

1,060,781.

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AUTOMATIC ALARM AND SIGNAL DEVICE.

1,060,781.

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To all whom it may concern:

Be it known that I, JAMES D. NELSON, a citizen of the United States of America, and resident of Cincinnati, county of Hamilton, and State of Ohio, have invented certain new and useful Improvements in Automatic Alarm and Signal Devices, of which the following is a specification.

With some types of automatic alarm and signal devices, it is necessary to deliver alternating current to the alarm circuit of the devices during the periods that the alarm devices are inoperative and to employ direct current while the alarm devices are operative or are transmitting signals. The use of alternating currents gives rise to difficulties, since the indicating instruments of the relay devices controlling these instruments are alternately subjected to maximum and zero current, and tend to vibrate, and consequently to transmit signals, while the alarm or signal devices are inoperative.

An object of this invention is to produce means for supplying alternating current to the alarm circuits and for overcoming the difficulties ordinarily encountered, due to subjecting the indicating instruments, or the relay devices controlling such instruments to periods of zero current.

A further object is to produce means for producing alternating or pulsating current in an alarm circuit, which will not subject the indicating instruments, or the relay devices controlling such instruments, operating in connection with the alarm circuits, to periods of maximum and zero current.

These and other objects I attain by means of apparatus embodying the features herein described and illustrated.

In the single sheet drawing accompanying and forming a part of this application, I have diagrammatically illustrated apparatus embodying my invention, shown in connection with diagrammatically illustrated alarm and local circuits.

Referring to the drawings:—the illustrated embodiment of my invention includes two separate sources of direct-current, a relay device 3, an oscillating switch 4, and an accelerating device 5 for the pole-changer. The source of direct-current illustrated consists of batteries 6 and 7, which are electrically connected to the oscillating switch 4. The positive electrode of the battery 6 is connected to a winding 8 of one of the elec-

tro-magnets of the relay device 3, and its negative electrode is grounded. The negative electrode of the battery 7 is connected to a winding 9 of an electro-magnet of the relay device and its positive electrode is grounded. The electro-magnets in which the windings 8 and 9 are included, cooperate in controlling a spring-restrained armature 10, which is adapted to make and break a local circuit 11, which includes an indicating device, such as an electric bell 12, and a source of direct-current supply 13. When the relay 3 is demagnetized, the armature 10 is released and is moved by its restraining spring, so that it completes the circuit 11 and rings the electric bell 12.

The oscillating switch 4, illustrated, consists of mercury cups 14 and 15, which are respectively connected to the windings 8 and 9 of the relay 3; a pendulum actuated circuit breaker, a pendulum 16, and the pendulum accelerator 5. The mercury cup 14 is adapted to contain mercury, which is electrically connected to the winding 8, and, consequently, to the battery 6, by a wire 17, through which the current always flows in the same direction. The mercury cup 15 is adapted to contain mercury, which is electrically connected to the winding 9, and, consequently, to the battery 7, by a wire 18, through which the current flows in an opposite direction to the flow through the wire 17.

The circuit breaker, illustrated, consists of an arm 19, which is pivotally mounted between the cups 14 and 15 and is provided at its ends with fingers 21 and 22, adapted to project into the cups 14 and 15, respectively, and to make electrical connection with the mercury contained in the cups. The pendulum 16 is shown as integrally formed with the arm 19, and the arm is connected to an alarm circuit 23 by means of a wire 24. The fingers 21 and 22 are so arranged that their periods of electrical connection with the mercury in the respective cups 14 and 15 overlap; that is the finger 21 continues to contact with the mercury in the cup 14, after the finger 22 is in contact with the mercury in the cup 15, and, on the return swing of the pendulum, the finger 22 remains in contact with the mercury, after the finger 21 contacts with the mercury in the cup 14. With this arrangement, the periods of current-flow from the batteries 6 and 7, through the windings 8 and 9 of the relay 3, will

overlap, and, consequently, the electro-magnets of the relay will be alternately energized, but the relay will not be deenergized by the pulsations of current caused by the pole-changer. When the finger 21 is in electrical connection with the mercury in the cup 14, current will flow from the battery 6, through the winding 8, the wire 17, the mercury in the cup 14, the arm 19, the wire 24 and the alarm circuit 23. The alarm circuit is grounded, and, consequently the return circuit will flow through the ground and then the windings of the accelerator 5 to the negative electrode of the battery 6. During the period that the finger 22 is in contact with the mercury in the cup 15, and the finger 21 is raised out of the mercury in the cup 14, the current will flow from the positive electrode of the battery 7, through the windings of the accelerator 5 and the ground connection, the alarm circuit 23, the wire 24, the arm 19, the mercury in the cup 15, the wire 18, and through the winding 9 to the negative electrode of the battery 7. During the intermediate periods, that is, during the time that the fingers 21 and 22 are both submerged in the mercury of their respective cups, the flow of current through the wire 24 and the alarm circuit 23 ceases, but the flow of current through the windings 8 and 9 continues. The only effect that the overlapping of current-flow through the windings 8 and 9 will have on the relay 3, is that its effective magnetism is approximately double. This will not effect the operation of the armature 10, since its actuated spring is so proportioned, that it cannot move the armature, while either of the electro-magnets of the relay are energized. The accelerating device 5 for the oscillating switch is designed to impart just enough energy to the pendulum 16 to overcome friction, and, consequently it operates with a small expenditure of energy. The accelerator consists of a permanent bar-magnet 25, which is pivotally mounted, so that it is capable of oscillating between the poles 26 and 27 of an electro-magnet, the windings of which are connected to a wire 31 and to the ground. The windings of the electro-magnet are so arranged that the bar-magnet 25 will be repelled by the pole 27, and attracted by the pole 26 when current flows from the cup 14, through the wire 24, and vice versa, will be repelled by the pole 26 and attracted by the pole 27, when current flows from the cup 15, through the wire 24. With this arrangement, the bar-magnet will move from the pole 27 to the pole 26, during the time that the pendulum 16 is completing the swing, which moves the finger 21 into the mercury of the cup 14, and the finger 22 out of the mercury of the cup 15. The bar-magnet 25 will remain in this position during the period that the current flows through

