May 26, 1925.

1,538,960

E. O. THOMPSON

ALTERNATING CURRENT RELAY

Filed July 19, 1922

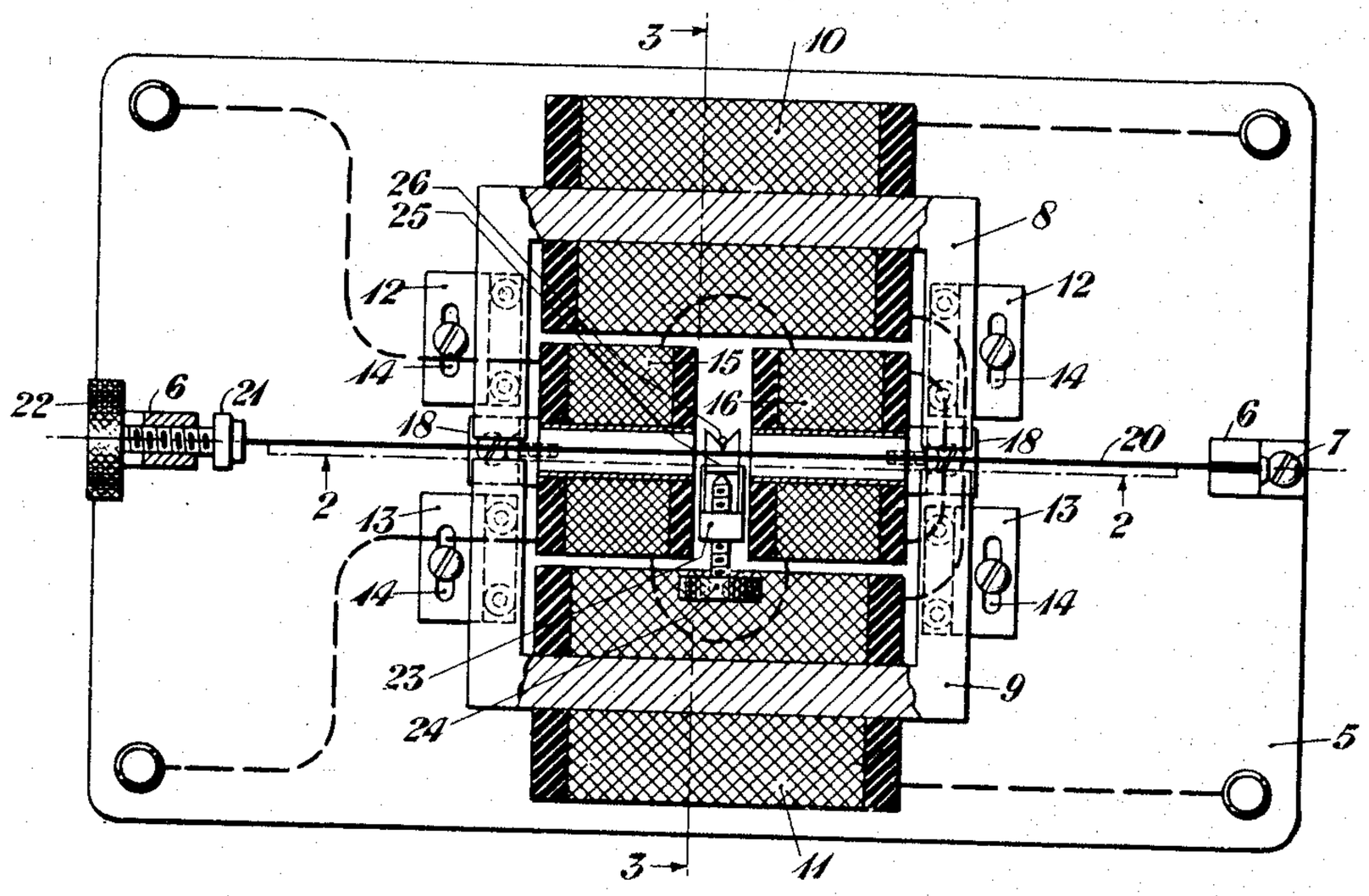

Fig. 1

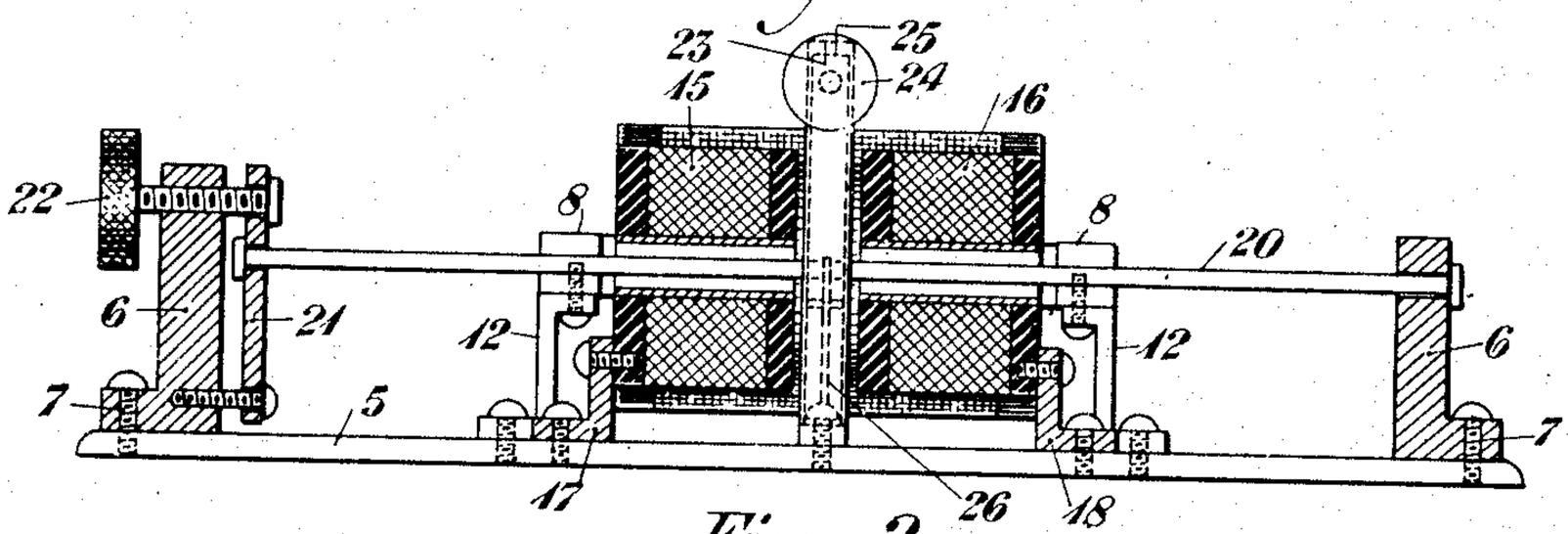

Fig. 2

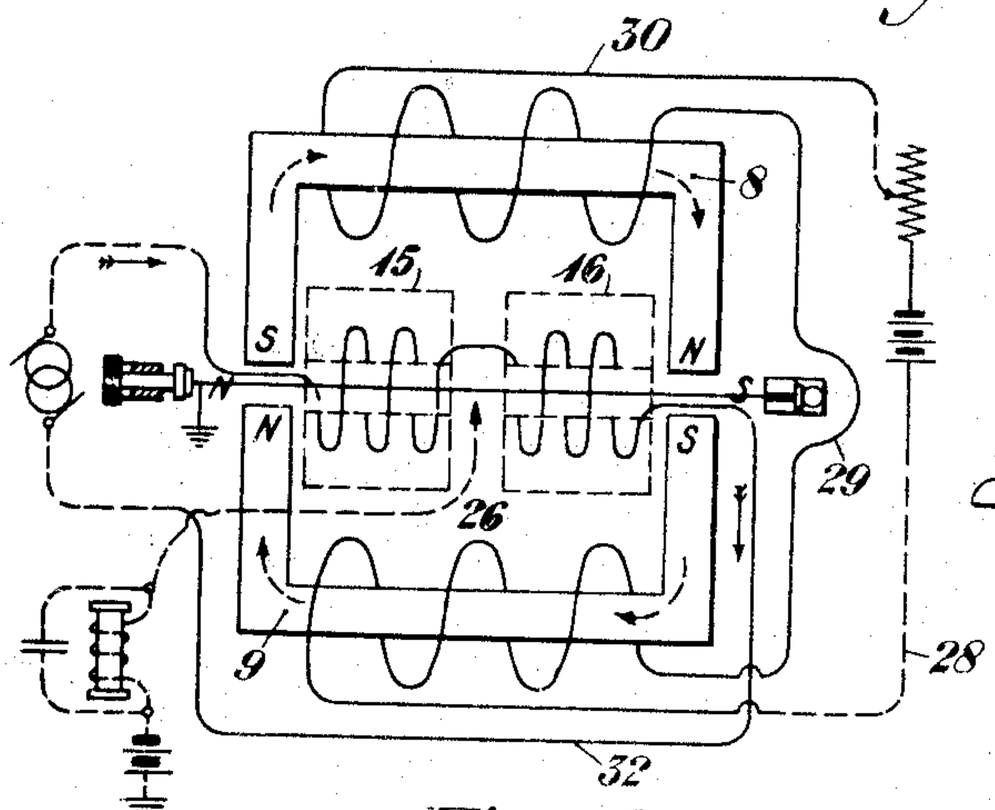

Fig. 4

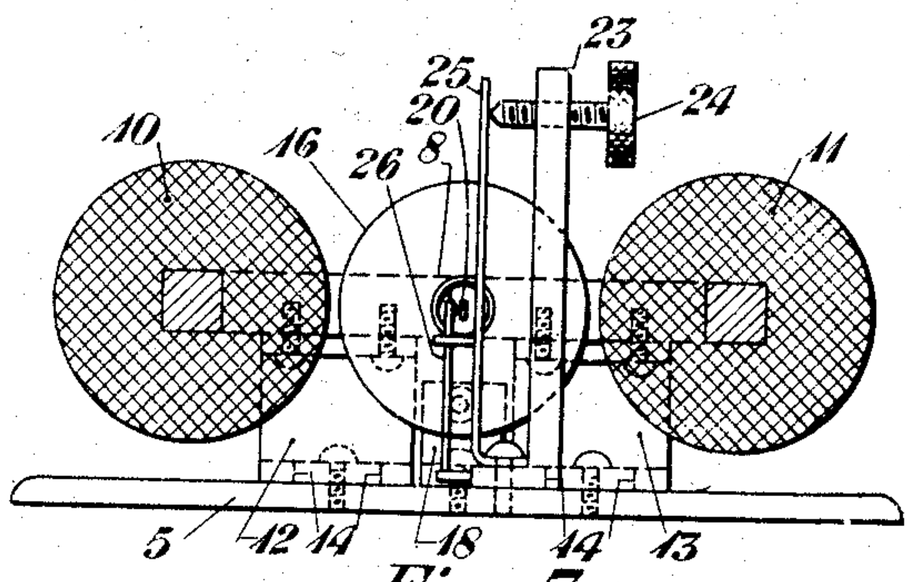

Fig. 3

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Patented May 26, 1925. 1,538,960

UNITED STATES PATENT OFFICE.

ELMER O. THOMPSON, OF TOMPKINSVILLE, NEW YORK, ASSIGNOR TO AMERICAN TELEPHONE AND TELEGRAPH COMPANY, A CORPORATION OF NEW YORK.

ALTERNATING-CURRENT RELAY.

Application filed July 19, 1922. Serial No. 576,048.

To all whom it may concern:

Be it known that I, ELMER O. THOMPSON, residing at Tompkinsville, in the county of Richmond and State of New York, have invented certain Improvements in Alternating-Current Relays, of which the following is a specification.

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 drawings, in which certain embodiments thereof are illustrated.

