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MEANS FOR PREVENTING BIAS IN TELEGRAPH SYSTEMS

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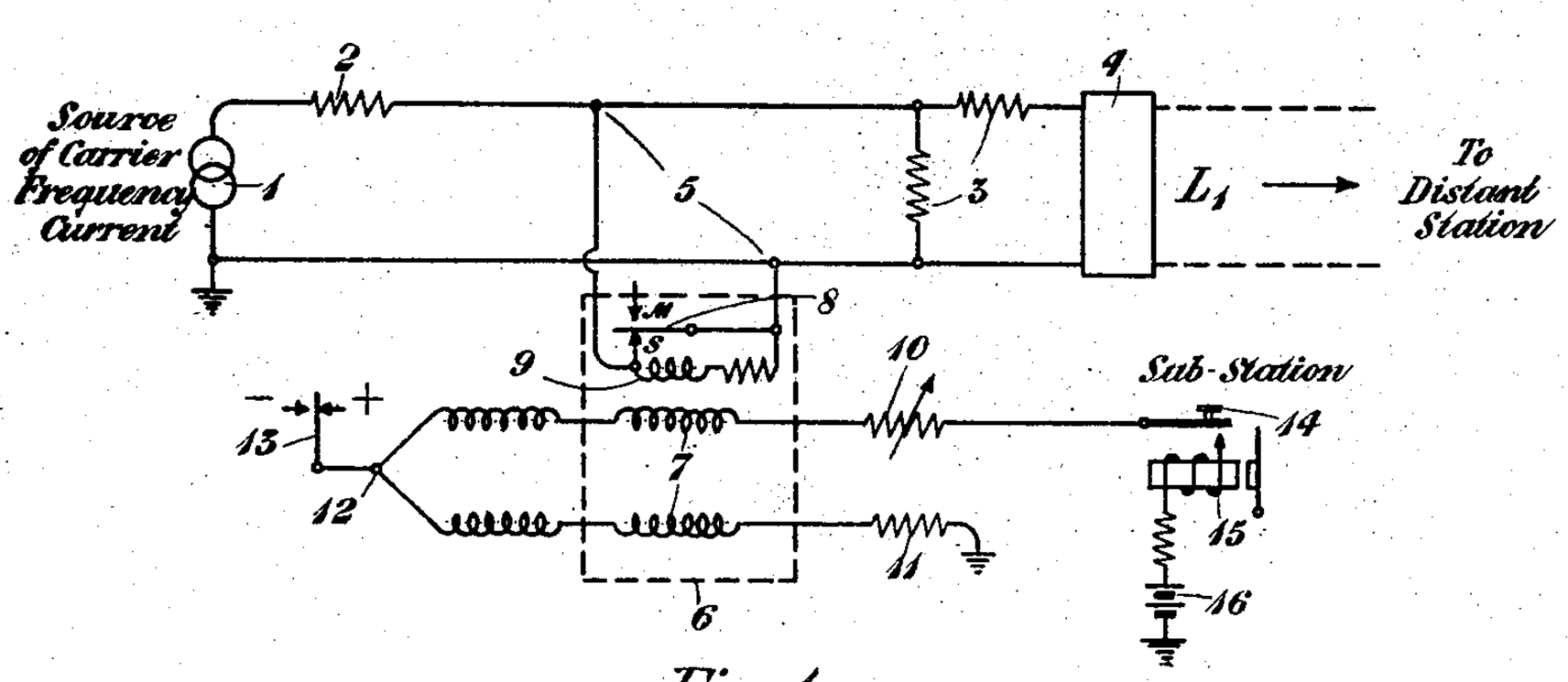

