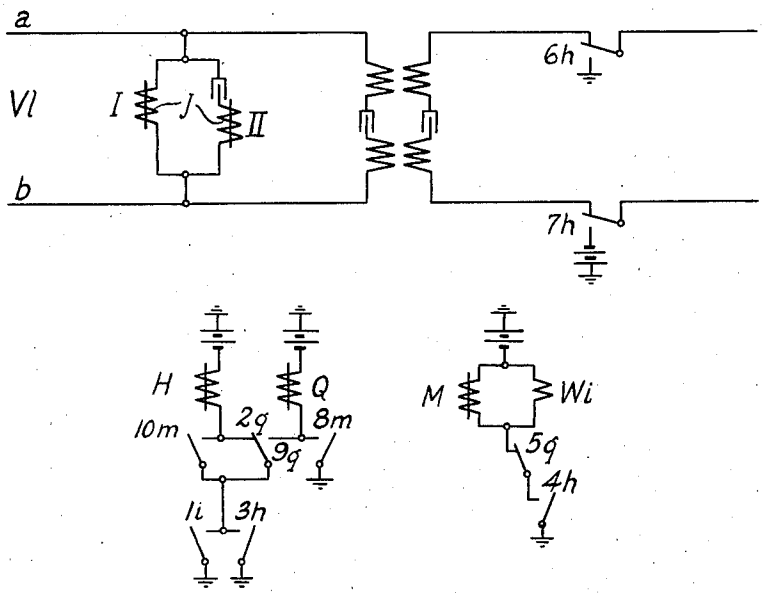
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IMPULSE CORRECTING REPEATER

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IMPULSE CORRECTING REPEATER

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The present invention relates to automatic telephone systems and especially to an arrangement for correcting the current impulses.

In the transmission of current impulses the electrical properties of relays and lines, over which impulses are transmitted, cause the transmitted impulses to be distorted, thereby the proper setting up of the connection is endangered. Various so-called impulse-correcting devices are already known whereby the impulses, before they actuate the connecting devices, are transformed into a composition suitable for positioning the connecting devices. These known arrangements, however, have various defects, which in certain cases endanger the correct operation of the correcting device. For example in the known arrangements on the one hand, impulses that are too short are not sufficiently lengthened, while on the other hand when the received impulses have too short intervals between them, the correcting device can be afresh taken into use before its circuit arrangements have returned to the normal position, so that in this case current impulses are absorbed.

Now the object of the invention is to provide an arrangement for correcting the current impulses in all cases in an entirely satisfactory and reliable manner, this being achieved in that two auxiliary relays co-operate with the impulse repeating relay, which is controlled by the impulse receiving relay, the said auxiliary relays preparing already during the retransmission of an impulse the impulse-correcting device to receive a further impulse and at the completion of the retransmitted and received impulse they put the correcting device in a condition to receive another impulse.

This arrangement has the important advantage that the device is put into a condition to receive impulses as soon as possible after the correction has been effected, thus reducing to a minimum the time during which the correcting device may not be taken into use by the next arriving impulse.

One method of carrying out the invention is shown in the drawing, which only shows the arrangements required for transmitting and correcting the current impulses.

For the purpose of describing the method of operating, it will be assumed that the junction line VL having the leads *a* and *b* has been taken into use in any desired manner, for example over a preselecting device or a group selector. Each time an alternating current impulse arrives, the relay J is energized over its windings I and II, and at contact 1*i* it closes the following circuit for the impulse repeating relay H: earth, contacts 1*i*, 2*q*, winding of the relay H, battery, earth. The relay H is operated, at its contact 3*h* it establishes a locking circuit for itself parallel to the contact 1*i*, and at contact 4*h* and the back contact 5*q* it operates the relay M. A comparatively low ohmic resistance W*i* lies parallel to the winding of relay M, thus rendering the operation of the relay M slightly slow. Over the contacts 6*h* and 7*h* the impulses are repeated to the succeeding switches. When the relay M operated, the relay Q was energized over the contact 8*m*; at contact 5*q* it interrupts the circuit of the relay M and at contact 9*q* it closes a locking circuit for itself extending over the contact 3*h*. When the relay M operated, it closed at contact 10*m* a locking circuit of the relay H. Upon the release of the relay M, owing to the opening of the contact 5*q*, the circuit of the impulse repeating relay H is opened; it therefore falls back; at the contacts 6*h* and 7*h* the transmitted impulse is ended and the opening of the contact 3*h* causes the relay Q to fall back. The arrangement is ready to receive the next current impulse after the contact 2*q* has been closed.

Hence the length of the impulse transmitted over the contacts 6*h* and 7*h* is made up of the time taken for the relays M and Q to be operated, as well as the time taken for the relays M and H to fall back. The relay Q is a normal direct current relay, which falls back quickly after its locking circuit has been opened. The arrangement must not be taken into use for transmitting the next impulse after the relay H has fallen back until the relay Q has fallen back. As has just been mentioned, the relay Q falls

back very quickly, hence the dangerous time has been reduced to a minimum.

