June 18, 1929. E. O. THOMPSON 1,717,475

ALTERNATING CURRENT RELAY

Filed July 19, 1922

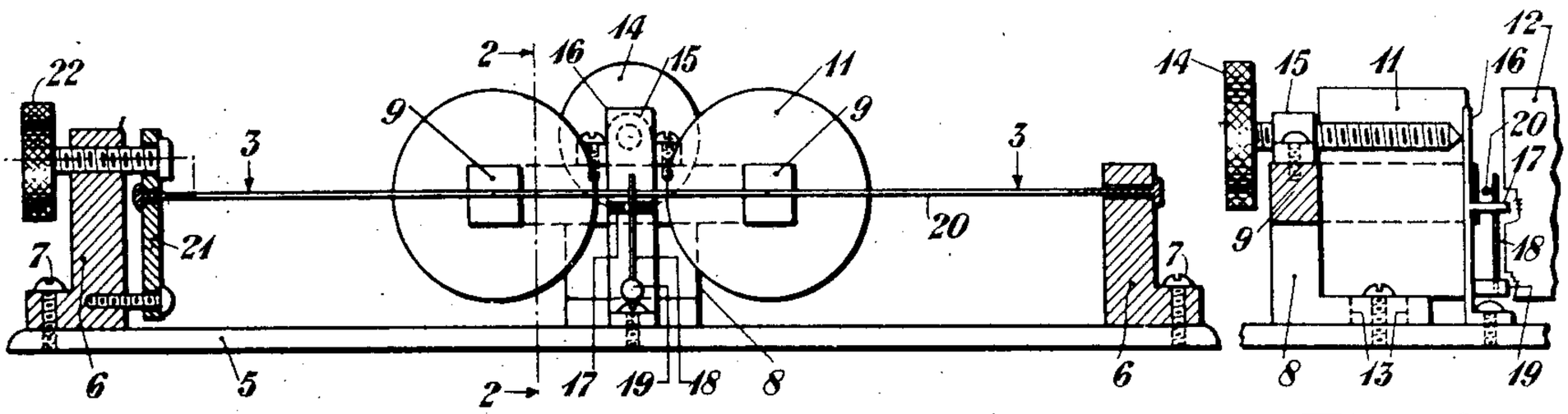


Fig. 1 Fig. 2

