

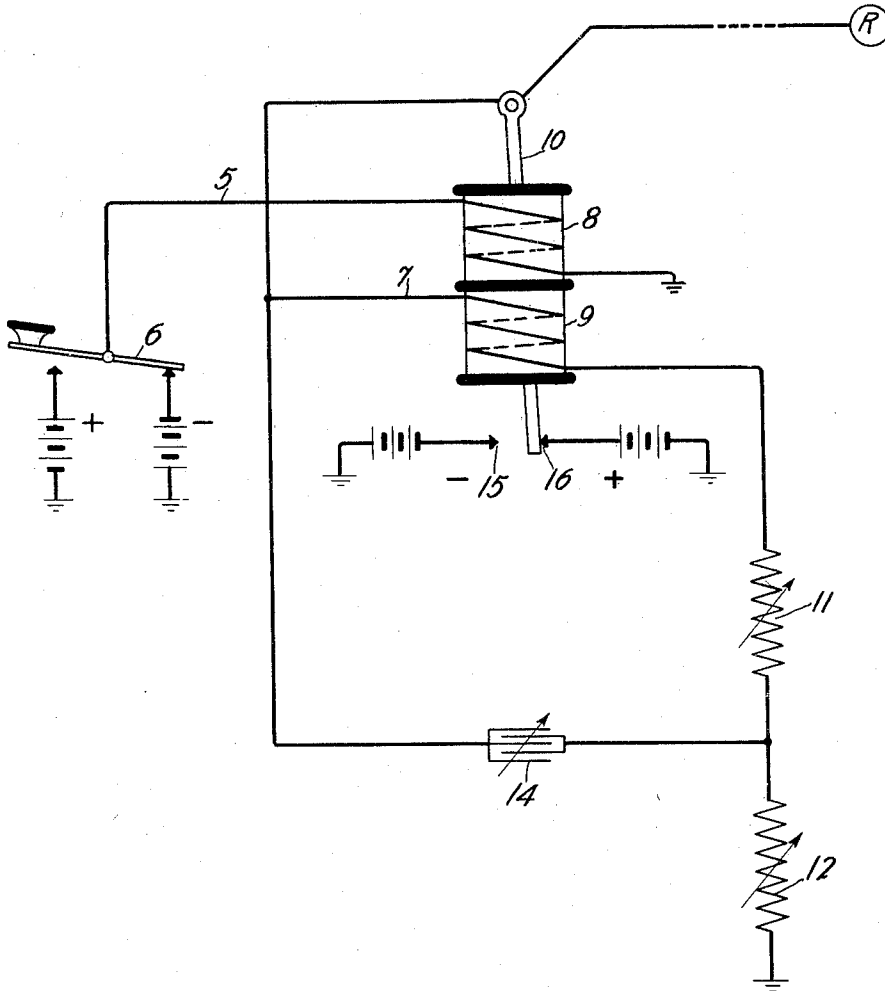
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C. O. VAN DER VORT

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TELEGRAPH SYSTEM

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Inventor:

Charles O. Van der Vort.
by *John A. Palmer* Att'y

UNITED STATES PATENT OFFICE.

CHARLES O. VAN DER VORT, OF EAST ORANGE, NEW JERSEY, ASSIGNOR TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

TELEGRAPH SYSTEM.

Application filed August 24, 1920. Serial No. 405,666.

To all whom it may concern:

Be it known that I, CHARLES O. VAN DER VORT, a citizen of the United States, residing at East Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Telegraph Systems, of which the following is a full, clear, concise, and exact description.

This invention relates to telegraph systems and apparatus, and an object of the invention is to provide an improved arrangement for relaying or repeating signal current impulses from one circuit to another.

Another object is the provision of a high-speed vibrating relay which is efficient and reliable in operation.

In operating telegraph apparatus by reversals of current over long transmission lines, the loss of energy may become so great that in order to prevent mutilation of signals, with the customary voltage applied, a material diminution in speed must be made. Moreover, when the lines are subject to inductive disturbances resulting from exposure to high tension or other telegraph circuits or other causes, the current impulses may become so distorted as to render reliable operation at the desired maximum speed impossible with the present arrangements employed. It is therefore to overcome these difficulties that the present invention is particularly adapted, although its use under other circumstances may be found advantageous.

Broadly considered, the invention concerns an electro-responsive device such as, for example, a relay so constructed and arranged that it is normally in operation at a speed approximating that of the arrival of the line signal current impulses, such impulses then merely being required to assist or oppose the normal tendency, in order to cause an exact reproduction of the required effects. More specifically, the invention involves the use of a repeater or relay having a plurality of windings, one of which is connected in the line circuit, while the other, or what may be termed the local or auxiliary circuit winding, is so arranged and associated in a local circuit with a resistance and capacity that the relay armature is normally kept in vibration; the rate of vibration being dependent and capable of being varied

by the resistance and capacity employed. The magnetic effect of the local circuit winding is always less than the maximum effect produced by line current impulses passing through the line winding, and the connections are such, that when the armature is on either of its co-operating contacts the effect of the winding in the local circuit opposes that of the line winding. While the armature is traveling between its contacts, transitory currents passing through this local circuit winding aid the magnetic effects produced by the line winding. That is the effects produced by the transitory currents passing through the local circuit winding are always in the same direction as those produced by the impulses passing through the line winding.

A relay similar in a number of respects to the one covered herein and commonly called the Gulstad relay has been known for some years in connection with submarine cable telegraphy. In the Gulstad relay, three windings are utilized and are termed line windings, opposing windings and accelerating windings. The present invention may be considered as an improvement of the Gulstad relay.

