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E. O. THOMPSON

ALTERNATING CURRENT RELAY

Filed July 19, 1922

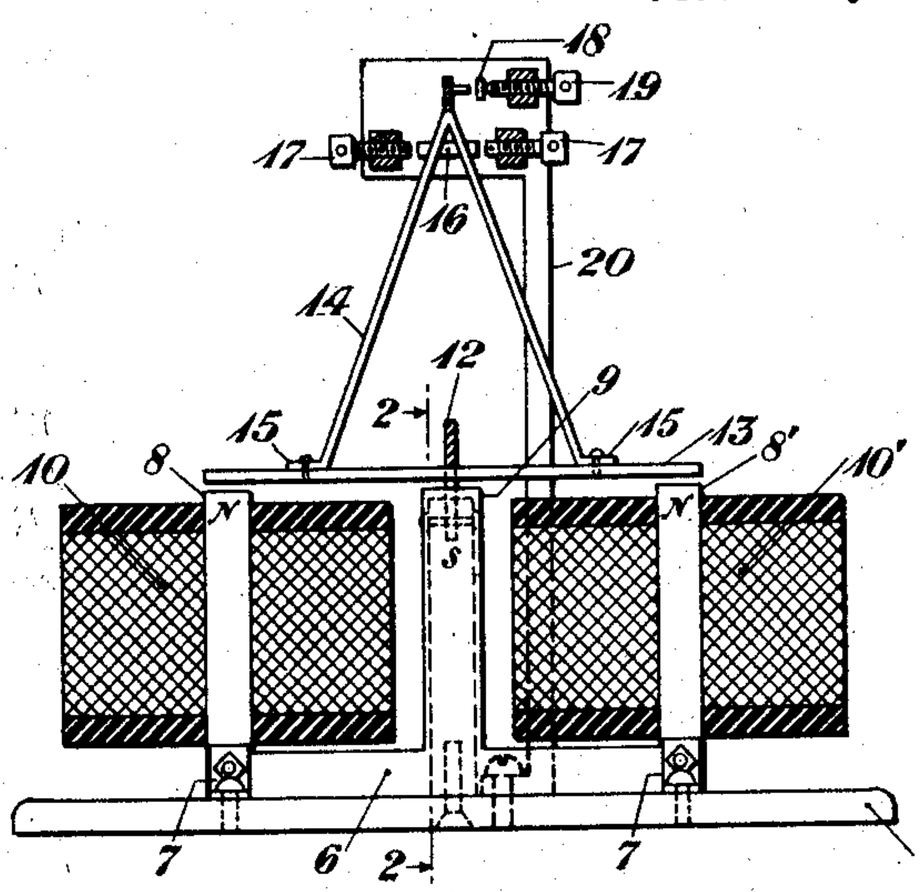

Fig. 1

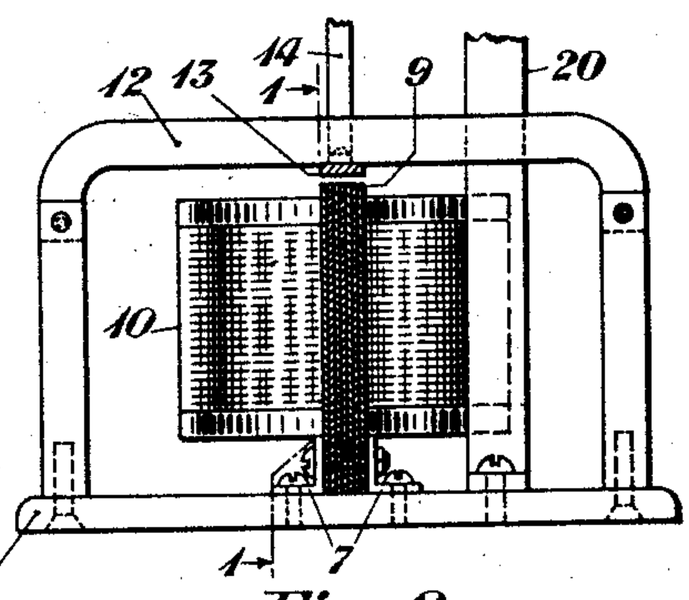

Fig. 2

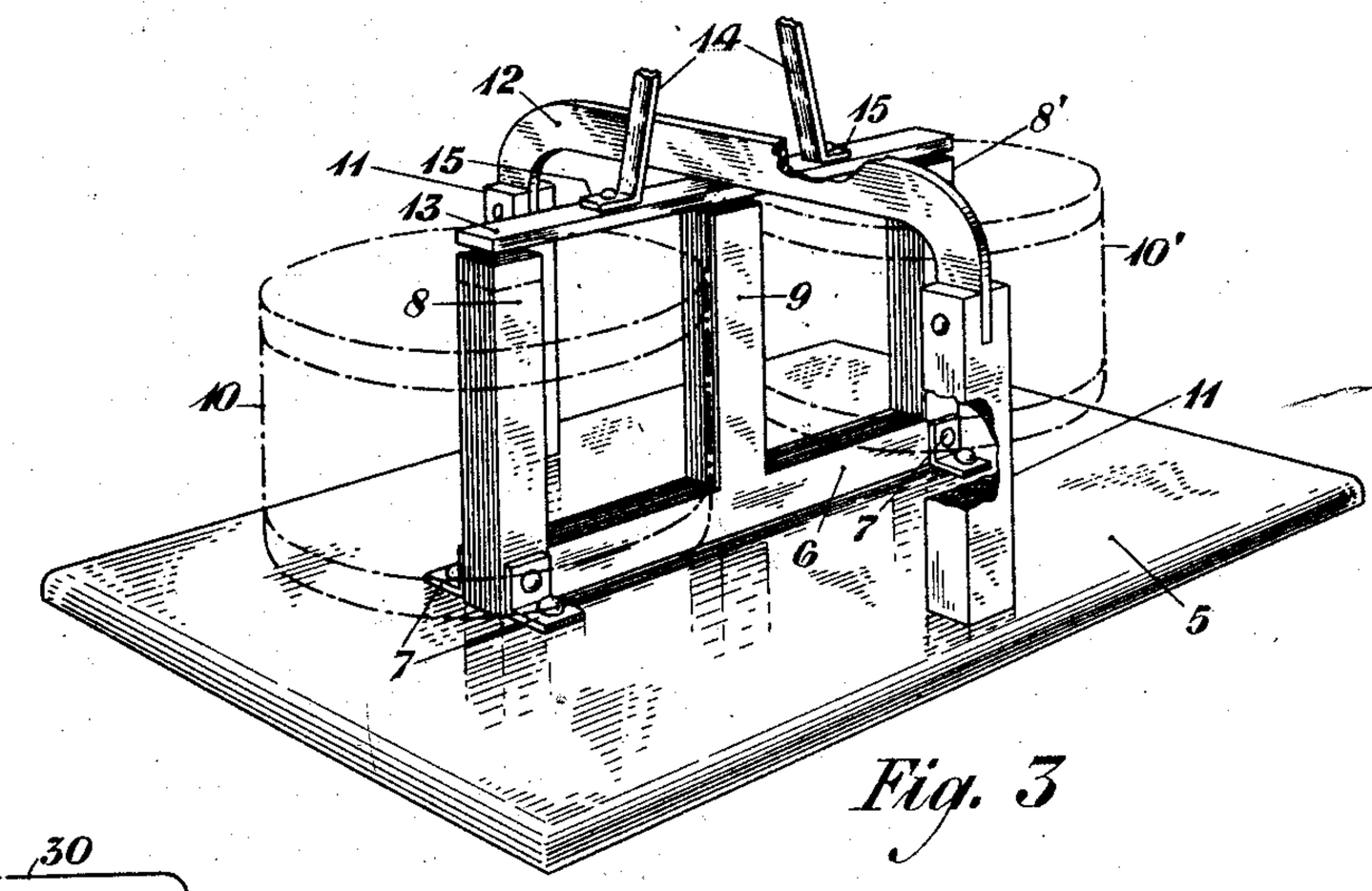

Fig. 3

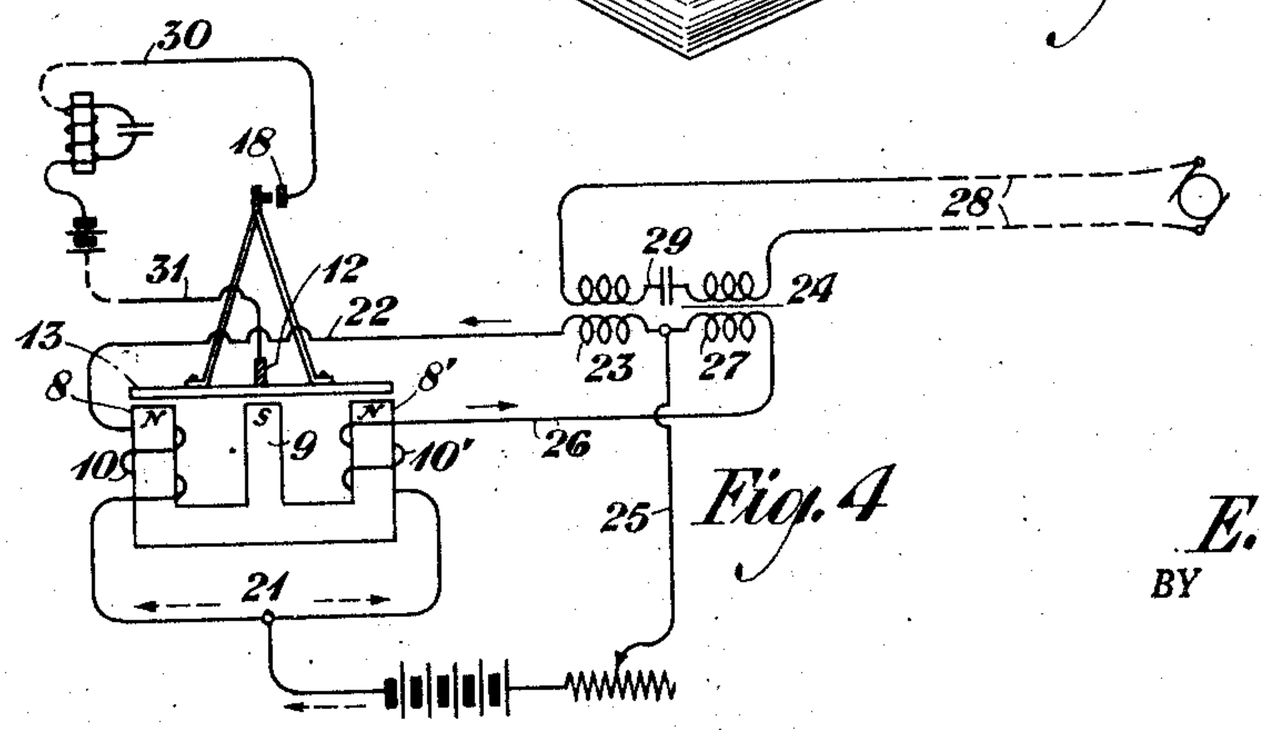

Fig. 4

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UNITED STATES PATENT OFFICE.

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ALTERNATING-CURRENT RELAY.

Application filed July 19, 1922. Serial No. 576,049.

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 certain embodiments thereof are illustrated.

In the drawings, in which like characters of reference designate like parts throughout, Figure 1 is a side elevation in section of the improved relay; Fig. 2 is an end view thereof on the line 2—2 of Fig. 1 looking in the direction of the arrows; Fig. 3 is a perspective view of the device, and Fig. 4 is a diagram of the circuits which may be used in connection therewith. The relay shown in the drawing is designed to respond selectively to alternating currents, for instance of 1000 cycles. Such current is employed on long telephone lines for signaling, and comes in much attenuated to a terminal station.