In the drawings, in which like characters of reference designate like parts throughout, Figure 1 is a top view in section of the improved relay; Fig. 2 is a side elevation thereof taken on the line 2—2 looking in the direction of the arrows; Fig. 3 is a sectional view of the device taken on the line 3—3 of Fig. 1, and Fig. 4 is a diagram of the magnetic circuit for said relay. The relay shown in the drawing is designed to respond selectively, for instance, to alternating currents 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 brass blocks 6, 6 secured on either end thereof by means of screws 7, 7. In the approximate center of the base 5, between the blocks 6, 6 a pair of U-shaped yokes 8 and 9 is mounted in horizontal position with their poles facing each other. The yokes are provided with windings 10 and 11, respectively, which are wound thereon in the customary manner. The mountings for the yokes 8 and 9 are provided by a pair of standards 12 and 13, respectively. The standards are affixed to the yokes in any suitable fashion and to the base 5 by means of screws, which are positioned in the slots 14 of each of the standards. The yokes 8 and 9, with their attached windings, may be moved within the limits of the slots toward and from each other, as more clearly shown in Fig. 1 of the drawing. The air gap between said yokes may be thus regulated.

Spools 15 and 16 and associated windings are mounted on the base 5 in the space between the windings 10 and 11 and secured to said base, for instance, by brackets 17 and 18, respectively, which may be screwed thereto. An armature 20, which may consist of a ribbon or wire made of silicon steel, or like material of high permeability, is affixed in any suitable manner to the block 6 at one end of the base 5. The armature extends and is fashioned to an adjusting bar 21, associated with the companion blocks 6 at the opposite end of said base. The bar 21 is adjustably connected with a tuning screw 22, which is threaded through the associated block 6. The armature 20 passes through the cores of the spools 15 and 16 and lies between the poles of the yokes 8 and 9. It it actuated by the magnetic influence of said spools and yokes and may be tuned to a desired frequency by means of the adjusting screw 22.

The windings 10 and 11 are connected with a source of regulated direct current, and the windings of spools 15 and 16 are connected with a source of alternating current, as will later appear.

A vertical member 23 is secured to the base 5 and is positioned in the approximate center thereof between the spools 15 and 16 and at one side of the armature 20. The member 23 is provided with an adjusting screw 24 threaded through the upper part thereof. This screw serves to adjust contact spring 25, which extends upwardly from the base 5. A vibrating contact 26 is positioned on the opposite side of the armature 20 from that of spring 25, and is mounted vertically upon a lug provided on the lower part of said spring. A flange 27, having a V-shaped slot provided therein, extends at right angles from the spring 25, and said slot serves as a guide for the contact 26 when it is vibrated by the armature 20. The armature 20 is controlled by the magnetic influence of the coils and yokes, and when actuated completes a circuit through the contact 26, as will later apear. The members 23, 25 and 26 are insulated from each other and from the base 5 in any desired manner.

In the diagram of Fig. 4, the circuit for polarizing the relay may be traced from battery, conductor 28, winding of yoke 9, conductor 29, winding of yoke 8, and return by way of conductor 30. The path for alternating current may be traced from source of alternating current, conductor 31, windings of spool 15 and 16, and return by way of conductor 32.

The application of direct current over the path just traced through the windings of yokes 8 and 9 induces a magnetic flux through said yokes in the direction indicated by the dotted arrows. The armatures 20, however, will not be moved under this condition.

The application of alternating current causes the armature 20 to vibrate between the poles of the yokes 8 and 9, and assuming the alternating current flows in the direction indicated by the arrows in full lines, the ends of the armature 20 will be magnetized as represented, north and south. The north pole of the armature 20 will be attracted toward the south pole of the yoke 8 and the south pole of the armature will be attracted toward the north pole of said yoke. The attractive force presented by the south and north poles of the yoke 8 upon the armature 20 will be aided by the repelling force of the opposite poles of yoke 9. Upon reversal or negative flow of the alternating current, the polarity of the armature 20 is changed and said armature is attracted toward yoke 9 in a manner corresponding to that described in connection with its attraction toward yoke 8. Each time the armature 20 is attracted toward yoke 9 it makes contact with the contact point 26. The relay will operate, for example, on current of 1000 cycles per second. During the time current is applied 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 26 which normally rests against the V-shaped stop or guide of the member 25. Ground is connected to the armature 20 at one end thereof and the contact point 26 is connected to an electromagnetic device such as a relay which in turn may be connected with a source of current. During the series of intermittent contacts of the armature 20 with the point 26, a circuit may be closed from ground connected with said armature to battery through any electromagnetic device included in the circuit, and said relay or electromagnetic device in turn may control other apparatus and cause it to function at the same frequency as that of armature 20.

