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C. I. HALL

RELAY

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Fig. 1.

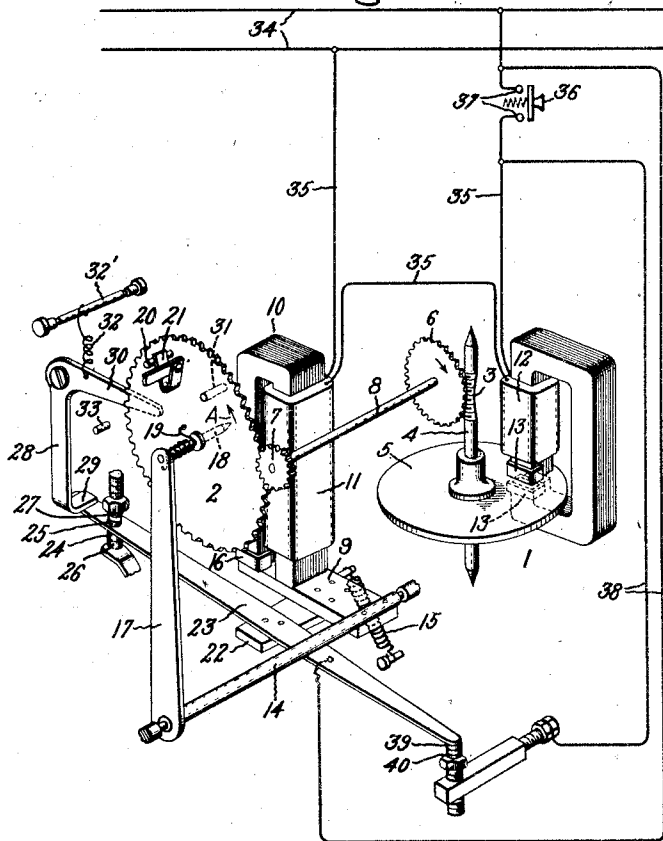
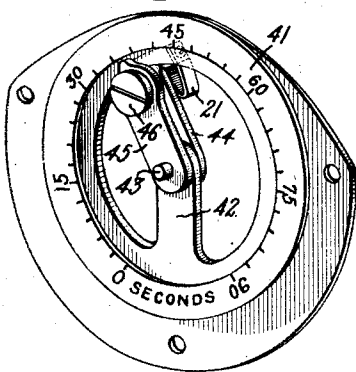


Fig. 2.



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UNITED STATES PATENT OFFICE.

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RELAY.

Application filed September 24, 1921. Serial No. 502,914.

To all whom it may concern:

Be it known that I, CHESTER I. HALL, a citizen of the United States, residing at Fort Wayne, county of Allen, State of Indiana, have invented certain new and useful Improvements in Relays, of which the following is a specification.

My invention relates to relays and more particularly to relays operative with definite time limit characteristics. An object of my invention is to provide a relay which has dependable definite time limit characteristics under all conditions for which the relay is intended to operate. Another object of my invention is to provide a definite time limit relay with a simple and reliable means for setting the relay to respond for different time delays.

Various time delay relays operative with more or less definite time limit characteristics are known to the art but these relays usually employ dash pots and similar devices which may be somewhat uncertain in their action and usually cannot be readily and simply changed or adjusted by the operator to respond to various time settings with the ease and certainty of operation that is desirable.

According to my invention, I provide a definite time limit relay, without dash pots or similar devices, comprising contact controlling mechanism adapted to be actuated by a constant speed electric motor and a simply operated manual means for varying the time setting of the relay that insures positiveness and precision of operation.

My invention will be better understood from the following description taken in connection with the accompanying sheet of drawings and its scope will be pointed out in the appended claims.

Figure 1 illustrates in perspective an embodiment of my invention, and Fig. 2 illustrates in perspective the time setting mechanism of my relay.

The embodiment of my invention illustrated in Fig. 1 comprises an alternating current constant speed electric motor 1 preferably of the induction disk type arranged to drive a rotatably mounted contact controlling member 2 movable into and out of driving relationship with a reducing gear train, comprising a worm 3 on the shaft 4 of the disk 5 and gears 6 and 7 on a shaft 8, by

the hinged armature 9 of an electromagnet 10 having its winding 11 connected in circuit with the energizing winding 12 of the motor 1. The motor 1 is of the shaded pole type and one of the shaded poles 13 may be made adjustable, if desired, to vary the torque on the disk 5 and thus the speed of the motor 1. The armature 9 of the electromagnet 10 is secured to a pivotally supported shaft 14 and is biased to the unattracted position by a spring 15. One of the poles of the electromagnet 10 is preferably provided with a shading coil 16 to prevent chattering of the armature 9 when in its attracted position. Rigidly mounted on the armature shaft 14 is an arm 17 which supports one end of a shaft 18 on which the contact controlling member 2 is mounted. There is thus formed a movable or floating bearing for one end of the shaft 18 while the other end thereof is journaled in a fixed bearing preferably in the frame or casing of the relay. A counter-torque element, such as a torsion spring 19 surrounding the shaft 18, serves to rotate the contact controlling member 2 to its initial position when the electromagnet 10 is de-energized, a pin 20 on the rotatable member 2 coming to rest against a preferably resilient stop 21, which is adjustably mounted to vary the initial position or angular movement of the rotatable member 2 and thus the time limit of the relay.

