Aug. 28, 1928. 1,682,676

A. J. HORTON

ELECTROMAGNETICALLY OPERATED DEVICE

Filed June 22, 1918

Fig. 1.

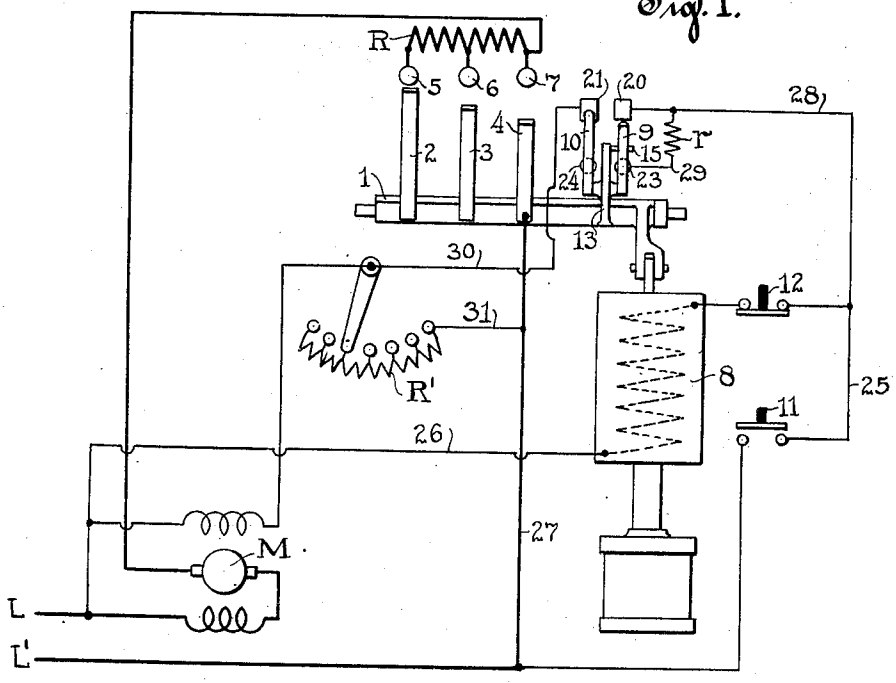


Fig. 2.

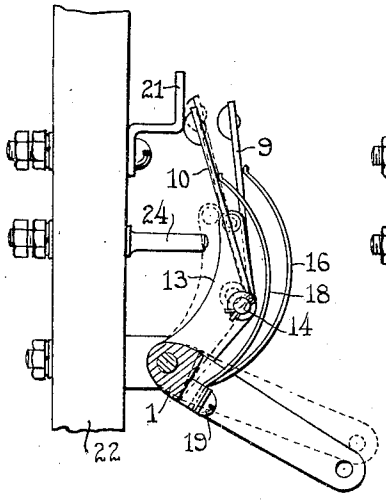


Fig. 3.

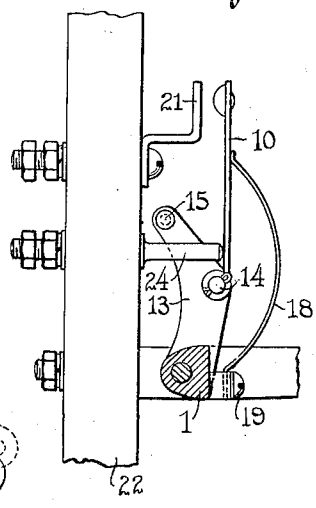
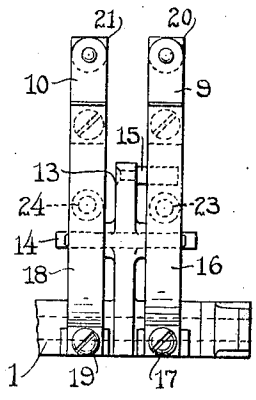


Fig. 4.



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UNITED STATES PATENT OFFICE.

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ELECTROMAGNETICALLY-OPERATED DEVICE.

