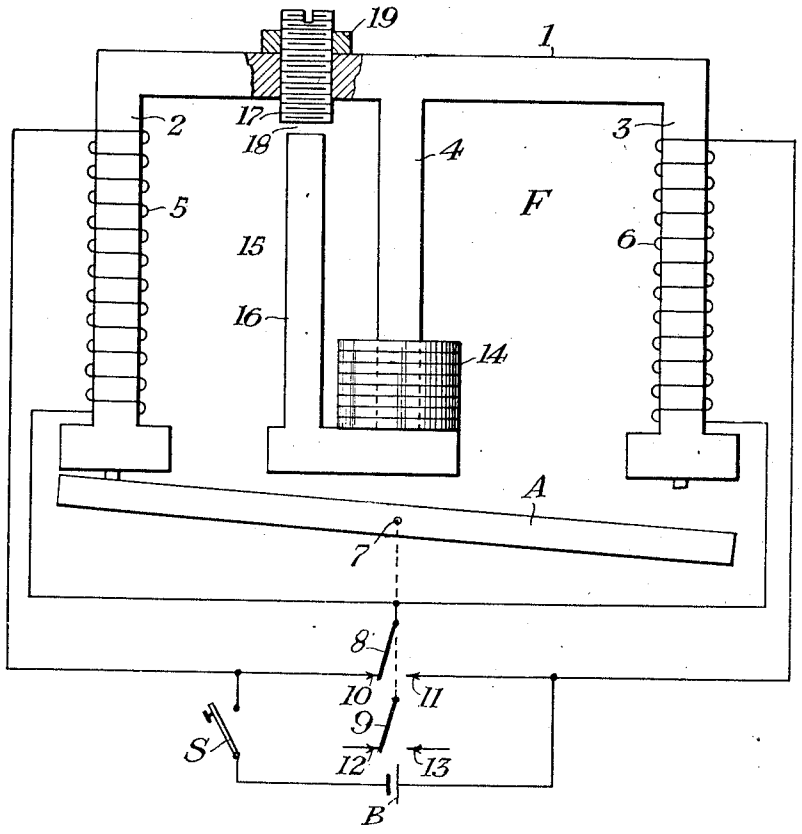
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ELECTRICAL RELAY

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ELECTRICAL RELAY

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Our invention relates to electrical relays, and particularly to relays of the flasher type which involve short circuited windings for the purpose of controlling the time characteristic of the relays. Specifically, our invention relates to new and novel means for varying the effectiveness of the short circuited windings to compensate for changes in the speed of operation of a relay of the type described. Our invention is an improvement in part on the relay disclosed and claimed in an application for Letters Patent, Serial No. 732,857, filed by Branko Lazich and Harry E. Ashworth, on June 28, 1934, for Electrical relays.

We shall describe one form of relay embodying our invention, and shall then point out the novel features thereof in claims.

The accompanying drawing is a diagrammatic view illustrating one form of relay embodying our invention.

Referring to the drawing, the reference character F designates in general a relay of the type commonly known as a flasher relay. As here shown, the relay F comprises a backstrap 1 which is provided with two outer legs 2 and 3 and with a middle or common leg 4. Outer legs 2 and 3 are provided with windings 5 and 6, respectively, which windings are connected in series through a switch S with a suitable source of current here shown as a battery B. The relay F is provided with an armature A pivotally mounted at point 7 and normally biased to an initial position as shown in the drawing. Operably connected to and moving in unison with armature A are movable contacts 8 and 9. When armature A occupies its initial or left-hand position so that contact 8—10 is closed, a branch path will be closed across winding 5, and, when armature A occupies its right-hand position so that contact 8—11 is closed, a branch path will be closed across winding 6.

When the switch S is closed, current will flow from battery B through switch S, contact 8—10, and winding 6 back to battery B so that armature A will be attracted to its right-hand position. When contact 8 comes into engagement with contact 11 so that the branch path becomes closed across winding 6, substantially all of the energy from battery B will flow through winding 5. As a result, armature A will be restored to its initial or left-hand position. It is readily apparent that armature A will continue to move back and forth between its two extreme positions as long as switch S is closed.

Contact 9 alternately engages with fixed contacts 12 and 13 and may be utilized in any well-known manner for the control of various devices. For example, these contacts may be used to control a pair of flashing lamps of a highway crossing signal.

