

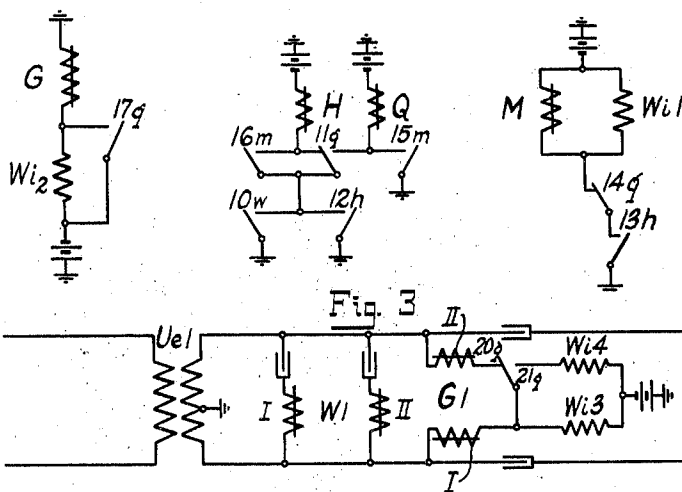
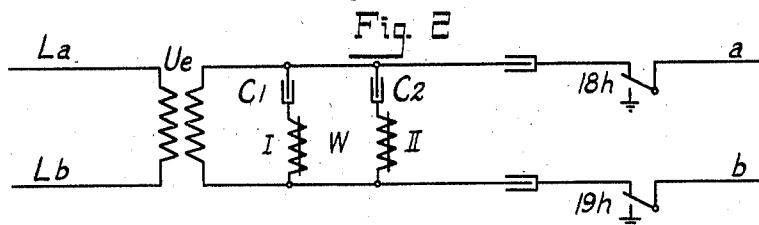
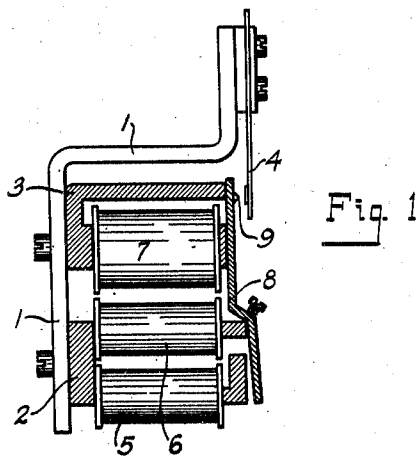
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TELEPHONE SYSTEM

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TELEPHONE SYSTEM

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The invention relates to provisions for receiving current impulses, especially for automatic and semi-automatic telephone systems.

5 To ensure reliable service and especially the reliable operation of the switches in such systems, it is of primary importance that the impulse receiving and impulse repeating relays operate perfectly. A very sensitive im-
10 pulse repeating relay is essential for the impulse transmission over long trunk lines in order to reach great distances.

Now the object of the invention is to furnish a highly sensitive relay, which with very
15 simple construction gives very reliable service. This is achieved by restoring the armature of the impulse receiving relay to its normal position by means of an auxiliary winding which is momentarily energized
20 after an impulse has been received or retransmitted. Examples of the invention are shown in the drawing.

Figure 1 shows a possible construction of the relay, while the Figures 2 and 3 show diagrammatically the circuits of this relay in
25 connection with an impulse repeater.

These examples are based on a relay, which is brought into the operated position by one or more alternating current windings and is
30 restored to its normal position by a direct current winding. In the circuit diagrams, the relays have been shown separated from their contacts and placed wherever it was found convenient in view of their functions.
35 The relays and operating magnets are designated by capital letters and their contacts by corresponding small letters and numerals. The entire equipment is shown in normal or resting position. Details of operation will
40 be explained in the following description.