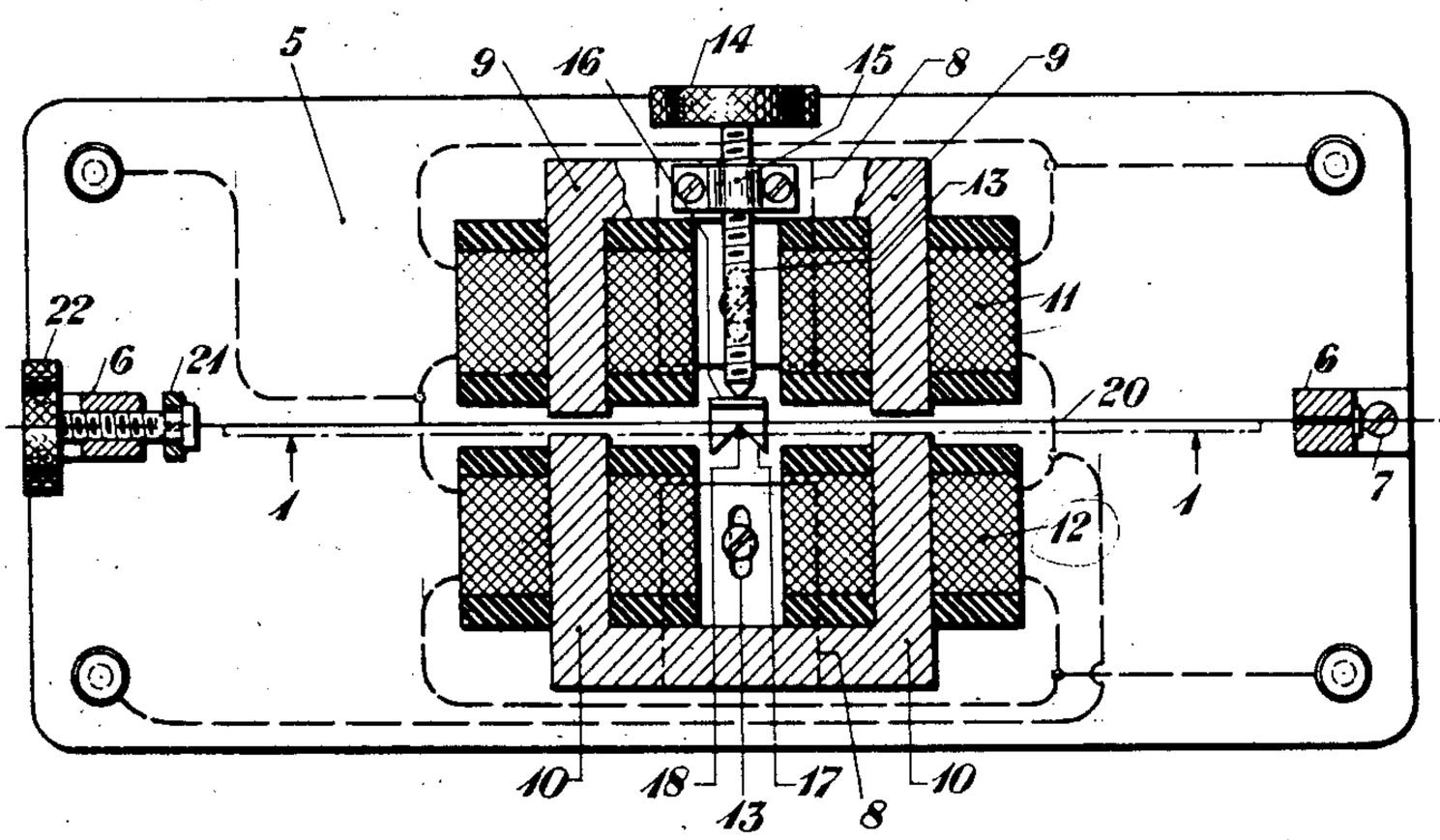


Fig. 3

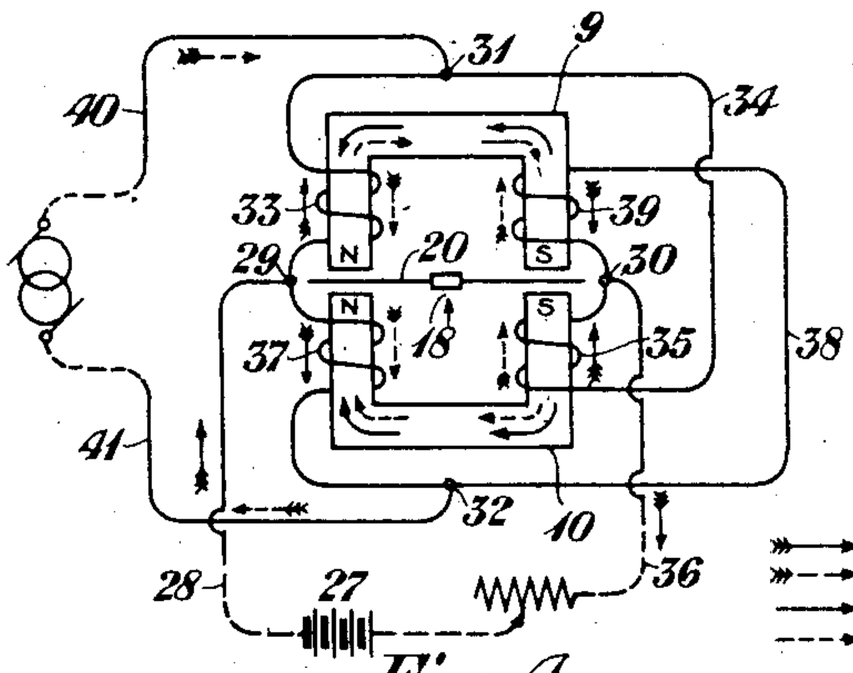
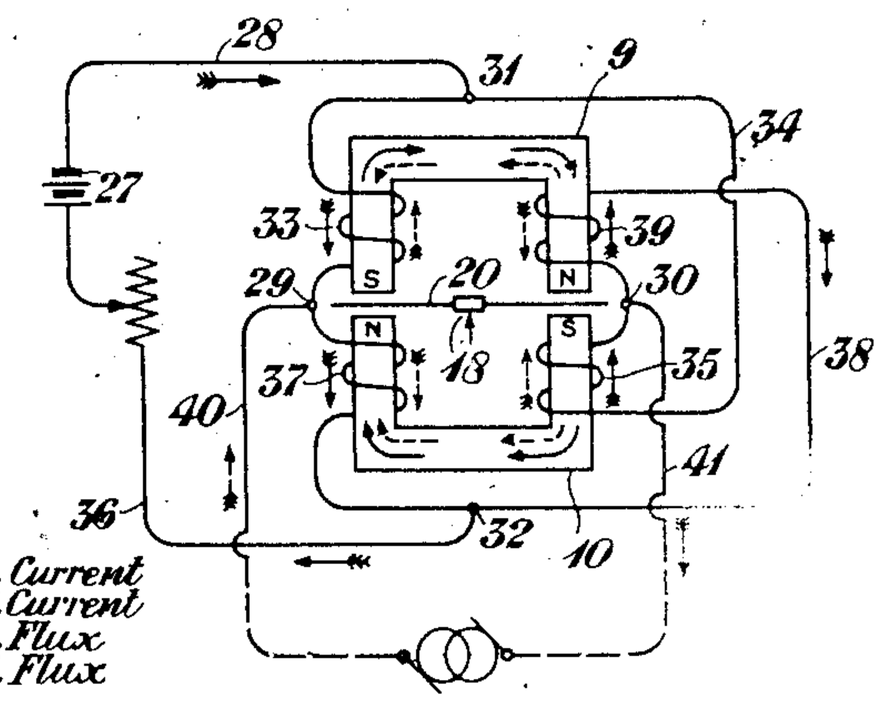


Fig. 4



D.C. Current
A.C. Current