In order to control the time characteristics of the relay, it is customary to provide middle leg 4 with a plurality of short circuited windings here shown as copper rings 14, The copper rings 14 delay the decay of flux in the winding which is being deenergized and also delay the building up of the flux in the winding which is being energized so that the speed of operation of relay F can be very readily adjusted by increasing or decreasing the number of copper rings. We have found, however, that, after a relay of this type has been in service for a period of time, the speed of operation tends to vary from the initial adjustment. The customary manner of compensating for changes in the speed of operation has been to increase or decrease the number of short circuited windings 14. This operation, however, requires the removal of the backstrap 1.

In order to avoid any disturbance of the relay assembly, we provide an auxiliary leg paralleling middle leg 4 and designated in general by the reference character 15. As here shown, auxiliary leg 15 comprises a lower stationary portion 16 which is separated from an upper movable portion 17 by an air gap 18. The upper portion 17 is threaded in backstrap 1 and is provided with a lock nut 19 to prevent an accidental change in adjustment. It will be readily apparent that the flux flowing in middle leg 4 and acting on copper rings 14 may be readily shunted by closing air gap 18 of auxiliary leg 15.

Relays of the type hereinbefore described usually become slower in operation after a period of use. The initial speed of the relay may be restored, however, by simply reducing air gap 18 so as to shunt a greater portion of the flux in middle leg 4 away from copper rings 14. It is obvious that this adjustment may be made with accuracy and without disturbing the relay assembly in any way. If for any reason the speed of operation of the relay should become faster than its initial adjustment, it will be readily apparent that the speed might be reduced to its initial value by a wider opening of air gap 18.

Although we have herein shown and described only one form of relay embodying our invention, it is understood that various changes and modifications may be made therein within the scope of the appended claims without departing from the spirit and scope of our invention.

Having thus described our invention, what we claim is:

1. A relay comprising a core having three legs, an armature pivotally mounted and arranged to swing towards one or the other of the outer legs, two windings one on each outer leg, means for alternately energizing said windings to operate said armature, short circuited windings on the middle leg for adjusting the time lag of the response of said armature to said alternate energization, and variable means for magnetically shunting said short circuited windings.

2. A relay comprising a core having three legs, an armature pivotally mounted and arranged to swing towards one or the other of the outer legs, two windings one on each outer leg, means for alternately energizing said windings to operate said armature, short circuited windings on the middle leg for adjusting the time lag of the response of said armature to said alternate energizations, and an auxiliary leg of said core paralleling said middle leg and including an adjustable air gap for varying the effectiveness of said short circuited windings.

3. A relay comprising a core having three legs, an armature pivotally mounted and arranged to swing towards one or the other of the outer legs, two windings one on each outer leg, means for alternately energizing said windings to operate said armature, short circuited windings on the middle leg for adjusting the time lag of the response of said armature to said alternate energizations, an auxiliary magnetic circuit including an air gap for shunting said short circuited windings, and means for varying the size of said air gap.

4. A relay comprising a core having three legs, an armature pivotally mounted and arranged to swing towards one or the other of the outer legs, two windings one on each outer leg, means for alternately energizing said windings to operate said armature, short circuited windings on the middle leg for adjusting the time lag of the response of said armature to said alternate energizations, and an auxiliary leg of said core paralleling said middle leg, said auxiliary leg including a movable portion and a stationary portion separated by an air gap.

5. In a contact operating mechanism, a movable armature, two U-shaped electromagnets for actuating said armature to oppositely disposed positions, each of said electromagnets having a common leg, means for alternately energizing said electromagnets, a first means including said common leg for adjusting the time lag of the response of said armature to said alternate energizations, and means including an auxiliary leg also common to both electromagnets for varying the effectiveness of said first means.

6. In a contact operating mechanism, a movable armature, two U-shaped electromagnets for actuating said armature to oppositely disposed positions, each of said electromagnets having a common leg, means for alternately energizing said electromagnets, a first means including said common leg for adjusting the time lag of the response of said armature to said alternate energizations, an auxiliary leg also common to both electromagnets, and means including an adjustable air gap and said auxiliary leg for varying the effectiveness of said first means.

7. In combination, a movable armature, a magnetic circuit for actuating said armature, short circuited windings associated with said magnetic circuit for governing the inductive characteristics of said magnetic circuit, means for establishing a magnetic shunt path extending around said short circuited windings and through which flux in said magnetic circuit may flow from a point in said circuit at one side of said short circuited windings to a point in said magnetic circuit at the other side of said short circuited windings, and means for adjustably varying the permeability of said magnetic shunt path and thereby varying the effectiveness of said short circuited windings.