Fig. 1

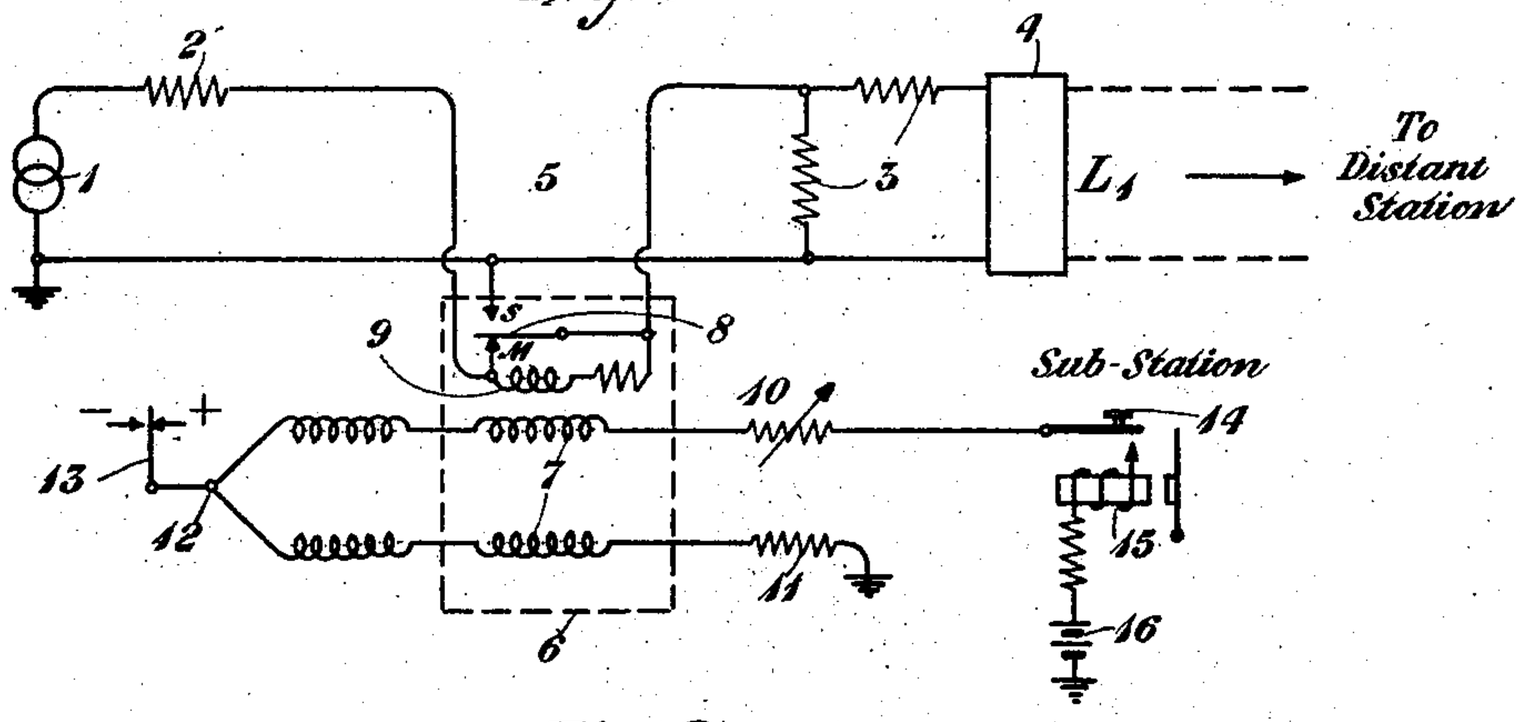

Fig. 2

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MEANS FOR PREVENTING BIAS IN TELEGRAPH SYSTEMS.

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This invention relates to telegraph signaling systems and particularly to means for preventing the introduction of bias into telegraph signals resulting from the time required for the armatures of the relays to travel between their marking and spacing contacts.

In telegraph systems, particularly of the carrier type in which a train of waves is transmitted from a source of carrier current to the line whenever the controlling key is operated for the transmission of a marking signal and in which the source is effectively shunted whenever the key is operated for the transmission of a spacing signal, difficulty has been experienced due to the lengthening of the marking impulses of such signals, which lengthening arises from the time consumed by the armature of the relay in traveling between its contacts.

In the patent to R. B. Shanck No. 1,581,326, which issued on April 20, 1926, there is described a method and means for preventing such biasing of signals by using an auxiliary relay controlled either by the break relay or by the sending relay of the loop circuit.

It is the object of this invention to prevent such biasing by a combination of means utilizing the auxiliary windings of the sending relay in place of the extra relay.

This invention will be clearly understood from the following description when read in connection with the attached drawing, of which Figure 1 shows schematically one circuit arrangement for neutralizing such biasing and Fig. 2 shows other arrangements of this invention by means of which the biasing may be prevented.

In Fig. 1, a source 1 of current of carrier frequency is effectively connected with the line L_1, which extends to a distant station to which signals are to be transmitted. Connected between the source 1 and the line L_1 is a current limiting reactance 2, a network 3 and a sending filter 4. Connected across the circuit at the point 5 is the armature of the sending relay 6, the windings 7 of which are connected with the loop circuit whereby the said armature may be controlled by the key at the substation. When the armature 8 is upon its spacing contact, as shown in the figure, the source 1 will be effectively short-circuited so that no current will flow to the line L_1. When the armature moves to its marking contact, as indicated, a fairly high impedance 9 is connected across the circuit so that carrier current will flow to the line. Connected in the loop is a variable resistance 10, by means of which the loop current may be controlled, and an artificial network 11 by means of which the line may be balanced. An armature 13 of a transmitting device is connected with the apex of the bridge coils for the transmission of impulses to the substation. This device is controlled by impulses received over the line L_1 from the distant station. The substation is schematically represented by the key 14, a relay 15 and a source of current 16.

