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RELAY CIRCUIT

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2 Sheets-Sheet 1

FIG. 1

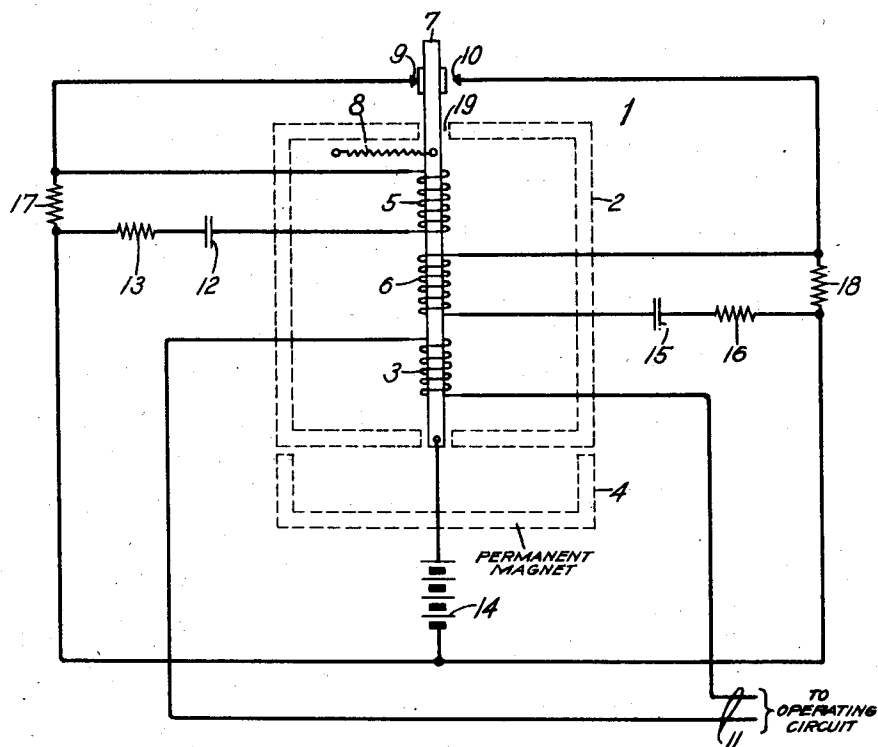
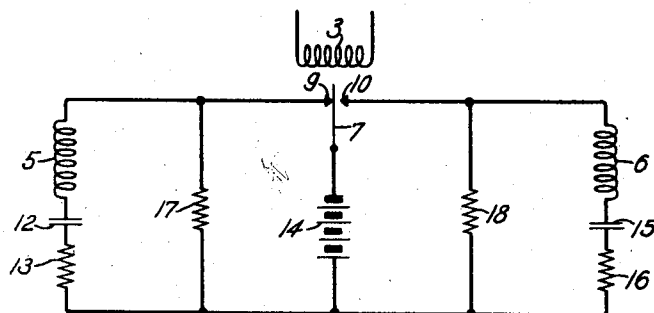


FIG. 1-A



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RELAY CIRCUIT

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This invention relates to accelerating and delay action devices and more particularly to relay arrangements suitable for controlling signal operated devices in signaling systems such for example, as voice operated control circuits.

The main object of the invention is to provide a circuit arrangement which will operate quickly and hold for a sufficient time after it operates to insure proper operation of the circuit with which it is to be employed.

One of the features of this invention consists in the method employed to secure rapid operation without contact chatter when the relay is employed in connection with signal operated volume control circuits.

A relay having a plurality of windings is employed in conjunction with a single source of potential and resistances and condensers. Two condensers are employed, each of which is in series with a winding of the relay. When an impulse, as for example, from the output of a voice operated detector circuit, is transmitted through the operating winding, the armature is moved from its normal position and the normally closed contact opens. This causes one of the condensers to discharge through one of the accelerating windings referred to and assists in completely operating the relay. When the armature makes contact with the normally open contact, a second condenser charges through the other accelerating winding on the relay which holds the armature rigidly against this contact, thereby preventing contact chattering. When this holding current approaches zero amplitude and the current through the operating winding approaches zero amplitude, mechanical or electrical bias may be used to break the armature from the normally open contact. The second condenser discharges therewith and assists the armature to return to its normal position. When the armature makes with the normally closed contact, the condenser first referred to charges through the accelerating winding associated therewith and produces a holding force similar to that obtained when the armature makes contact with the normally open contact. When

no mechanical or electrical bias is used to make one contact the normally closed contact, the arrangement functions to accelerate and make more positive the normal functions of a polar relay.