Secured to the armature 9 of the electromagnet 10 is an insulating piece 22 which supports a flexible contact carrying or switch member 23 provided with contacts 24 and 25 arranged to cooperate with contacts 26 and 27 respectively. These co-operating contacts may be included in any circuits which it is desired to control by the relay. The contacts 24 and 26 are closed with the armature 9 in either unattracted or attracted position, being held closed in the attracted position of the armature 9 against the flexure of the switch member 23 by a pivoted member 28 such as a bell crank having a stop or restraining means 29 bent up in the path of the switch member 23. One arm 30 of the bell crank 28 is arranged to be engaged by a pin 31 on the rotatable member 2 which when rotated to contact controlling or releasing position causes the pin 31 to bear against the arm 30 and turn the member 28 thus moving the stop 29 off the end of the

switch member 23, the flexure of which closes contacts 25 and 27 and opens contacts 24 and 26. The bell crank 28 is biased in switch restraining direction by a spring 32 secured to a pin or projection 32' mounted in the relay frame. The rotation of the bell crank 28 in the opposite direction may be limited by a pin or stop 33.

As shown in Fig. 1, the windings 11 and 12 of the electromagnet 10 and the motor 1 respectively are connected in series across one phase of an alternating current circuit 34 which may include for example suitable circuit interrupting means controlled by the relay through control circuits including the pairs of contacts 24—26 and 25—27. Although the windings 11 and 12 are shown connected in series, they may be in parallel if desired. The circuit including the windings 11 and 12 of the electromagnet and motor respectively and conductors 35 is normally open but may be closed by a switch 36, either manually or automatically operated, controlling contacts 37 and if desired the relay may be provided with a sealing-in circuit comprising conductors 38, switch member 23 and contacts 39 and 40. The function of the sealing-in circuit is to insure that the relay when once started will complete its cycle of operation. If the contacts 37 are controlled by an automatic device, for example an overload relay, the sealing-in circuit may be omitted. In this case, in order that the time limit relay may complete its cycle of operation, the overload would have to last for a time equivalent to the time setting of the time limit relay.

In the embodiment of my invention shown in Fig. 1, the parts are in the positions they occupy immediately after the switch 36 has been closed to complete the circuit including the windings 11 and 12 of the electromagnet 10 and motor 1 respectively. The motor 1 and the electromagnet 10 are thus energized and the armature 9 of the electromagnet is drawn to its attracted position against the bias of spring 15 thereby moving the end of the shaft 18 carried by the end of arm 17 to clutch-in the rotatable contact controlling member 2 with the gear 7 of the gear train which is being driven by the motor 1, the sealing-in circuit being completed by the movement of the armature 9 which causes the switch member 23 to close contacts 39 and 40, and contacts 24 and 26 being held closed against the flexure of switch member 23 by the stop 29. The motor 1 running at constant speed rotates the contact controlling member 2 uniformly in the direction shown by the arrow A from its initial position where it is held by the spring 19 against the stop 21 until the pin 31 strikes the arm 30 of the bell crank 28, thus turning the crank 28 and moving the stop 29 off the end of the switch member

23, the flexure in which, when thus released, opens contacts 24 and 26 and closes contacts 25 and 27. The closing of contacts 25 and 27 may, for example, complete the trip circuit of a circuit breaker to interrupt the circuit 34 thereby deenergizing the circuit including the windings 11 and 12 of the electromagnet 10 and the motor 1 respectively. With the opening of this circuit, the armature 9 returns to its unattracted position under the action of spring 15 thus moving the end of shaft 14 to disengage the contact controlling member 2 from the gear 7. The contact controlling member 2 under the action of the counter-torque of spring 19 then rotates to its initial position where it is held by the adjustable stop 21 and the spring 32 turns the bell crank member 28 so that its stop 29 again engages the end of the switch member 23. With the armature 9 in its unattracted position, the contacts 39 and 40 of the sealing-in circuit are open and the contacts 24 and 26 are again closed and contacts 25 and 27 open, the relay being ready to complete its cycle of operation.