Thus it will be seen that by means of the improved relay, with its ribbon armature of high permeability, greater sensitivity is attained, and a correspondingly large amplitude for the incoming current. The flux for the alternating current has two air gaps in multiple which causes a lower reluctance and a correspondingly increased magnetic flux in said armature. Furthermore, the amplitude at the point of contact of the armature is considerably greater than at the point of magnetic pull exerted by said yokes, thus causing the contact gap to be less affected by atmospheric conditions and more readily adjustable.

From the foregoing, it is thought that the construction, operation and the many advantages of the herein described and delineated invention will be apparent to those skilled in the art without further description, and it will be understood that various changes in the shape, proportion and minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

What is claimed is:

1. A relay comprising a base, yokes adjustably supported thereon having their poles oppositely positioned with respect to each other, windings for said yokes, a pair of spools including windings therefor mounted on said base between said yokes, a spring member mounted on said base, means for adjusting said spring member, and an armature positioned longitudinally of said yokes and centrally of said spools, said armature being adapted to make contact with said spring member, and means on said base for adjusting the tension of said armature.

2. A relay comprising a base, yokes adjustably supported thereon, windings for said yokes through which direct current may flow, a pair of spools including windings therefor through which alternating current may flow, a spring member mounted on said base, and an armature positioned longitudinally of said yokes and centrally of said spools adapted to make contact with said spring member, the amplitude of movement of said armature under the magnetic influence of the direct current and alternating current being greater at the point of contact than at the point of magnetic pull exerted by said yokes.

3. A relay comprising a base, yokes adjustably supported thereon, windings for said yokes through which direct current may flow, a pair of spools including windings therefor through which alternating current may flow, a spring member mounted on said base, an armature positioned longitudinally of said yokes and centrally of said spools adapted to make contact with said spring member, the amplitude of movement of said armature under the magnetic influence of the direct current and alternating current

being greater at the point of contact than at the point of magnetic pull exerted by said yokes, and means mounted on said base for adjusting the tension of said armature.

4. A relay comprising a base, yokes adjustably supported thereon having their poles oppositely positioned with respect to each other, windings for said yokes through which direct current may flow, a pair of spools including windings therefor through which alternating current may flow mounted on said base between said yokes, a spring member mounted on said base, means for adjusting said spring member, and an armature positioned longitudinally of said yokes and centrally of said spools adapted to make contact with said spring member, the amplitude of movement of said armature under the magnetic influence of the direct current and alternating current being greater at the point of contact than at the point of magnetic pull exerted by said yokes.

5. A relay comprising a base, yokes adjustably supported thereon having their poles facing each other, windings for said yokes through which direct current may flow, a pair of spools including windings therefor through which alternating current may flow, and an armature positioned longitudinally of said yokes and centrally of said spools, the field produced in the magnetic system by said alternating current having two air gaps in multiple whereby a lower reluctance and a correspondingly increased magnetic flux is created for said armature.

6. A relay comprising a base, yokes adjustably supported thereon having their poles facing each other, windings for said yokes through which direct current may flow, a pair of spools including windings therefor through which alternating current may flow, an armature positioned longitudinally of said yokes and centrally of said spools, the field produced in the magnetic system by said alternating current having two air gaps in multiple whereby a lower reluctance and a correspondingly increased magnetic flux is created for said armature, a spring member mounted on said base with which said armature is adapted to make contact, the amplitude of movement of said armature at the point of contact being greater than at the point of magnetic pull exerted by said yokes, means for adjusting the tension of said armature, and means for adjusting said spring member.

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

ELMER O. THOMPSON.