

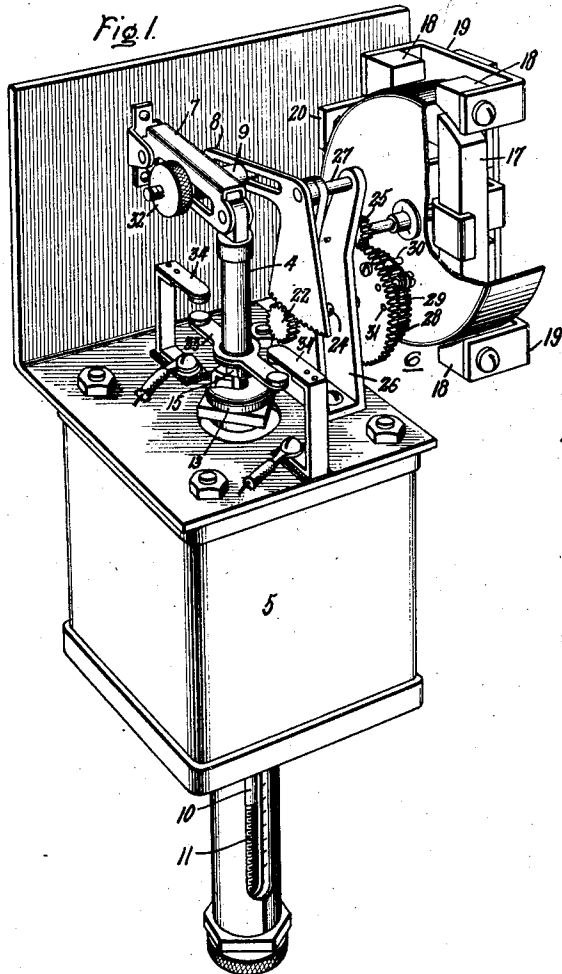
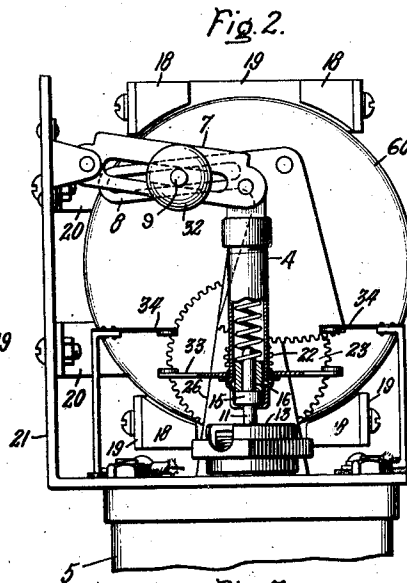
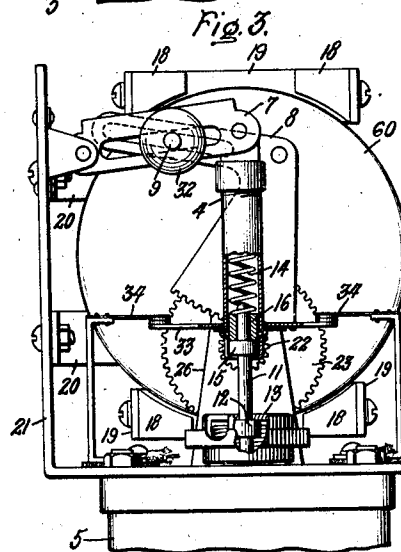
Dec. 3, 1929.

H. M. STEVENS

1,738,461

RELAY

Filed May 3, 1928



Inventor:
Harry M. Stevens,
by *Charles E. Tuller*
His Attorney

UNITED STATES PATENT OFFICE

HARRY M. STEVENS, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK

RELAY

Application filed May 3, 1928. Serial No. 274,900.

My invention relates to improvements in relays and more particularly to time protective relays and an object of my invention is to provide an improved time relay where-
5 in time adjustments can be made without disturbing the other adjustments of the relay. More specifically an object of my invention is to provide for a relay, whose armature has a predetermined travel independent of
10 the setting of the relay, an arrangement for adjusting the time independently of such travel. Another object of my invention is to provide a time relay construction which is independent of the more or less erratic action
15 inherent in dash pots and the like.