In Figure 1, the angular piece 1 is made of non-magnetic material such as brass; it serves to support the cores 2 and 3 of the alternating and direct current windings and to
45 carry the contact spring 4. The relay is provided with two alternating current windings 5 and 6, which are mounted on a common core 2, and with a direct current winding 7, which is wound on the core 3 which is magnetically
50 separated from the core 2. The two cores 2

and 3 act on the common armature 8, which at its upper end carries a contact point 9. The armature can be so constructed that it is retained in its normal position by its own weight. Preferably, however, the armature
55 is held in its normal position by a weak constant current over the winding 7. When the alternating current windings 5 and 6 are energized, the lower part of the armature 8 is drawn against the core 2 and thus the con-
60 tacts 4 and 9 are closed. It should be particularly noted that the armature need not overcome any spring tension, so that it can be brought into its operated position by comparatively weak currents in the windings 5
65 and 6. On the cessation of the current flowing through the windings 5 and 6, the direct current winding 7 is energized in a local circuit in a manner explained hereafter with
70 reference to the Figs. 2 and 3, and this winding restores the armature 8 to its normal position.

The method of operating the circuit arrangement shown in the Figure 2 will now
75 be described in detail. This figure shows the circuit of a repeater of impulse and speech currents; it is located at the incoming end of a trunk line between two exchanges. The windings I W and II W correspond to the
80 windings 5 and 6 of Figure 1, while the winding G corresponds to the winding 7 in Fig. 1. When an alternating current impulse is sent over the trunk line La, Lb, it reaches the windings I and II of the alternating current relay W over the repeater Ue.
85 These windings I and II are in series with condensers C1 and C2 and are bridged across the outgoing talking conductors from the secondary windings of the repeater Ue. The relay W at its contact 10 w closes a circuit
90 over the contact 11 q for the winding of the relay H. At contact 12 h a locking circuit is established for the relay H, while at contact 13 h the following circuit is closed for the relay M: ground, contacts 13 h, 14 g,
95 winding of the relay M and parallel thereto resistance W2 to battery. The relay M over its contact 15 m energizes the winding of the relay Q and at contact 16 m it bridges the contact 11 q in the locking circuit of
100

the relay H. When the relay Q is operated, its contact 14 *g* opens the circuit of the relay M, which releases after a while and interrupts the energizing circuit of the relay Q as well as the locking circuit of the relay H.

At the same time the contact 17 *g* short circuits the high ohmic resistance *Wi* 2 in the circuit of the winding G, which receives now a strong current and returns the armature of the impulse receiving relay to the normal position as soon as the incoming current impulse is ended. When the relay H falls back, its contact 12 *h* interrupts the circuit of the relay Q, which opens the contact 17 *g* and thus removes the short circuit from the high ohmic resistance *Wi* 2. Thereupon the winding G of the impulse receiving relay only receives a weak current, which suffices to retain the armature of the relay in its normal position. It should also be mentioned that the received current impulse is transmitted to the succeeding switches over the contacts 18 *h* and 19 *h* and over the conductors *a* and *b* of the outgoing trunk line.

The circuit shown in Figure 3 only differs from that of the Figure 2 in that the impulse receiving relay has two direct current windings and is therefore differently connected up. With the arrangement in its normal condition, there is the following circuit for the direct current windings: battery, high ohmic resistance *Wi* 3, winding I G 1, lower half of the secondary winding of the repeater *Ue* 1, ground, and parallel thereto: contact 20 *g*, winding II G 1, upper half of the secondary winding of the repeater *Ue* 1, ground. The windings I G 1 and II G 1 are wound in opposite directions on the common core and are so adjusted that there is only a weak resulting field, which is required to keep the armature in the normal position. If an impulse of current arrives over the junction line, the alternating current windings I W 1 and II W 1 are energized. When the relay Q is operated (as in Fig. 2) it opens the contact 20 *g* while over the contact 21 *g* the low resistance *Wi* 4 is placed in parallel with the resistance *Wi* 3 and thus a stronger energizing current is sent over the winding I G 1 which returns the armature to the normal position at the end of the received current impulse.