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This invention relates to electromagnetically operated devices, and, while not limited thereto, is particularly applicable to motor controlling devices.

In practice it is often desired to effect operation of electromagnetic devices of various kinds by momentary closure of a push button switch and to include a resistance in circuit with the operating winding of the device upon completion of its operation and the present invention has among its objects to provide in conjunction with such devices simplified means affording the aforesaid control thereof.

Also the invention has other objects and advantages which will hereinafter appear.

The accompanying drawing illustrates an embodiment of the invention particularly designed for motor control and the same will now be described, it being understood that certain features illustrated might be advantageously used in various other relations.

In the accompanying drawing, Figure 1 shows the controller schematically; and,

Figs. 2, 3 and 4 show in detail a preferred construction of a part of the controller.

The controller illustrated comprises a rock shaft 1 carrying contact arms 2, 3 and 4 which are shown as co-operating with contacts 5, 6 and 7 to control the armature circuit of a compound motor M, an electromagnet 8 for actuating said rock shaft and auxiliary contact arms 9 and 10, the former to control the electromagnet 8 and the latter to control a shunt around a field rheostat R′ for motor M. That part of the controller comprising the rock shaft 1, contact arms 2, 3 and 4 and electromagnet 8 is of a well known form wherein the contact arms are set in different angular positions on the rock shaft to engage contacts 5, 6 and 7 successively and the electromagnet 8 is provided with a normally open push button switch 11 for energization thereof and with a normally closed push button switch 12 for de-energization thereof. Accordingly it will be understood that in order to obtain full operation of the controller by momentary operation of the push button switch 11 it is necessary to parallel said switch, and the contact arm 9 with its co-operating contacts is provided for this purpose and for the further purpose of inserting a resistance r in series with the electromagnet 8 after full response thereof. Also, as will be understood, it is desired to short circuit the field rheostat throughout the period of armature control and to then interrupt the short-circuit thereof and the contact arm 10 with its associated contact is provided for this purpose.

As shown in Figs. 2, 3 and 4 the contact arms 9 and 10 are both pivotally supported on an upstanding lug 13 provided on the rock shaft 1 and more specifically, by a pin 14 passing through said lug, said arms being arranged on opposite sides of said lug. The lug 13 has a laterally projecting pin 15 providing a stop for the contact arm 9 and said arm is biased towards said stop by a leaf spring 16 fixed at its lower end to the rock shaft by a screw 17. Also, the switch arm 10 is similarly biased by a leaf spring 18 fixed at its lower end to the rock shaft by a screw 19 and said arms 9 and 10 are respectively provided with co-operating stationary contacts 20 and 21 fixed to a panel 22. In the normal position of the rock shaft, as shown in Fig. 2, the arm 10 engages contact 21 while the arm 9 is held out of engagement with contact 20 by the stop pin 15. However, the arrangement is such that when the shaft 1 is rocked to position the lug 13 as shown in dotted lines (Fig. 2), the arm 9 engages the contact 20 and the structure is such that this operation may be effected by momentary closure of the push button switch 11. Also, the structure is such that in the meantime the switch arm 10 remains in engagement with contact 21. On the other hand, the contact arms 9 and 10 are respectively provided with stop posts 23 and 24 fixed to the panel 22 and said posts function as shown in Fig. 3 to effect disengagement of both of said arms from their contacts upon continued movement of the lug 13 toward the panel. More specifically each stop post is arranged directly in the path of its respective contact arm and above its pivot on the lug 13 whereby continued movement of the lug 13 after engagement of said arms with their respective posts, rocks the former outwardly on their pivots against the ac-

tion of their respective springs and the posts are so proportioned that the contact arms are thus disengaged upon completion of the rocking motion of the shaft 1.

