuator for releasing said detent and holding said controller in open position whenever said actuator is in detent releasing position, and a spring engaging said controller and detent and tending to move said controller to closed position when said detent is released.

15. In a device of the character described, the combination of a member tending to move in one direction, a solenoid for moving it in the opposite direction, a detent for holding said member after it has been moved by said solenoid and tending to move to holding position when removed therefrom, a circuit controller for said solenoid normally tending to close when said detent is in non-holding position, an actuator for releasing said detent and holding said controller in open position whenever said actuator is in detent releasing position, a stationary support for said parts, and a spring engaging said support and said detent and tending to move said detent to holding position.

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Witnesses:

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