The arrangement has the advantage that when direct current impulses arrive over the trunk line, the resulting attractive force of the windings IG1 and II G 1 exceeds that of the windings I W 1 and II W 1, and thus the operation of the entire relay arrangement is prevented. The said direct current impulses may be generated by condenser or atmospheric discharges.

What is claimed is:

1. In an impulse repeater, a relay, means in said relay for receiving a remotely generated current impulse, means actuated by

said relay for repeating said current impulse, an auxiliary winding for said relay, and means for temporarily energizing said auxiliary winding to restore said relay to normal position.

2. In an impulse repeater, a relay, a plurality of windings in said relay for receiving remotely generated current impulses, means actuated by said relay in response to said impulses for repeating said impulses to distantly located switching devices, a single auxiliary winding for said relay mounted magnetically separate from said other windings, and means for temporarily energizing said auxiliary winding to restore said relay to normal position.

3. In an impulse repeating device, a relay having a first winding, means for actuating said relay over said first winding by remotely generated current impulses, means actuated by said relay for repeating said impulses to distantly located switching apparatus, a second winding for said relay, means for permanently energizing said second winding by a weak current, and means for momentarily energizing said second winding by a strong current impulse after the transmission of each impulse received by said first winding in order to secure its quick release.

4. In an impulse repeating device, a relay having a first winding and a second winding, means for permanently energizing said first winding in a certain manner in order to secure the normal position of said relay, means for energizing said second winding in order to produce an operating position of said relay, and means for momentarily energizing said first winding in a different manner in order to restore said relay to normal position.

5. In an impulse receiving and repeating device, a relay, a plurality of windings for said relay for receiving remotely generated alternating current impulses, means actuated by said relay in response to said impulses for repeating said impulses to distantly located switching devices, a single auxiliary winding for said relay mounted independently and magnetically separate from said other windings and means for momentarily energizing said auxiliary winding by a direct current impulse in order to restore said relay to normal position.

6. In an impulse repeating device, a relay having an auxiliary winding, means for energizing said winding sufficient only to secure the normal position of said relay, an operating winding for said relay, means for energizing said operating winding in order to produce an operated position of said relay, and means for momentarily energizing said auxiliary winding sufficiently to restore said relay to normal position.

7. In an impulse repeating device, a relay having an operating winding and an auxiliary winding, circuit means for actuating

said relay over its operating winding by remotely generated current impulses, means actuated by said relay for repeating said impulses to distantly located switching apparatus and switching means for momentarily energizing said auxiliary winding in order to effect the restoration of said relay to normal position.

8. In an impulse receiving and repeating device, a relay, a plurality of windings for said relay for receiving alternating current impulses, said relay operated responsive to each impulse of a series for repeating said impulses, an auxiliary winding for said relay, and means responsive to each operation of said relay for momentarily energizing said auxiliary winding by direct current to restore said relay to normal.

9. In an impulse receiving and repeating device, a relay, a plurality of windings for said relay for receiving alternating current impulses, said relay operated responsive to each impulse of a series, means controlled by said relay for translating said alternating current impulses to direct current impulses, an auxiliary winding for said relay, and means operated responsive to each operation of said relay for momentarily energizing said relay by direct current to restore said relay to normal.

10. In an impulse repeater, a relay having an armature, biasing means in said relay for holding said armature in an inoperated position, a pair of windings in said relay connected in multiple with each other and in series with condensers and responsive to alternating current impulses for overcoming the effect of said biasing means and moving said armature to the operated position, means responsive to the operation of said armature for repeating the impulses, and means for influencing said biasing means to return said armature to the inoperated position.

11. In an impulse repeater, a relay having an armature, biasing means comprising a winding of said relay for holding said armature in an inoperated position, a pair of windings in said relay connected in multiple with each other and in series with condensers and responsive to alternating current impulses for overcoming the effect of said biasing means and moving said armature to an operated position, means responsive to the operation of said armature for repeating the impulses, and means for momentarily energizing said biasing winding to restore said armature to the inoperated position.

In witness whereof, I hereunto subscribe my name this 26th day of January, A. D. 1928.

HANS VON BECKERATH.