Again referring to Fig. 1, the functions of contact arms 9 and 10 will be more specifically described. Closure of push button switch 11 completes a circuit from line L′ by conductor 25 through push button switch 12, thence through the winding of electromagnet 8, by conductor 26 to line L and contact arm 9 upon engaging contact 20 completes a circuit from line L′ by conductor 27 through rock shaft 1 and through said arm to contact 20 and by conductor 28 to switch 12, thus paralleling push button switch 11. Hence inasmuch as the contact arm 9 is engaged with contact 20 upon initial movement of the rockshaft it enables release of the push button switch 11 after a momentary period without interfering with continued operation of the controller. On the other hand when the operation of the controller is completed, contact arm 9 is disengaged from contact 20, whereupon the current traversing the electromagnet 8 is forced to take the path from arm 9 to stop post 23 by conductor 29 through resistance r to conductor 28, thus including said resistance in series with said electromagnet.

In initial position of the controller the switch arm 10 completes a short circuit for the field rheostat R′ which extends from the arm of said rheostat by conductor 30 to contact 21 through arm 10 and the rockshaft 1, by conductor 27 to line L′. On the other hand, when the operation of the controller is completed, the arm 10 is disengaged from the contact 21 as above described, thereby interrupting the short circuit around the rheostat.

What I claim as new and desire to secure by Letters Patent is:

1. In combination, a electromagnetically operated device, an energizing switch therefor requiring manual retention in closed position, a resistance for inclusion in circuit with the winding of said device upon operation thereof to a given degree, and an auxiliary switch having a contact element attached to and movable with said device to first establish an energizing circuit therefor independent of said first-mentioned switch and to subsequently include said resistance.

2. In combination, an electromagnetically operated device, an energizing switch therefor requiring manual retention in closed position, a normally open shunt circuit around said switch, a resistance for inclusion in circuit with the winding of said device upon operation thereof to a given degree, and an auxiliary switch having a contact element movable by said device to close said shunt circuit and control said resistance sequentially.

3. In combination, an electromagnetically operated device, a control switch therefor requiring manual retention thereof in closed position, a resistance to be included in circuit with the operating winding of said device upon full operation thereof, and a normally open switch having a contact element operatively connected to said device, said contact element having other positions to which it is movable by said device to first establish a shunt around said first mentioned switch and thereafter effect inclusion of said resistance.

4. In combination, an electromagnetically operated device, a control switch therefor requiring manual retention thereof in closed position, a normally open shunt circuit around said switch, a resistance, and a normally open switch having a contact element operatively connected to said device, said contact element having a position to which it is movable upon initial movement of said device to complete said shunt circuit and another position to which it is movable upon continued movement of said device to effect inclusion of said resistance in circuit with the operating winding of said device.

5. In combination, an electromagnetically operated device having a rocking element, a switch for said device having a contact arm pivotally mounted on said rocking element, a stationarily mounted contact to be engaged by said arm upon a given movement of said element and a stop to be engaged by said arm upon continued movement of said element to effect disengagement of said arm from said stationary contact.

6. In combination, an electromagnetically operated device, a switch therefor comprising a contact arm and a stationarily mounted contact to be engaged by said arm, said device having a rocking element upon which said arm is pivotally mounted and having a stop toward which said arm is biased, said stop serving to normally disengage said arm from said contact but permitting the former to engage the latter upon movement of said rocking element and a fixed stop in the path of said arm serving to effect disengagement of said arm from said contact upon continued movement of said element.

7. In combination, an electromagnetically operated device having a rocking element, and a control switch therefor comprising a plurality of stationary contacts and a cooperating contact arm, said contact arm being pivotally supported on said rocking element of said device to be engaged with both of said contacts upon movement of said element and one of said contacts forming a stop for said arm to effect its disengagement from another of said contacts upon continued movement of said element.

8. In combination, an electromagnetically operated device, a control switch therefor comprising a contact arm and a plurality of contacts to be engaged thereby, said device in-

cluding a rocking element upon which said contact arm is pivotally supported and a part to engage said arm to disengage the latter from said contacts, said arm being biased against said part and being operable by said rocking element to engage said contacts and one of said contacts forming a stop for said arm to effect its disengagement from another of said contacts upon continued movement of said element.