D.C. Flux
A.C. Flux

Fig. 5

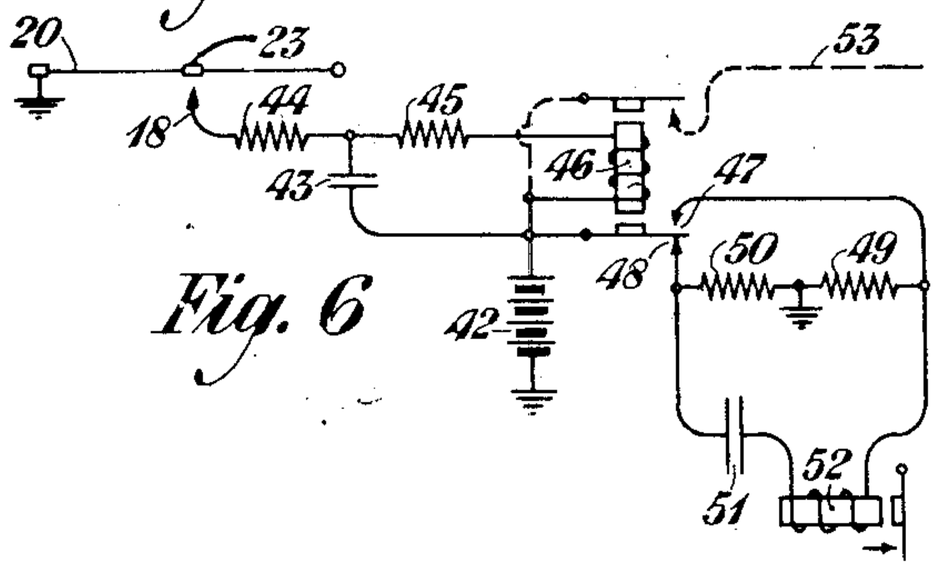


Fig. 6

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UNITED STATES PATENT OFFICE.