The function of the invention will perhaps be more clearly understood if an explanation is given of the operation of the circuit without the auxiliary winding 9 of the relay 6. When the key 14 is closed for the transmission of a marking impulse the current flowing from the source 16 through the winding 7 will move the armature 8 from the spacing to the marking contact. As soon as the armature leaves the spacing contact the short circuit across the source 1 will be removed and the carrier current will begin to flow to the line L_1. It will continue to flow thereto not only as long as the armature remains upon the marking contact but also up to the instant that the armature returns to the spacing contact, after the key 14 is opened for the sending of a space signal. As described in the said copending application of Shanck, this results in lengthening the impulse representing a marking signal by an amount equal to the time required for the armature to travel once from one contact to the other. This bias of the marking impulse has been found to be in the order of 6 per cent at 20 dots per second when the armature travel is .004 inch. I have found that by using a third winding 9, connected between the armature 8 and the spacing contact of the sending relay 6, it is practicable to equalize the marking and the spacing impulses. The time constant of this short-circuited winding is so adjusted that the armature 8 may be delayed a definite interval of time before leaving the spacing contact after the key 14 has been closed for the transmission of a marking impulse. This delay will compensate for the travel time of the armature, so that the space impulse will be correspondingly

lengthened. Although this third winding 9 is bridged across the circuit during the transmission of a marking impulse, the strength of this impulse will not be materially reduced if the impedance of the shunt be made appreciably high.

If the current drain, due to the third winding of the relay 6, is so large as to reduce the transmission efficiency, the arrangement shown in Fig. 2 may be used. In this figure, the third winding 9 is connected between the armature 8 and the marking contact. In Fig. 1, the effect of this third winding was to hold the armature upon its spacing contact a predetermined length of time. In Fig. 2, the third winding holds the armature upon the marking contact a predetermined length of time. If this third winding were not present the current representing a marking impulse would cease to flow to the line L_1 as soon as the armature left its marking contact and would not flow again until the armature had returned thereto, thus increasing the length of a spacing signal. By retarding the armature 8 from leaving its marking contact the length of a marking impulse may be increased so that the marking and spacing impulses may thereby be equalized.

It will be seen that by means of any of the arrangements shown in the drawing, the bias of signaling impulses due to the travel time of the relay armature, may be effectively prevented without the use of an additional relay.

While this invention has been disclosed as embodied in a particular form it is to be understood that it is capable of embodiment in other forms without departing from the spirit and scope of the appended claims.

What is claimed is:

1. In a system for minimizing bias of telegraph signals, the combination with a source of potential of a line, a multiwinding relay adapted to control the application of marking and spacing impulses to the said line, and means to control the said relay, one of the windings of the said relay being so proportioned and poled as to tend to retard the departure of the armature from one of its contacts whereby the duration of the marking and spacing impulses applied to said line by said source may be equalized.

2. In a system for minimizing bias of telegraph signals, the combination with a source of potential of a line normally effectively connected with the said source, a multi-winding relay adapted to shunt the said line, means to control the said relay for the application of marking and spacing impulses to the said line, one of the windings of the said relay tending to retard the departure of the armature from the spacing contact thereof when the marking impulse is to be transmitted.

3. In a system for minimizing bias of telegraph signals, the combination with a source of carrier potential of a line normally effectively connected with the said source, a relay whose armature is adapted to shunt the said line when a spacing impulse is to be transmitted, a multi-winding relay controlling the said armature one of the windings of which is arranged to retard the movement of the said armature from its spacing contact whenever a marking impulse is to be transmitted.

4. In a system for minimizing bias of telegraph signals, the combination with a source of carrier voltage of a line to which the said source is normally effectively connected for the transmission of a marking impulse, a multi-winding relay whose armature shunts the said line when a spacing impulse is transmitted, one of the windings of the said relay retarding the departure of the armature from its spacing contact when a marking impulse is to be transmitted, whereby the duration of both impulses may be equalized.

In testimony whereof, I have signed my name to this specification this 6th day of May, 1924.

SAMUEL I. CORY.