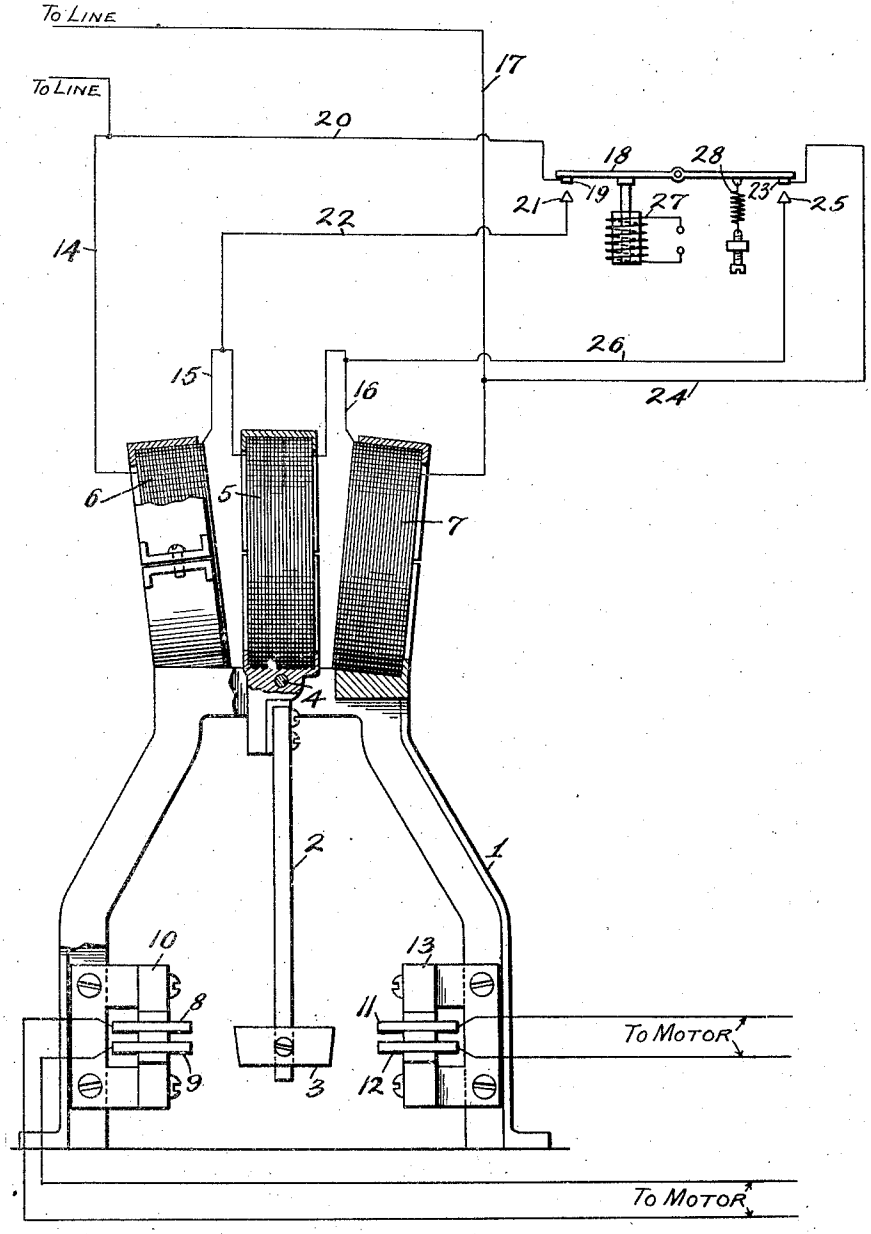
Aug. 9, 1927. 1,638,098

H. C. ROCHETTE

RELAY

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RELAY.

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This invention relates to improvements in magnetically actuated relays.

A common type of magnetically actuated relay comprises a swinging bar which is pivoted at its upper end, the lower end of the bar carrying circuit closing devices. Electro-magnets are located on opposite sides of the bar which is ordinarily provided with a piece of iron which can act as an armature for either magnet. The magnets are normally deenergized and one or the other is energized according as it is desired to cause the bar to swing in one direction or the other. When either of the magnets is energized it, of course, attracts its armature and pulls the bar over to it, this movement of the bar closing one of the circuits which the bar controls.