In order that my relay may be simply and conveniently adjustable for different time settings, I provide means mounted on the relay frame for varying the initial position of the rotatable member 2. This means, as shown in Fig. 2, comprises a suitably graduated plate or dial 41 preferably secured to studs in the relay frame and having a cut out central portion into which extends an arm 42 which may be integral with the dial 41. Mounted on the arm 42 at the center of the circle of graduations is a shaft 43 supporting two movable radial members 44 and 45, one on each side of the dial 41, the inner one 44 of which carries the resilient stop 21 and the outer 45 is a pointer which is movable over the face of the graduated dial 41. The radial members 44 and 45 are provided with a fastening means such as a screw 46 at their outer end which holds the members together so that moving the pointer member 45 causes a corresponding angular movement of the inner or stop carrying member 44. The screw 46 also serves as a clamp to draw the outer ends of the two radial members 44 and 45 against the dial 41 thus holding the stop 21 at any predetermined time setting indicated by the figures on the graduated dial 41. By means of this time setting, it is therefore very simple and easy to vary the time limit of the relay as no valve settings or other tedious adjustments have to be made as in the case of relays equipped with dash pots and similar devices. Furthermore, since the motor 1 runs at constant speed a uniform rotation of the member 2 is secured so that the time limit characteristics of the relay are positively definite.

What I claim as new and desire to secure by Letters Patent of the United States, is:—

1. A definite time limit relay comprising an induction disc constant speed motor, an electromagnet having its winding in circuit with said motor, a hinged armature adapted to be attracted by said electromagnet and normally biased therefrom, a rotatable member mounted on a shaft and normally biased to initial position, means comprising said armature for moving said rotatable member into driving relationship with said motor, contacts controlled by said rotatable member, and means adapted to be operated to vary the initial position of said rotatable member whereby the time required by said motor to rotate said rotatable member to contact controlling position may be changed.

2. A definite time limit relay comprising a constant speed electric motor, an electromagnet provided with a hinged armature normally biased therefrom and a winding in circuit with said motor, a gear train adapted to be actuated by said motor, a rotatable contact controlling member, contacts controlled thereby, a shaft on which said contact controlling member is mounted movable by said armature when said electromagnet is energized to place said contact controlling member in driving relationship with said gear train, means adapted to be operated to vary the initial position of said contact controlling member whereby the time required by said motor to rotate said contact controlling member to contact controlling position may be changed, and means for rotating said contact controlling member to initial position when said electromagnet is deenergized.

3. A definite time limit relay comprising an alternating current constant speed motor including an induction disk and a winding for producing a torque thereon, an electromagnet having its winding in circuit with the winding of said motor, a hinged armature adapted to be attracted by said electromagnet and normally biased therefrom, a gear train adapted to be actuated by said motor, a rotatable contact controlling member, contacts controlled thereby, a shaft on which said contact controlling member is mounted supported at one end in a fixed bearing and at the other end in a floating bearing movable by said armature when said electromagnet is energized to place said contact controlling member in driving relationship with said gear train, a torsion spring surrounding said shaft for rotating said contact controlling member to initial position when said electromagnet is deenergized, and means comprising a member adjustably positioned on a graduated scale for varying the initial position of said contact controlling member whereby the time required by

said motor to rotate said contact controlling member from initial position to contact controlling position can be changed.

4. A definite time relay comprising an alternating current constant speed motor of the induction disc type provided with a winding for producing a torque on the disc thereof, an electromagnet having its winding in circuit with the winding of said motor, a hinged armature adapted to be attracted by said electromagnet and normally biased therefrom, a gear train driven by said motor, a rotatable contact controlling member normally biased to initial position, a shaft on which said contact controlling member is mounted supported at one end by said armature and movable thereby when said electromagnet is energized to establish a driving relationship between said gear train and said contact controlling member, contacts controlled by said contact controlling member, and means comprising a member adjustably positioned on a graduated scale for varying the initial position of said contact controlling member to change the time required by said motor to rotate said contact controlling member from initial position to contact controlling position.

5. A definite time limit relay comprising a constant speed electric motor, an electromagnet provided with a hinged armature, normally biased therefrom and a winding in circuit with said motor, a gear train adapted to be actuated by said motor, a rotatable member, a shaft on which said member is mounted supported at one end in a fixed bearing and at the other end in a bearing movable by said armature when said electromagnet is energized to place said rotatable member in driving relationship with said gear train, a flexible switch member secured to said armature, restraining means whereby said armature when attracted flexes said switch member, said restraining means being adapted to be released by said rotatable member, means for varying the angular movement of said rotatable member to change the time required by said motor to rotate said rotatable member from initial position to releasing position, and counter-torque means for rotating said rotatable member to initial position when said electromagnet is deenergized.

6. A relay comprising an electromagnet provided with a hinged armature normally biased therefrom, a rotatable member, means for rotating said member, a shaft on which said member is mounted supported at one end in a fixed bearing and at the other end in a bearing movable by said armature when said electromagnet is energized to place said rotatable member in driving relationship with said rotating means, a flexible switch member secured to said armature, restrain-

ing means for holding one end of said switch member whereby said armature when attracted flexes said switch member, said restraining means being adapted to be released
5 by said rotatable member, means for varying the angular movement of said rotatable member to change the time required by said rotating means to rotate said rotatable mem-
ber from initial position to releasing position, and countertorque means for rotating 10
said rotatable member to initial position when said electromagnet is deenergized.

In witness whereof, I have hereunto set my hand this 21 day of Sept. 1921.

CHESTER I. HALL.