Referring to the drawings, 5 represents a base having a laminated yoke or frame 6 mounted longitudinally thereof. The frame 6 may be secured to the base by brackets 7 which are provided on either side of the frame and at the ends thereof. The frame comprises a horizontal bar having two vertical cores 8, 8′, one at either end of the bar, and a vertical member 9 intermediate said cores; these vertical members are formed integral with said bar. The cores are composed of any suitable material, and each has a winding 10, 10′ associated therewith in the customary manner. A pair of standards, 11, 11, are affixed to the base 5 near the edges of the longer sides thereof in approximate transverse alinement with the vertical member 9. These standards carry a torsional support 12 which is mounted so as to move thereon, and is controlled in its movement by an armature 13. The torsional support 12 may be tuned by varying its moment of inertia, or by varying the elasticity of said support. The armature 13 may be secured to the suppcrt 12 in any desired manner, as, for instance, by welding. The mounting of the armature 13 will cause it to be balanced against mechanical disturbances. An inverted V-shaped contact member 14 is supported on the armature 12 by means of outwardly turned arms 15, 15, which rest flatly on the top surface of the armature, and are suitably secured thereto. At the approximate juncture of the arms of the member 14, a contact plug 16 is provided which cooperates with stop pins 17 positioned at either side thereof to limit the amplitude of movement of the member 14. The member 14 has a contact surface provided near its top which projects to one side thereof and is adapted to make electrical connection, as will later appear, with a contact surface 18 on adjusting screw 19. The adjusting screw 19 serves to vary the gap between the two contact surfaces, and the contact travel between these surfaces is further governed by the length of the arms of the member 14, which may be of any length desired. The stop pins 17 and adjusting screw 19 are mounted upon a vertical support 20 in any well known manner, and said support may be affixed to the base 5 by means of screws. The support 20 and other components of the relay structure which are mounted on the base 5 are insulated therefrom as by mica, rubber or the like.