An objection to this type of relay is that it is sluggish. Assuming that one of the actuator magnets is energized and has attracted its armature, it may happen that, as soon as the bar has swung over and closed its circuit, the circuit for that magnet is broken and the circuit to the other magnet is immediately closed. The armature on the actuator bar, however, is now in its furthest position from that magnet which is now to operate, that is, in the most unfavorable position for the magnetic forces to act. The time required to swing the bar from one limit of its position to the other limit is considerable, because the magnetic pull exerted is weak in the first instance.

Further, with this type of relay, assuming that one of the actuator magnets has operated and the bar has swung over, if the circuit for the magnet is opened, the bar swings back by gravity and will continue to oscillate like a pendulum, if neither magnet is energized, until it finally reaches a position of rest midway between the magnets. It may happen, however, in the operation of the relay that the circuit of one of the magnets will be closed while the bar is swinging away from that magnet. Under these conditions, the magnet has to stop the bar and swing it back. The sluggishness of this type of relay produces the well-known phenomena of "hunting" in the systems in which the relay is employed and devices, such as damping devices, are frequently introduced to overcome the difficulties incident to "hunting". Such damping devices, of course, decreases the sensitiveness of the entire apparatus.

The present invention has for its object to produce a magnetically controlled relay which is simple in construction, certain in operation and in which the difficulties due to the sluggish action of prior constructions are obviated.

With these and other objects not specifically referred to in view, the invention consists in certain constructions, parts, improvements and combinations, as will be hereinafter fully described and then specifically pointed out.

Referring to the drawing which illustrates a concrete embodiment of the invention, the drawing represents diagrammatically in side elevation a construction embodying the invention.

In said drawing, 1 indicates a frame in which the parts of the apparatus are mounted. Constructions embodying the invention will include a movable polarized circuit controller. While this controller may be variously constructed, in the particular construction illustrated, it includes a swinging bar 2 carrying a circuit bridging contact 3, the bar being pivoted at 4 in the frame. In the particular construction illustrated, the polarization of the circuit controller is effected by providing the bar with a current carrying coil 5 which may be conveniently enclosed in a casing. In the construction illustrated, actuator fields are established on opposite sides of the field of the current carrying coil 5, these fields being of such a character that they oppose or buck the field of the controller. As shown, these fields comprise coils 6, 7, these coils being also conveniently mounted in casings which are secured to the frame 1. The terminals of two circuits which are to be opened and closed by the controller are shown as being mounted in the frame. The terminals of one of these circuits are marked 8, 9, the terminals being supported in an insulating block 10 secured to one of the legs of the frame. The terminals of the other circuit are marked 11, 12, these terminals being supported in a block 13 secured to the other leg of the frame. In the best constructions embodying the invention, the coils by which the magnetic fields are established, will be normally energized. Under this condition,

each actuator field is opposing or bucking the field of the polarized controller with the result that the controller stands in its midway position and the bridge contact 3 is midway between the sets of circuit contacts. If it be desired to have the circuits closed through the terminals 8, 9, the coil 7 will be deenergized. The field 6 immediately acts to repel the coil 5 and swing the controller over, so that the bridge contact 3 bridges the terminals 8, 9. If now it is desired to close the circuit through the other set of terminals, the coil 6 will be deenergized, and the field of the coil 7 will immediately repel the coil 5, swinging the controller in the opposite direction. It will be observed that at the start of this movement, the coil 5 is in that position which enables the coil 7 to act on it with the greatest force. The result is that there is no sluggishness of operation. The worst position for immediate operation which the controller can occupy is when it is midway between the coils, in which position it has the least distance to travel in order to close a circuit. In other words, with this construction, the further the controller has to travel in order to close the circuit, the stronger the actuating force will be at the beginning of the movement. Again, with this construction and where the fields are normally energized, each field acts not only to cause the movement of the controller, but also acts to damp the movement produced by the other coil. The result is that if there is a rapid alternation of opening and closing of the circuits through the actuator coils, there is no undue oscillation of the controller which will result in "hunting" in the system. Further, with a construction in which the coils are normally energized, the controller is under the influence of the coils for any position it may occupy between the limits of its movement.