The invention will be better understood by referring to the following detailed description and accompanying drawings, wherein Figs. 1 and 2 are circuit diagrams of diverse embodiments of the invention, and Figs. 1—A and 2—A illustrate the same embodiments shown in Figs. 1 and 2 respectively, showing the relays in schematic form to facilitate understanding the description of the invention.

Referring to Figs. 1 and 1—A, the polar relay 1 comprises a yoke 2, a permanent magnet 4 associated with the yoke, windings 3, 5 and 6 and an armature 7, which armature is arranged to swing between contacts 9 and 10. The armature 7 is held in the position shown, away from the yoke leg 19, by biasing means 8.

Coil 3 is connected to the input circuit 11. One end of winding 5 is connected to contact 9. The other end of winding 5 is connected to one end of condenser 12, the other end of which condenser is connected through a resistance 13 to a source of potential 14. One end of winding 6 is connected to contact 10. The other end of winding 6 is connected to one end of a condenser 15, the other end of which condenser is connected through a resistance 16 to the side of the source of potential 14 to which resistance 13 is connected. A resistance 17 is connected, in parallel with the series connection of the winding 5, condenser 12 and resistance 13, from contact 9 to the side of the source of potential 14 to which resistances 13 and 16 are connected. A resistance 18 is connected, in parallel with the series connection of the winding 6, condenser 15 and resistance 16, from contact 10 to the side of the source of potential 14 to which resistances 13, 16 and 17 are connected. The opposite side of the potential source 14 is connected to the armature 7.

The operation of this system is as follows:

When an impulse, as for example, from the output of a voice-operated detector cir-

cuit (not shown) is transmitted from the input circuit 11 through winding 3, the armature 7 is moved from its normal position shown, thereby breaking the connection between armature 7 and contact 9. When the connection between armature 7 and contact 9 is broken condenser 12 discharges through resistances 13 and 17 and winding 5, thereby aiding the current through winding 3 in moving the armature toward the yoke leg 19.

When the armature 7 makes connection with contact 10 the condenser 15 is charged up through the circuit from the source of potential 14, resistance 16, condenser 15, winding 6, contact 10 and armature 7 to the other side of the source of potential 14, thereby tending to hold the armature 7 rigidly in its operated position without contact chattering taking place between the armature 7 and contact 10.

When the operating current through winding 3 approaches zero amplitude and the condenser 12 has discharged and the condenser 15 has charged, the biasing means 8, causes the armature 7 to move away from the yoke leg 19, thereby moving armature 7 away from contact 10. As soon as armature 7 disconnects from contact 10, the condenser 15 discharges through resistances 16 and 18 and winding 6, thereby aiding the biasing means in moving the armature 7 to its non-operated or normal position.

As soon as armature 7 makes connection with contact 9, condenser 12 is charged up through the circuit from the source of potential 14, resistance 13, condenser 12, winding 5, contact 9, and armature 7 to the other side of the source of potential 14, thereby tending to hold the armature 7 rigidly in its normal position without contact chattering taking place between armature 7 and contact 9.

After condenser 15 has discharged and condenser 12 has charged, the system is ready to again operate in response to an impulse transmitted through winding 3.

Referring to Figs. 2 and 2—A, the polar relay 51 comprises a yoke 52, a permanent magnet 54 associated with the yoke, windings 53, 55 and 56 and an armature 57, which armature 57 is arranged to swing between contacts 59 and 60. The armature 57 is held in the position shown, away from the yoke leg 69, by biasing means 58.

Winding 53 is connected to the input circuit 61. One end of winding 55 is connected to the contact 59. The other end of winding 55 is connected to one end of condenser 62 and the other end of which condenser is connected through a resistance 63 to one side of a source of potential 64. One end of winding 56 is connected to contact 60. The other end of winding 56 is connected to one end of condenser 65, the other end of which condenser is connected through a resistance 66 to the side of the source of potential 64 to

which resistance 63 is connected. A resistance 67 is connected, in parallel with the series connection of the winding 55, condenser 62, resistance 63 and source of potential 64, from contact 59 to the side of the source of potential 64 opposite that to which the resistances 63 and 66 are connected. A resistance 68 is connected, in parallel with the series connection of the winding 56, condenser 65, resistance 66 and source of potential 64, from contact 60 to the junction of the resistance 67 and the source of potential 64. The armature 57 is connected to the junction of resistances 63 and 66 and the source of potential 64.

The operation of this system is as follows: When an impulse, as for example, from the output of a voice-operated detector circuit (not shown) is transmitted from the input circuit 61 through winding 53, the armature 57 is moved from its normal position shown toward yoke leg 69, thereby breaking the connection between armature 57 and contact 59. When the connection between armature 57 and contact 59 is broken, condenser 62 charges through resistances 63 and 67 and winding 55, thereby aiding the operating current through winding 53 in moving the armature 57 toward yoke leg 69.