In the diagram shown in Fig. 4, the circuit for polarizing the relay may be traced as follows: From battery to neutral point 21, where the circuit divides into two paths, one path passing through the winding 10 of core 8, conductor 22, coil 23, mid-point of transformer 24 and return by conductor 25. The other path for the polarizing circuit continues from neutral point 21 through the winding 10′ of core 8′, conductor 26, coil 27, mid-point of transformer 24 and return by conductor 25. The connection of battery over the path just outlined, assuming the flow to be in the direction indicated by the dotted arrows, polarizes the cores 8 and 8′ and causes the poles of each to become north and the pole of the middle core 9 to become south, thus magnetizing the armature 13 in two sections, making each end of the armature south and the middle of the armature north.

The circuit through which alternating current flows may be traced from source of alternating current over both sides of the line 28, through the coils of the transformer 24, over

conductors 22 and 26 and both windings of the relay, in the direction indicated by the arrow in full lines. A condenser 29 is connected between the two primary windings of the transformer and electrically tuned to the alternating current of 1000 cycles, for instance. The superposing of alternating current on the direct current in the manner indicated, partially counteracts the magnetic effect produced by the direct current flow in winding 10, thereby weakening the magnetic pull of core 8 upon one end of the armature 13, and aids the magnetic effect produced by direct current flow in winding 10′, thereby strengthening the magnetic pull of the core 8′ upon the other end of the armature 13. Under this condition the armature 13 moves about its central supporting point on the torsional member 12 toward the pole of core 8′, causing the member 14 which is mounted thereon to partake of such movement and close contact 18. The closing of the contact 18 completes a local circuit from armature 13 which is grounded, over the conductor 31 and through said closed contact over conductor 30 to an electromechanism such as a relay, which may be connected to battery. On the reversal of or opposite flow of alternating current, the armature will be attracted toward the pole of core 8, causing the member 14 to break contact at point 18, and the magnetic condition created in said windings will be inverse to that just outlined. The amplitude of movement of the armature will thus continue under the magnetic influence of the windings, making and breaking the contact at point 18 at the desired frequency. Thus during the time the contact 18 is intermittently opening and closing, the electromechanism or relay connected with the conductors 30 and 31 is caused to operate, and it in turn may operate other apparatus which may be connected therewith.

It is pointed out that the tuning of the armature is largely controlled by the strength of the regulated battery, and that as the armature is pivoted at its center, the moment of inertia is small. It will be also obvious that a saving in copper wire is effected, by the use of the same windings for the polarizing circuit and operating circuit.

What is claimed is:

1. A relay comprising a yoke, said yoke having a plurality of vertical cores, an armature, a torsional support for the armature, and a vibrating contact member mounted longitudinally of said armature.

2. A relay comprising a base, a yoke mounted thereon, said yoke comprising a plurality of vertical cores, windings for two of said cores, an armature, a torsional support for the armature, standards affixed on the base in transverse alinement with one of said cores for mounting said torsional support, and a vibrating contact member mounted longitudinally of said armature on either side of the torsional support.

3. A relay comprising a base, a yoke mounted thereon, said yoke comprising a plurality of vertical cores, windings for two of said cores through which direct current and alternating current may flow, an armature controlled by the magnetic influence created in said cores by the flow of said currents through said windings, a torsional support for the armature, and a vibrating contact member mounted on said armature and partaking of the movement thereof.

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

ELMER O. THOMPSON.