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ALTERNATING-CURRENT RELAY.

Application filed July 19, 1922. Serial No. 576,047.

This invention relates to relays, and more particularly to devices of this character which are adapted to be used in connection with electrical currents of comparatively high frequency.

An object of the invention is to provide an alternating current relay that shall have great sensitivity and high selectivity, and which shall respond with certainty to currents of a desired frequency. Another object of the invention is to provide means for the adjustment and polarization of the device. These objects and further objects of the invention will be apparent from the following description when read in connection with the attached drawing, in which one embodiment thereof is illustrated.

In the drawings, in which like characters of reference designate like parts throughout, Figure 1 is a side elevation, partly in section, of the improved relay; Fig. 2 is an end view thereof taken on the line 2—2 of Fig. 1, looking in the direction of the arrows; Fig. 3 is a top plan sectional view of the device; Fig. 4 is a schematic diagram of the circuit for polarizing said relay; Fig. 5 is a diagram similar to that of Fig. 4 showing an alternative circuit arrangement for polarizing the relay, and Fig. 6 is a diagram of the circuits which may be used in connection with the relay of this invention.

Referring to the drawings, 5 represents a base having brass blocks 6, 6 secured on either end thereof by means of screws 7, 7. Mounted on the base 5 in the approximate center thereof between the blocks 6 is a pair of parallel L-shaped standards, one of which is shown at 8. These standards support U-shaped yokes 9 and 10 in horizontal position, the poles of each yoke facing the poles of the opposite yoke. Windings 11 and 12 are associated with the arms of the yokes 9 and 10, respectively. The yokes 9 and 10 with their attached windings are adjustable toward and from each other by loosening the screws associated with the slots provided in the base of the standards, as indicated at 13. An adjusting screw 14 is mounted on the standard 8, and is shown in the present instance as being kept in place by a bracket 15, which may be secured to the said standard in any desired manner. The screw 14 is adapted to engage a contact member 16, which extends vertically from the base 5, to which it may be suitably secured. The contact piece 16 is insulated from the base 5 and lies between the yokes 9 and 10, and is provided with a flange 17, which extends at right angles therefrom, and in the present instance is shown as having a V-shaped slot formed therein. The slot serves to guide a vibrating contact 18, which is mounted on and extends upwardly from a shelf 19 attached to the lower portion of contact member 16. The vibrating reed 18 is adapted to yield, thus permitting the armature 20 to continue its amplitude. The armature 20, which may consist of a ribbon or wire made from silicon steel, or the like, is secured in any suitable manner to the brass block 6 at one end of the base 5, and extends and is fastened to an adjusting bar 21 associated with the companion block 6 on the opposite end of said base. The bar 21 is adjustably connected with the tuning screw 22, which is threaded through the block 6. The armature 20 lies between the poles of the yokes 9 and 10, and the tension thereof is regulated by the tuning screw 22. Said armature may have a platinum contact point 23, which is adapted to cooperate with the vibrating contact 18.

The arrows shown in the drawing indicate the character and direction of current flowing through the relay windings in Figs. 4 and 5 as well as the resulting flux created by such currents.

In Fig. 4 the circuit for polarizing the relay may be traced as follows: from battery 27, conductor 28 to terminal 29, where the circuit divides in parallel paths, one path flowing through winding 33, conductor 34, winding 35, terminal 30 and conductor 36. The other path continues from terminal 29, winding 37, conductor 38, winding 39 to terminal 30 and return over conductor 36. When alternating current is now applied to the relay, the circuits therefor may be traced from source of alternating current, conductor 40 to terminal 31, where the circuit divides in parallel paths, one path flowing through windings 33 and 37 to terminal 32 and return over conductor 41, and the other path from terminal 31, conductor 34, windings 35 and 39, conductor 38 to terminal 32 and return over conductor 41. The strength of the alternating current is so adjusted as to be of less strength than the direct current, so that no loss of efficiency will occur. The flux in the yoke 9 under the above condition is reduced, while the flux in the yoke 10 is increased, this

tending to pull the armature 20 toward the poles of the yoke 10 thereby causing the armature 20 to make momentary contact with the contact point 18, as will be later explained. On the reversal or negative flow of the alternating current, the conditions just mentioned are reversed, so that armature 20 will be attracted toward the poles of yoke 9. The terminals for the direct current are conjugate with respect to the terminals for the alternating current.