The circuits through the coils may be variously arranged and controlled. In the construction illustrated, the coils are connected in series, one of the line wires being indicated at 14, the wire which connects the coil 6 to the coil 5 being indicated at 15 and the wire which connects the wire 5 to the wire 7 being indicated at 16, the other line wire being indicated at 17. The devices illustrated for opening and closing the circuits to the coils are of any ordinary character. A pivoted insulated circuit closing bar is indicated at 18. One of the contacts 19 of this bar is connected by a wire 20 to the line wire. The contact with which this contact 19 cooperates is marked 21 and this is connected by a wire 22 to the wire 15. The other contact of this pivoted circuit closing bar 18 is marked 23, this contact being connected by a wire 24 to the other line wire 17. The contact with which this contact 23 cooperates is marked 25 and this is connected by a wire 26 to the wire 16. This bar 18 is provided with the usual operating solenoid, indicated at 27, and a returning spring 28.

With this arrangement of circuits, as has been indicated, all the coils are normally energized. If the bar 18 is swung down, so that a contact is made between the terminals 19 and 21, the coil 6 will be shunted through the circuit wires 20 and 22, with the result that the coil 7 acts to repel the coil 5 and move the circuit controller. If, on the other hand, contact is made between the terminals 23 and 25, the coil 7 will be shunted.

In the best constructions embodying the invention, the pivot for the bar will be located below the coil. With this construction, the rate of movement of the circuit controller can be varied by varying the location of the pivot with respect to the coil. The higher the pivot is with respect to the center of gravity of the moving element, the more rapid the rate of movement will be at or near the limit of movement of the circuit controller.

Changes and variations may be made in the construction for carrying the invention into effect. The invention is not, therefore, to be limited to the particular construction herein shown and described.

What is claimed is:

1. In a relay, a polarized movable circuit controller, actuator fields located on opposite sides of the controller, said actuator fields normally opposing the controller field and thus normally maintaining the controller in inoperative position, and means for varying the strength of the fields to cause movement of the controller.

2. In a relay, a polarized movable circuit controller, actuator fields located on opposite sides of the controller, said actuator fields opposing the controller field and thus maintaining the controller in inoperative position, and means for varying the strength of one or the other of the actuator fields to cause movement of the controller.

3. In a relay, a polarized movable circuit controller including a current carrying controller coil, actuator coils located on opposite sides of the field of the controller coil, means for so supplying current to the actuator coils that the magnetic fields set up thereby oppose the field of the controller coil, and means for varying the field strength to cause an operative movement of the controller.

4. In a relay, a polarized movable circuit controller including a current carrying controller coil, actuator coils located on opposite sides of the field of the controller coil, means for so supplying current to the actuator coils that the magnetic fields set up thereby oppose the field of the controller coil, and means for so varying the current

flow through one or the other of the actuator coils as to cause an operating movement of the controller.

5. In a relay, a swinging controller bar, a current carrying coil mounted on the bar, actuator coils on opposite sides of the bar coil, means for so supplying current to the actuator coils that the magnetic fields of these coils oppose the field of the bar coil, and means for varying the field strength to cause an operating movement of the bar.

6. In a relay, a polarized movable circuit controller, means for establishing an actuator field on opposite sides of and opposing the controller field, whereby the controller is normally held stationary between the actuator fields, and means for rendering either of the actuator fields inoperative.

7. In a relay, a movable circuit controller including a pivoted bar, a magnet carried by the bar, means for establishing actuator fields on opposite sides of the bar magnet, said fields opposing the magnet field, and means for varying the strength of one or the other of the actuator fields to cause a movement of the bar.

8. In a relay, a pivoted bar, a current carrying coil carried by the bar, actuator coils mounted on opposite sides of the bar coil the fields of said coils opposing the field of the bar coil, and means for varying the strength of either of the actuator fields.

9. In a relay, a movable circuit controller comprising a pivoted bar, a current carrying coil mounted thereon, actuator coils located on opposite sides of the bar coil, said coils being so connected in series with the bar coil that the actuator fields oppose the bar coil field, and means for rendering either one or the other of said actuator fields inoperative.

10. In a relay, a movable circuit controller including a bar, a current carrying coil mounted on the bar, a pivot for the bar located below the coil, actuator coils located on opposite sides of the bar coil said coils being so connected in series with the bar coil that the fields of the actuator coils oppose the field of the bar coil, and means for rendering one or the other of the actuator fields inoperative.

In testimony whereof, I have hereunto set my hand.

HENRY C. ROCHETTE.