My invention will be better understood from the following description when considered in connection with the accompanying drawing and its scope will be pointed out in
20 the appended claims.

In the accompanying drawing, Fig. 1 illustrates in perspective an embodiment of my invention and Figs. 2 and 3 are part side elevations of the embodiment of my invention shown in Fig. 1 illustrating the timing
25 control mechanism in different positions.

The illustrated embodiment of my invention includes a controller member, such as a hollow cylinder or sleeve 4 which is arranged
30 to be actuated in response to a predetermined energization of an electromagnet 5, and a mechanism 6 for delaying the movement of the controlling member. In order to vary the time of operation of this member, I
35 provide between it and the mechanism 6, in accordance with my invention, an adjustable linkage shown as including two pivotally mounted members such as levers 7 and 8 having a common adjustable connection 9 for
40 varying their relative lengths.

The particular electromagnet 5 chosen to illustrate my invention is of the iron-clad type such as disclosed in United States Letters Patent No. 1,532,003 to O. C. Traver,
45 dated March 31, 1925, and assigned to the same assignee as this invention. The electromagnet 5 includes an armature 10 adjustably positioned on an operating rod 11 so that the sensitivity or pick-up of the magnet can be
50 varied. The operating rod 11 extends up-

wardly through the electromagnet and in order that the armature 10 and, therefore, the rod secured thereto may have a predetermined travel which can be varied, the rod is provided with a collar 12 which is ar-
55 ranged to abut the fixed upper pole (not shown) of the electromagnet when the armature is in the unattracted position and to abut an adjustably positioned stop or cap 13 when the armature is in the attracted position. In
60 order to have maximum flexibility in the time-current characteristics of the relay, there is preferably provided between the armature 10 of the electromagnet and the controlling member 4 means such as a spring
65 14, arranged to have energy stored therein on movement of the armature. As shown, this spring is mounted within the sleeve 4 between the upper end thereof and the upper end of the operating rod 11 which has a col-
70 lar 15 arranged to be slipped into the sleeve through a suitable side opening therein and locked in place by a bushing 16 placed into the sleeve from the upper end before the
75 spring is mounted.

The load mechanism 6 for delaying the movement of the controlling member 4 is of a rotary type in order to eliminate the erratic action inherent in dash pots and the like. As shown, the mechanism 6 includes a
80 rotatable element such as a cylinder 60 of conducting material which upon rotation is subject to a restraining effect such as a magnetic drag dependent on the angular velocity of the cylinder. The magnetic drag may be
85 provided by any suitable magnetic structure which, as shown, includes two permanent magnets 17 positioned respectively on opposite sides of the axis of rotation of the rotatable element 60 and two pairs of cooperating
90 pole pieces 18 secured to magnetic yokes 19. This magnetic structure is suitably mounted as, for example, by a structure including brackets 20, fastened to a supporting member such as a plate 21 which may be suitably
95 secured to the electromagnet 5.

In order to obtain the desired load or magnetic drag, the conducting member 60 may be connected to the controlling member 4 through a driving connection which includes,
100

besides the levers 7 and 8, a step-up gear mechanism including a gear sector on one arm of the lever 8, a pinion 22 and a gear 23 mounted on a shaft 24 and a pinion 25 on the shaft of the member 60. A bracket 26 secured to the supporting member 21 serves as a bearing member for the shaft 24, the shaft of the cylinder 60 and the pivot 27 of the lever 8. In order to have a free return of the controlling member 4, for example, on movement of the armature 10 to the unattracted position upon deenergization of the electromagnet 5, the driving means may be arranged to permit movement of the controlling member in one direction independently of the restraint of the load mechanism 6. For this purpose the gear 23 may be arranged for movement relatively to the shaft 24 and to be locked thereto for movement therewith in a desired direction by any suitable mechanism herein shown as comprising a ratchet wheel 28 secured to the shaft 24 and a spring pawl 29 secured to the gear 23. The pawl and ratchet mechanism illustrated is of the reversible type so that the locking action can be arranged for rotation in either direction as desired. This may be accomplished by transferring the pawl abutment screw 30 from the position shown and inserting it in the hole 31 and at the same time reversing the pawl 29 end for end on the support by which it is secured to the gear 23. With the pawl 29 reversed, the armature 10 may be normally energized and in the attracted position without delay on the pick-up movement but, on deenergization sufficient to drop the armature, its movement to the unattached position will be delayed. Obviously, therefore, the relay may be used either as a time delay pick-up or a time delay drop-out device.