In Fig. 5, which is a modification of Fig. 4, the direct current source and the alternating current source are interchanged. The polarizing circuit in this instance may be traced from battery 27, conductor 28 to terminal 31, where the circuit divides into parallel paths, one path flowing through winding 33, terminal 29, winding 37, terminal 32 and return by way of conductor 36. The other path continues from terminal 31, conductor 34, winding 35, point 30, winding 39, conductor 38, point 32 and return by conductor 36. When the alternating current is now applied to the relay, the circuits therefor may be traced from source of alternating current, conductor 40 to terminal 29, where the circuit divides in parallel paths, one path flowing through winding 33, terminal 31, conductor 34, winding 35, terminal 30 and return by way of conductor 41, the other path continuing from terminal 29, winding 37, terminal 32, conductor 38, winding 39, terminal 30 and return by conductor 41. The strength of the alternating and direct current in this instance is the same as explained in connection with Fig. 4. The flux in the yoke 9 under this condition is reduced, while the flux in yoke 10 is increased, thus tending to pull the armature 20 toward yoke 10, thereby causing said armature to make momentary contact with the contact point 18, as will be later explained.

Referring to the diagram shown in Fig. 6, the incoming alternating current is applied over the conductors 40 and 41 and through the windings of the relay, as formerly indicated. The relay will operate on current, by way of illustration, of 1,000 cycles, interrupted at the rate of 20 cycles per second, the current being on for a fortieth of a second and off for a fortieth of a second. During the time the current is on, the armature 20 of the relay will vibrate in unison with the impressed alternating current frequency thus at each cycle making contact with the flexible contact spring 18, which normally rests against the V-shaped stop. While a momentary contact is made between the armature 20 and its contact 18, current from battery 42 will charge the condenser 43 through the resistance 44 and contact 23 of the armature 20 to ground, the resistance 44 making the charge non-oscillatory. During the time contact at 23 is broken, the charge from positive plate of condenser 43 will flow through the resistance 45 and winding of relay 46. During the application of 1,000 cycle interrupted current, the armature of relay 46 will be held against contact 47 for the first fortieth of a second, and for the next fortieth of a second against contact 48. Current from battery 42 flows alternately through contact 47 and resistance 49 to ground and through contact 48 and resistance 50 to ground. This causes an alternating current of 20 cycles per second to flow through the relay 52 and condenser 51, which is in series with it. This local circuit is tuned to 20 cycles and will not respond to frequencies above or below this value. Relay 52 will be held up as long as the proper frequency is maintained.

An alternative plan for employing the improved relay in connection with continuous signaling current is shown by dotted lines in Fig. 6, wherein the operation of relay 46 will close a circuit through its contact from battery over conductor 53.

What is claimed is:

1. A relay comprising a base, a pair of U-shaped yokes, each yoke having its poles in alinement with the poles of the opposite yoke, supporting means for each of said yokes provided with slots whereby they may be movably mounted on said base to adjust the air-gap between said poles, windings for each of said yokes through which direct current and alternating current may flow, terminals for said windings, the terminals of the direct current windings being conjugate with respect to the terminals of the alternating current windings, an armature stretched longitudinally of the poles of said yoke, and adjusting means for said armature mounted on said base for adjusting the tension of said armature.

2. A relay comprising a base, a pair of yokes adjustably supported thereon to vary the air-gap between said yokes, windings associated with said yokes, a ribbon armature positioned longitudinally of said yokes and associated windings, a vibrating reed associated with said armature and adapted to yield in accordance with the movement thereof to permit said armature to continue its amplitude, a guide for said reed, and means for adjusting said guide.

In testimony whereof, I have signed my name to this specification this 18th day of July, 1922.

ELMER O. THOMPSON.