9. In combination, an electromagnetically operated device and a pair of switches therefor each comprising a stationary contact and a co-operating contact arm, said device having a rocking element upon which said contact arms are pivotally supported and biased toward their contacts for normal engagement of one of said arms with its contact, said element having a stop for the other of said arms to normally disengage the same from its contact, but permitting engagement thereof upon initial movement of said element, and fixed stops for said arms providing for disengagement thereof from their respective contacts upon continued movement of said element.

10. In combination, an electromagnetically operated device and a pair of switches therefor each comprising a stationary contact and a co-operating contact arm, said device having a rocking element upon which said contact arms are pivotally supported and biased toward their contacts for normal engagement of one of said arms with its contact, said element having a stop for the other of said arms to normally disengage the same from its contact, but permitting engagement thereof upon initial movement of said element, and fixed stops for said arms providing for disengagement thereof from their respective contacts upon continued movement of said element, one of said fixed stops constituting a second contact for its respective contact arm.

11. In an electric switch, in combination, a stationary contact, a co-operating rigid contact element, a pivotally movable supporting element for said contact element, the latter being yieldable relatively to the former and being biased into a given relation with respect thereto whereby engagement with said stationary contact is effected upon a given movement of said supporting element and a stop engageable by said contact element upon continued movement of said supporting element for disengagement of said contact element from said contact.

12. In an electric switch, in combination, co-operating contacts, a rocking element having an arm pivotally mounted thereon and carrying certain of said contacts, yielding means biasing said arm into a given relation with respect to said element whereby engagement of said contacts is effected upon a given movement of said element and a stop engageable with said arm to effect disengagement of said contacts upon continued movement of said element.

13. In an electric switch, in combination, co-operating contacts, an arm carrying certain of said contacts, a rocking element upon which said arm is pivotally mounted, resilient means biasing said arm into a relation with respect to said element for engagement of said contacts upon a given rocking movement of said element and a stop in the path of said arm and located between said contacts and the pivot of said arm whereby upon continued movement of said element said arm is caused to disengage said contacts against the bias of said means.

14. In an electric switch, in combination, a stationary contact, a co-operating rigid contact arm normally out of engagement therewith, a pivotally movable supporting element for said arm, the latter being movable with respect to said arm, and a stop co-acting with said arm to effect such relative movement, said stop being arranged to provide for engagement with and dis-engagement from said stationary contact of said arm upon movement of said element unidirectionally.

15. In an electric switch, in combination, a plurality of sets of co-operating contacts, a movable element carrying arms to support certain of the contacts of each of said sets, each of said arms supporting its respective contact for relative movement between the latter and said element and fixed means co-acting with said arms to effect such relative movements upon operation of said element, said element in one position effecting engagement of certain of said contacts and disengagement of other of said contacts while in another position effecting disengagement of the former and engagement of the latter and during unidirectional movement effecting both engagement and disengagement of one of said sets of contacts.

16. In combination, an electromagnetically operated device, an energizing switch therefor requiring manual retention in closed position, a resistance for inclusion in circuit with the winding of said device upon operation thereof to a given degree, an auxiliary switch having a single contact element pivotally attached to and movable with said device and a plurality of stationary contacts to be engaged thereby, said contact element being adapted to first engage one of said stationary contacts to establish an energizing circuit for said device independently of said first mentioned switch and to thereafter engage another of said stationary contacts to effect inclusion of said resistance.

17. In combination, an electromagnetically operated device, a control switch therefor requiring manual retention thereof in closed position, a normally open shunt circuit

around said switch, a resistance, a rocking element operable by said device, an auxiliary switch having a single contact element pivotally carried by said rocking element, a stationary contact to be engaged by said contact element upon a given operation of said rocking element to effect completion of said shunt circuit, and another stationary contact to be subsequently engaged by said contact element upon continued operation of said rocking element to effect inclusion of said resistance in circuit with the operating winding of said device and to also effect disengagement of said contact element from said first mentioned stationary contact.

In witness whereof, I have hereunto subscribed my name.

ALBERT J. HORTON.