In order to vary the timing of the relay particularly so that it can be done independently of the travel of the armature 10, the means whereby the rectilinear movement of the armature is transmitted to the element 60 is, in accordance with my invention made adjustable, so that the angular movement of the gear sector of the lever 8 can be varied independently of other adjustments of the relay. For this purpose, the operating levers 7 and 8 are connected through the adjustably positioned pin 9 which is movable in slots in the levers and is arranged to be secured to one of the levers such as 7 by any suitable means herein shown as a clamping nut 32. The angle between the levers 7 and 8 varies in accordance with the position of the pin 9. Thus, the closer the pin 9 is to the supporting plate 21 on which the lever 7 is pivoted, the more nearly are the levers in alignment and the less the movement of the gear sector on the lever 8 and, therefore, the less the rotation of the cylinder 60 and the shorter the time required to use the energy stored in the spring 14. The farther the pin

9 is toward its pivotal connection to the sleeve 4, the greater the angle between the levers 7 and 8 and, therefore, the greater the rotation of the cylinder 60 and the longer the time delay.

In the illustrated embodiment of my invention, the relay is shown as of the circuit closing type, the circuit controlling member 4 being provided with a contact member 33 which is arranged to bridge contacts 34. In Figs. 1 and 2 this contact member is shown in the circuit opening or deenergized position of the electromagnet 5. Upon energization of the relay sufficient to pick-up the armature 10, the operating rod 11 compresses the spring 14, since the sleeve 4 cannot instantly partake of the movement of the rod 11 due to the inertia of the load mechanism 6 connected to the sleeve. As this mechanism gets under motion, the energy of the spring is gradually used in a time dependent on the position of the connecting pin 9, and the controlling member 4 reaches the position shown in Fig. 3 to close cooperating contacts 33 and 34. Upon deenergization of the electromagnet 5 the armature 10 returns to its unattracted position independently of the load mechanism 6 if the pawl and ratchet mechanism is provided and arranged as shown in Fig. 1. It will be obvious that the lighter the construction of the spring 14, the less readily will the sleeve 4 tend instantly to partake of the movement of the armature 10. Consequently, for a given movement of the armature the amount of spring compression and, therefore, the energy stored in the spring will be constant so that the time action of the relay will be definite. As the stiffness of the spring is increased, the sleeve 4 has a greater tendency instantly to partake of the movement of the armature and its associated operating rod 11 so that the time characteristic of the relay tends to become more and more inverse. This time characteristic can, of course, be made quite inverse by providing a spring 14 so stiff that it undergoes practically no compression. It is preferable, however, under any condition to have some yield to the spring so that in case of energization of the electromagnet 5 by exceedingly heavy currents, there will not be too great a tendency to transmit the substantially instantaneous movement of the armature directly to the load mechanism. It will, of course, be apparent that the travel of the operating rod 11 and, therefore, the armature 10 can be varied by adjusting the cap or stop 13. The amount of energy stored in the spring and the upward movement of the sleeve 4 varies with the travel of the armature. If desired the cap 13 can be removed and in this case the travel of the armature will be dependent upon its sensitivity setting and the time characteristic of the relay will be

more nearly inverse particularly if a stiff spring is used.

While I have shown and described my invention in considerable detail, I do not desire to be limited to the exact arrangement shown but seek to cover in the appended claims all those modifications that fall within the true spirit and scope of my invention.

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

1. A time relay including an electromagnet having a movable armature, a controlling member arranged to be actuated in response to the movement of said armature, a mechanism for delaying the movement of said member, and means interconnecting said member and said mechanism for varying the time of operation of the member independently of the travel of said armature including two pivotally mounted members having a common adjustable connection for varying their relative lengths.

2. A time relay including an electromagnet, a controlling member arranged to be actuated in response to a predetermined energization of the electromagnet, a mechanism for delaying the movement of said member, and means for varying the time of operation of said member including an adjustable linkage between the member and said mechanism.