8. In a device of the class described, in combination, a core element having a base portion and having three spaced substantially parallel legs extending therefrom, an armature pivotally mounted intermediate its ends for movement about an axis substantially opposite the middle one of said legs, said armature being arranged to swing about said axis towards one or the other of the outer legs, each outer leg having an energizing winding thereon, means for alternately energizing said windings to thereby operate said armature, short circuited windings on the middle leg for effecting a time lag in the response of said armature to said alternate energization of said energizing windings, and means for variably magnetically shunting said short circuited windings to thereby vary the effectiveness of said short circuited windings and therefore vary the rapidity of response of said armature, said means comprising a magnetically permeable auxiliary element associated with said core element middle leg, said auxiliary element having one portion substantially engaging the core element at one side of the short circuited windings on the core element middle leg, said auxiliary element having another portion spaced from a portion of said core element at the other side of said short circuited windings, and a member formed of magnetically permeable material, said member being adjustably secured relative to one of said elements and being movable towards and away from the other of said elements to thereby vary the width of the gap between the core element and the auxiliary element.

9. In a device of the class described, in combination, a core having a base portion and having three spaced substantially parallel legs extending from one side thereof, an armature pivotally supported intermediate its ends for movement about an axis substantially opposite the middle one of said legs, said armature being arranged to swing about said axis towards one or the other of the outer legs, each outer leg having an energizing winding thereon, means for alternately energizing said windings to thereby operate said armature, short circuited windings on the middle leg for effecting a time lag in the response of said armature to said alternate energizations, and means for variably magnetically shunting said short circuited windings to thereby vary the effectiveness of said short circuited windings and therefore vary the rapidity of response of said armature, said means comprising a magnetically permeable element extending from the free end of the core middle leg to a point adjacent to but spaced from the base portion of said core, and a magnetically permeable member carried by said core base portion and adjustable relative thereto by means engageable with said member on the side of the core base portion opposite from said legs, said member being movable towards and away from said element to vary the width of the gap between said element and the core base portion.

10. In a device of the class described, in combination, a core element having a base portion and having a pair of spaced substantially parallel legs extending therefrom, an armature pivotally mounted for movement towards and away from one of said legs, said one of said core element legs having an energizing winding thereon, means for energizing said winding to thereby operate said armature, short circuited windings on the other core element leg for effecting a time lag in the response of said armature to changes in energization of said energizing winding, and means for variably magnetically shunting said short circuited windings to thereby vary the effectiveness of said windings and therefore vary the rapidity of response of said armature, said means comprising a magnetically permeable auxiliary element associated with said other core element leg, said auxiliary element having one portion substantially engaging the core element at one side of the short circuited windings on said other core element leg, said auxiliary element having another portion spaced from a portion of said core element at the other side of said short circuited windings, and a member formed of magnetically permeable material, said member being adjustably secured relative to one of said elements and being movable towards and away from the other of said elements to vary the width of the gap between the core element and the auxiliary element.

11. In a device of the class described, in combination, a core having a base portion and having two spaced substantially parallel legs extending from one side thereof, an armature pivotally mounted for movement towards and away from one of said legs, said one of said core element legs having an energizing winding thereon, means for energizing said winding to thereby operate said armature, short circuited windings on the other core element leg for effecting a time lag in the response of said armature to changes in energization of said energizing winding, and means for variably magnetically shunting said short circuited windings to thereby vary the effectiveness of said short circuited windings and therefore vary the rapidity of response of said armature, said means comprising a magnetically permeable element extending from the free end of said other core element leg to a point adjacent to but spaced from the base portion of said core, and a magnetically permeable member carried by said core base portion and adjustable relative thereto by means engageable with said member on the side of the core base portion opposite from said legs, said member being movable towards and away from said element to vary the width of the gap between said element and the core base portion.

12. In a relay, a stationary core element, an armature movable relative to said core element, the core element and the armature being constructed of magnetically permeable material and cooperating to form a path for the flow of magnetic flux, the armature being movable towards said core element on a predetermined increase in the flux in said circuit and being movable away from said core element on a predetermined decrease in the flux in said circuit; an energizing winding associated with said core element and operable when energized to create magnetic flux in the circuit formed by said core element and armature, a plurality of short circuited windings mounted on said core element for effecting a time lag in the change in flux in said magnetic circuit on a change in the energization of said energizing winding and thereby delay the response of said armature to a change in energization of said energizing winding, and means for variable magnetically shunting said short circuited windings to thereby vary the effectiveness of said short circuited windings and therefore vary the rapidity of response of said armature, said means comprising a magnetically permeable auxiliary element having a portion substantially engaging the core element at a point on one side of the short circuited windings mounted on said core element, said auxiliary element having another portion spaced from a portion of said core element at the other side of the short circuited windings thereon, and a magnetically permeable member adjustably secured relative to one of said elements and being movable towards and away from the other of said elements to thereby vary the width of the gap between the core element and the auxiliary element.

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