In the accompanying drawing, a relay structure representing one embodiment of the invention is shown, which, when considered in conjunction with the following description affords a clear understanding of the invention.

The relay may be of the usual polar type, having an armature 10 pivoted at one end and adapted to co-operate at the other with a pair of contacts 15 and 16 respectively connected to the positive and negative terminals of a suitable grounded source of energy. Connected with the armature 8 is a receiving apparatus R, such as an ordinary Wheatstone receiver.

About a suitable core is placed a winding 8 through which line current impulses pass produced by a transmitting key 6 located at a distant station. The transmitting mechanism has been shown in the form of a key, but it is of course obvious that a transmitter such as the well known Wheatstone transmitter may be substituted therefor.

In addition to the winding 8 there is provided a second winding 9 which is in-

cluded in a local circuit. One terminal of the winding 9 is connected with the armature 10, while the other terminal is connected to ground through a pair of variable resistances 11 and 12. Connected to one terminal of the winding 9 and to a point intermediate the two resistances 11 and 12 is a variable condenser 14. The values of the resistances 11 and 12 are so chosen that the flow of current through the winding 9 may be adjusted to compensate for any variation in the current traversing the line winding 8. This therefore permits the adaptation of the relay to systems in which the voltage supplied is not the same.

With the arrangement heretofore described, the relay is self-vibrating in the following manner:

When the armature 10 has just engaged contact 16, a surge of current flows from the positive terminal of the battery to the condenser 14 for charging the same, and which also tends to retain the armature in engagement with contact 16. This is possible since the resistance of the path including the condenser is much less than the one including the winding 9. Therefore, until the condenser 14 is completely charged, substantially no current will flow through this winding. Upon the accumulation of a charge on the condenser, current then flows through the winding 9 and the resistances 11 and 12 in series to ground. The momentary flow of current through the winding 9 produces a magnetic effect which, providing the line winding is not traversed by current, is sufficient to cause the armature 10 to move from contact 16. As soon as contact 16 is broken, the charge accumulated on the condenser is permitted to flow through the winding 9 and the resistance 11. The armature 10 will thereupon be carried into engagement with contact 15. When this contact is completed, the procedure outlined above is repeated; the first momentary surge of current charges the condenser and tends to make a firmer contact between the armature 10 and contact 15. The magnetic effect produced by current flowing through winding 9, after the condenser has been completely charged, finally builds up to a value sufficient to start the armature moving, after which the condenser is brought into play for accelerating the movement thereof.

The rate of vibration of armature 10 may be varied by altering the values of condenser 14 and resistances 11 and 12. Increasing the capacity 14 decreases the rate of vibration, since the time required for the condenser to become completely charged is longer. The rate of vibration may be increased by decreasing the value of the resistances 11 and 12, since under

these conditions the magnetic effect of winding 9 builds up more rapidly.

With the armature 10 in engagement with contact 16, and the negative terminal of the battery connected with the line winding 8 through a contact on key 6, the resulting magnetic effect produced by the two windings is such as to retain the armature against its engaged contact. Assuming that the relay is in the condition shown, and that the line current has started to reverse from its maximum negative value to positive, the magnetic effect produced by negative current passing through winding 8 is opposed by the effect caused by the local current through winding 9, but since the line current is reversing, and its magnetic effect is thereby decreasing, the resultant effect of holding armature 10 against contact 16 is likewise decreasing. As the line current decreases in value the resultant decrease finally changing its direction when the effect produced by winding 9 predominates, and when the predominance has reached a sufficient amount, the armature 10 is caused to move. This may and usually does occur, however, before the line current has reached the zero value in its reversal. The instant armature 10 disengages contact 16, a surge is caused by the discharge of condenser 14 through winding 9, as hereinbefore described. Immediately upon the engagement of armature 10 with contact 15, current flows from the negative terminal of the battery to charge the condenser, which tends to retain the armature 10 in engagement with its contact. The magnetic effect of winding 9 builds up but it can cause no movement of the armature 10 until the line current starts to reverse in direction.

What is claimed is:

1. In a telegraph system the combination of an incoming telegraph line, a relay connected thereto comprising a line winding, an armature serving as the core of said winding, current supply contacts cooperating with said armature, a local circuit including a winding arranged to produce a magnetic effect sufficient to move said armature, and a condenser serving upon the initial engagement of said armature with either of said contacts to retain said armature in its actuated position, but subsequently responsive to a diminution in the current in said line winding to act on said local winding during its entire discharge period irrespective of the position of the armature.

2. In a telegraph system the combination of an incoming telegraph line, a relay connected thereto comprising an armature, current supply contacts cooperating therewith, a line winding encircling said armature which forms the core of said winding, a local circuit including a winding also en-

circling said armature and arranged to produce a magnetic effect sufficient to move said armature, and a condenser serving upon the initial engagement of said armature with either of said contacts to retain said armature in its actuated position, but subsequently responsive to a diminution in the current in said line winding to act on said local circuit winding during its entire discharge period.

3. In a telegraph system the combination of an incoming telegraph line, a relay connected thereto comprising a line winding, an armature, current supply contacts cooperating therewith, a local circuit including

a winding encircling said armature and arranged to produce a magnetic effect sufficient to move said armature which is thereby magnetically polarized, and a condenser serving upon the initial engagement of said armature with either of said contacts to retain said armature in its actuated position, but subsequently responsive to a diminution in the current in said line winding to act on said local winding during its entire discharge period.

In witness whereof, I hereunto subscribe my name this 17th day of August A. D., 1920.

CHARLES O. VAN DER VORT.