3. A relay including an electromagnet having an armature arranged for a predetermined movement, a controlling member arranged to be actuated in response to the movement of the armature, means between the armature and the member arranged to have energy stored therein on movement of the armature, a mechanism for delaying the movement of said member arranged to be actuated by said stored energy, and means for varying the rate at which said stored energy is used by said mechanism including an adjustable linkage between the mechanism and said member.

4. A time relay including an electromagnet, a controlling member arranged to be actuated in response to a predetermined energization of the electromagnet, a mechanism for delaying the movement of said member including a rotatable element having its movement subject to a restraining effect dependent on its angular velocity and means for varying the time of operation of said member including an adjustable linkage between the member and said mechanism.

5. A time relay including an electromagnet, a controlling member arranged to be actuated in response to a predetermined energization of the electromagnet, a mechanism for delaying the movement of said member, and means for varying the time of operation of said member including two levers respectively mounted on stationary pivots and a common adjustable pivotal connection for varying the relative lengths of the levers.

6. A time limit relay including an electromagnet having a movable armature, a controlling member arranged to be actuated in response to movement of the armature, a mechanism for delaying the movement of the member in one direction including a rotatable element, and a driving connection between said member and said element including two pivotally mounted members having a common adjustable pivotal connection for varying their relative lengths and means for permitting the controlling member to move in the opposite direction independently of said rotatable element.

7. A time relay including an electromagnet having a movable armature, a controlling member arranged to be actuated in response to movement of the armature, a mechanism for delaying the movement of the member in one direction including a rotatable element having its movement subject to a restraining effect depending on its angular velocity and means for varying the time of operation of the member independently of the travel of the armature including a driving connection between said member and said element, said connection including two pivotally mounted members having a common adjustable pivotal connection for varying their relative lengths, and pawl and ratchet means for permitting the controlling member to move in the opposite direction independently of said rotatable element.

8. A time relay including an electromagnet having an armature arranged for a predetermined movement, a controlling member arranged to be actuated in response to movement of the armature, resilient means between the armature and the member arranged to have energy stored therein on movement of the armature, a mechanism for delaying the movement of said member including a rotatable element arranged to be actuated by said stored energy and to have its movement subject to a restraining effect dependent on its angular velocity, and means for interconnecting said member and said mechanism for varying the rate at which said stored energy is used by said mechanism including two pivotally mounted members having a common adjustable connection for varying their relative lengths.

9. A time relay including an electromagnet, a controlling member arranged to be actuated in response to a predetermined energization of the electromagnet and to have its travel varied, a mechanism for delaying the movement of said member, and means for varying the time of operation of the member independently of its travel including an adjustable linkage between the member and said mechanism.

10. A time relay including an electromagnet, a controlling member arranged to be actuated in response to a predetermined energization

zation of the electromagnet, a mechanism for delaying the movement of the member in one direction including a rotatable conducting element and magnets for exerting thereon a restraining torque dependent on the angular velocity of the element, and a driving connection between said member and said element including two movable members having a common adjustable pivotal connection and means permitting the controlling member to move in the opposite direction independently of said element.

11. A time relay including an electromagnet having a rectilinearly movable armature, a controlling member arranged to be actuated in response to the movement of said armature, a rotary mechanism for delaying the movement of said member, and means for transmitting the rectilinear movement of the armature to said mechanism including two pivotally mounted members arranged to have their relative lengths varied.

12. A time relay including an electromagnet having a rectilinearly movable armature, a controlling member arranged to be actuated in response to the movement of said armature, a rotary mechanism for delaying the movement of said member, and means for transmitting the rectilinear movement of the armature to said mechanism including two pivotally mounted members arranged to have their relative lengths varied and a resilient element between the armature and the controlling member.

13. A time relay including a movable controlling member, means for actuating said member, a mechanism for delaying the movement of the member, and means for varying the time of operation of said member including an adjustable linkage between the member and said mechanism.

14. A time relay including a movable controlling member, a movable operating member for actuating said controlling member, a mechanism for delaying the movement of the controlling member and means interconnecting the controlling member and said mechanism for varying the time of operation of the controlling member independently of the travel of the operating member including two pivotally mounted members having a common adjustable connection for varying their relative lengths.

In witness whereof, I have hereunto set my hand this 2nd day of May, 1928.

HARRY M. STEVENS.