the wire 24 from the cup 14, and during the period of zero flow through the circuit 23. As soon as the pendulum moves the finger 21 out of the mercury in the cup 15, the magnetism of the electro-magnet is reversed and the pole 26 repels, and the pole 27 attracts the bar-magnet. By providing a finger 28 on the bar-magnet, which will engage the pendulum 16, this last described motion of the bar-magnet is employed to accelerate the pendulum.

In the apparatus illustrated, the oscillating switch will deliver an alternating current to the circuit 23 and the relay 3 will not be affected by the operation of the oscillating switch. However, if the circuit 23 is opened, by the operation of any one of the signal devices 29, diagrammatically illustrated in the circuit, the relay will be deenergized and the armature 10 will complete the local circuit 11. The signal devices 29 may be, and preferably are, similar to those described in my co-pending application serially numbered 592,761.

I contemplate employing my invention in connection with apparatus for automatically cutting the oscillating switch out of the alarm circuit, and for connecting the relay 3 directly to the alarm circuit, so that the alarm circuit is subjected to direct-current. The apparatus for performing this function is rendered operative by the first movement of the armature 10, occasioned by a break in the alarm circuit 23, consequently, the alarm circuit will be subjected to direct-current, after the first break, occasioned by the operation of one of the alarm boxes or devices 29, and the subsequent breaks occasioned by the continuing operation of the operating alarm box or device will actuate the armature 10 in the usual manner. It is important that the first break occasioned by the operation of any one of the alarm devices 29 shall be longer than the period of zero-current on the circuit 23, to insure a demagnetization of the relay 3. With my invention, the relay will operate in response to makes and breaks in the alarm circuit, occasioned by the alarm box 29, and will not be subjected to periods of zero-current.

What I claim is:—

1. In combination with an alarm circuit, a relay device provided with two electro-magnetic windings, a separate source of direct-current supply delivering current to said windings, an oscillating switch connected to said windings and adapted to deliver current to said circuit, first from one and then the other source of current supply.

2. In combination with an alarm circuit, a relay provided with separate electro-magnetic windings, separate sources of direct current supply delivering current of opposite sign to said windings, an oscillating switch connected to said windings and

adapted to deliver current to said alarm circuit, first from one source of current supply and then to the other.

3. In combination with an alarm circuit, two separate sources of direct-current supply connected to one lead of said circuit, and adapted to alternately deliver current of opposite sign thereto, and an oscillating switch connected with the other lead of said circuit, and adapted to alternately connect one and then the other source of supply with said last mentioned lead.

4. In combination with an alarm circuit, an instrument provided with two separate electro-magnet windings, a separate source of direct-current supply connected to each of said windings, and an oscillating switch connected to said windings and to said circuit for delivering current to said circuit, first from one source of supply and then from the other, and for causing the periods of current-flow through the separate windings to overlap.

5. In combination with an alarm circuit, an instrument provided with two separate electro-magnet windings, a separate source of direct-current of opposite sign connected to each of said windings, an oscillating switch connected to each of said windings and to said circuit, and provided with means for delivering current to said circuit, first from one source of supply and then the other, and for causing the periods of flow through said windings to overlap.

6. In combination with a circuit, two separate sources of current supply, an oscillating switch relay having a separate terminal connected to each source of supply, a circuit breaker connected to said circuit, and adapted to oscillate to connect one and then the other of said sources of current supply with said circuit, and means for oscillating said circuit breaker.

7. In combination with a circuit, two separate sources of current supply, an oscil-

lating switch relay having a separate terminal connected with each source of supply, and means for alternately connecting said terminals with said circuit.

8. In combination with a circuit, two separate sources of current supply, an oscillating switch relay having a separate terminal connected with each source of supply, pendulum actuated means for alternately connecting said terminals to said circuit, and an electrically actuated accelerator for actuating said means.

9. In combination with a circuit, two sources of direct-current supply, a relay device and an oscillating switch for connecting said relay device to said circuit, and provided with means for delivering current to said circuit, first from one source of supply and then from the other, and for causing the periods of flow from said sources through said relay to overlap.

10. In combination with a circuit an oscillating switch connecting separate sources of direct-current, a mercury cup electrically connected with each source, a pendulum actuated bar connected to an alarm circuit and adapted to make electrical connection through each mercury cup between one and then the other of said sources and said circuit, and an accelerator actuated by the reversal of current through said circuit for actuating said pendulum.

11. In combination with a circuit, a source of direct current supply, a relay device, an oscillating switch comprising means for delivering current, first in one direction and then the other, from said source of supply to said circuit, and for causing a continuous flow of current from said source to said relay during the operation of said oscillating switch.

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Witnesses:

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