When armature 57 makes connection with contact 60 the condenser 65 discharges through the circuit from condenser 65, resistance 66, armature 57, contact 60, and winding 56 to the opposite side of condenser 65, thereby tending to hold the armature 57 rigidly in its operated position without contact chattering taking place between armature 57 and contact 60.

When the operating current through winding 53 approaches zero amplitude and the condenser 62 has charged and the condenser 65 has discharged, the biasing means 58 causes the armature 57 to move away from the yoke leg 69, thereby disconnecting armature 57 from contact 60. As soon as armature 57 disconnects from contact 60 the condenser 65 charges up through resistances 66 and 68 and winding 56, thereby aiding the biasing means in returning the armature 57 to its normal position.

As soon as the armature 57 makes connection with the contact 59, the condenser 62 discharges through the circuit including the resistance 63, armature 57, contact 59 and winding 55, thereby tending to hold the armature 57 rigidly in its normal position without chattering taking place between armature 57 and contact 59.

After condenser 65 has charged and condenser 62 has discharged, the system is again ready to operate in response to an impulse transmitted through winding 53.

It is within the invention to omit the biasing means referred to in the detailed description of the construction and operation

of relays 1 and 51, when it is desired to have the relay systems disclosed function as unbiased or vibrating polar relays.

The invention is also capable of other modifications and adaptations not specifically referred to but included within the scope of the appended claims.

What is claimed is:

1. A polar relay circuit including a relay having a pair of contacts, an armature arranged to swing between said contacts, an operating winding and accelerating windings, a source of potential, a capacitance and a resistance connected in series across each of said accelerating windings, connections from said resistances to said contacts, other connections from said resistances to said source of potential, a connection from said armature to said source of potential, said connection arranged in a manner such that the charging and the discharging of said condensers accelerates the movement of said relay armature from either of said contacts to the other of said contacts and hold said armature against said other contact for a predetermined period of time.

2. A polar relay comprising an armature, a pair of contacts between which said armature is arranged to swing, an operating winding, an electric accelerating circuit associated with said armature and the normally closed contact, another electrical accelerating circuit associated with said armature and the normally open contact, said electrical accelerating circuits comprising accelerating relay windings, capacitances, resistances said contacts, said armature and a source of potential.

3. A polar relay comprising an armature, a pair of contacts between which said armature is arranged to swing, an operating winding, an electric accelerating circuit associated with said armature and the normally closed contact, another electrical accelerating circuit associated with said armature and the normally open contact, said first-mentioned electrical accelerating circuit comprising an accelerating relay winding one end of which is electrically connected to said normally closed contact and the other end of which is electrically connected through a condenser and a resistance to a source of potential, another resistance electrically connected from said normally closed contact to one terminal of said source of potential and a connection from said source of potential to said armature, said second mentioned electrical accelerating circuit comprising an accelerating relay winding one end of which is electrically connected to said normally open contact and the other end of which is electrically connected through a condenser and a resistance to said source of potential, another resistance electrically connected from said normally open

contact to one terminal of said source of potential.

4. A polar relay circuit, including a relay having a pair of contacts, an armature arranged to swing between said contacts, an operating winding, accelerating windings with associated capacitances, resistances and a source of potential, connections from said contacts and said armature to said accelerating windings and their associated capacitances, resistances, and source of potential, so arranged that the opening of either contact initiates a change in the charge of one of said capacitances through the accelerating winding associated therewith, thereby accelerating and positively carrying said armature to the other of said contacts, and the closing of either contact initiates a change in the charge of one of said capacitances through the accelerating winding associated therewith, thereby holding said armature more firmly to said closed contact.

5. A polar relay circuit, including a relay having a pair of contacts, an armature arranged to swing between said contacts, an operating winding, accelerating windings with associated capacitances, resistances and a source of potential, connections from said contacts and said armature to said accelerating windings and their associated capacitances, resistances, and source of potential, so arranged that the opening of either contact initiates a change in the charge of one of said capacitances through the accelerating winding associated therewith, thereby accelerating and positively carrying said armature to the other of said contacts, and the closing of either contact initiates a change in the charge of one of said capacitances through the accelerating winding associated therewith, thereby holding said armature more firmly to said closed contact for a predetermined period of time.

6. In a relay circuit, a relay having separate windings, each in circuit with a condenser, a moving armature controlled by said windings, and means under control of said armature for alternatively and individually charging said condensers and discharging them through the respective windings, each winding on the charge of its associated condenser influencing said armature in one direction and upon the discharge of its associated condenser influencing the armature in the opposite direction.

In witness whereof, I hereunto subscribe my name this 3 day of June, 1929.

ROBERT C. MATHES.