Another advantage of the described arrangement is that the duration of the impulse received by the impulse receiving relay J need only be equal to the time taken by the relay H to operate. After it has been operated, it closes, as above described, a locking circuit for itself and also connects up the relays M and Q, so that an impulse is sent out over the contacts $6h$ and $7h$ having a length suitable for positioning the succeeding selecting devices. On the other hand, if the received impulse be too long, that is to say if the contact $1i$ is still closed when the relay H falls back, the relay Q is held over this contact until the conclusion of the received impulse and then the contact $1i$ is opened. Thereby the length of the re-transmitted impulse is not affected, because the relay H falls back when the contact $10m$ is opened, and the contact $2q$ is open.

What is claimed is:

1. In an impulse correcting repeater for use in a telephone system, an impulse receiving relay, an impulse repeating relay, two auxiliary relays, means for transmitting impulses to operate said impulse receiving relay, means responsive to the operation of said impulse receiving relay for closing an energizing circuit to energize said impulse repeating relay, means controlled by said repeating relay for closing an energizing circuit to energize the first of said auxiliary relays, means controlled by said first auxiliary relay for closing an energizing circuit to energize the second auxiliary relay, means controlled by said second auxiliary relay for opening the energizing circuit of said first auxiliary relay, and means controlled by said second auxiliary relay for opening the circuit of said impulse repeating relay to cause its deenergization.

2. In an impulse correcting repeater for use in a telephone system, an impulse receiving relay, an impulse repeating relay, two auxiliary relays, means for transmitting impulses to operate said impulse receiving relay, means responsive to the operation of said impulse receiving relay for closing an energizing circuit to energize said impulse repeating relay, means controlled by said repeating relay for closing an energizing circuit to energize the first of said auxiliary relays, means controlled by said first auxiliary relay for closing an energizing circuit to energize the second auxiliary relay, means controlled by said second auxiliary relay for opening the energizing circuit of said first auxiliary relay, means controlled by said second auxiliary relay for opening the circuit of said impulse repeating relay to cause its deenergization, and means controlled by said second auxiliary relay for preventing the reenergization of said impulse repeating relay until said impulse receiving relay and said second auxiliary relay deenergize.

3. In an impulse correcting repeater for use in telephone systems, an impulse receiving relay, an impulse repeating relay, two auxiliary relays, means for energizing said impulse receiving relay, a circuit for energizing said impulse repeating relay including contacts on said impulse receiving relay and contacts on the second of said auxiliary relays, a locking circuit for said impulse repeating relay including contacts on said impulse repeating relay and said contacts on said second auxiliary relay, a circuit for the first of said auxiliary relays including other contacts on said impulse repeating relay and other contacts on said second auxiliary relay, another locking circuit for said impulse repeating relay including either said contacts of said repeating relay in the first locking circuit or said contacts on said impulse receiving relay and contacts on said first auxiliary relay, a circuit for said second auxiliary relay including other contacts on said first auxiliary relay, and a locking circuit for said second auxiliary relay including the said contacts in said energizing circuit for the impulse repeating relay.

4. In combination, a trunk line consisting of two inductively connected sections, a normally open line connected to the first section, an impulse receiving relay bridged across said first section, means for transmitting pulses of current over said line to intermittently energize said impulse receiving relay, an impulse repeating relay, two auxiliary relays, means for energizing said impulse repeating relay controlled by said impulse receiving relay each time it energizes, means controlled by said two auxiliary relays for releasing said impulse repeating relay and means controlled by said impulse repeating relay for transmitting pulses of current to the second section of said trunk line.

5. In combination, a trunk line consisting of two inductively connected sections, a normally open line connected to the first section, an impulse receiving relay consisting of two windings in multiple with a condenser in series with one of said windings bridged across said line, means for transmitting pulses of current over said line to energize and deenergize said impulse receiving relay, an impulse repeating relay, two auxiliary relays, means for energizing said impulse repeating relay controlled by said impulse receiving relay each time it energizes, and means jointly controlled by said two auxiliary relays for maintaining said impulse repeating relay energized momentarily during the retransmission of each impulse.

6. In combination, a trunk line consisting of two inductively connected sections, a normally open line connected to the first section, an impulse receiving relay consisting of

two windings in multiple with a condenser in series with one of said windings bridged across said line, means for transmitting pulses of current over said line to energize and deenergize said impulse receiving relay, an impulse repeating relay, two auxiliary relays, means for energizing said impulse repeating relay controlled by said impulse receiving relay each time it energizes, means jointly controlled by said two auxiliary relays for maintaining said impulse repeating relay energized momentarily during the retransmission of each impulse, and contacts on said impulse repeating relay for connecting battery and ground to the second section of said trunk line for the retransmission of each impulse.

7. In combination, an impulse correcting device, a normally open incoming line and an outgoing line, an impulse receiving relay bridged across said incoming line, means for transmitting pulses of current over said line for energizing said impulse receiving relay, an impulse repeating relay for repeating impulses over said outgoing line, means controlled by said impulse receiving relay for energizing said impulse repeating relay, contacts on said impulse repeating relay for closing a locking circuit for itself, an auxiliary relay controlled by said impulse repeating relay, a second auxiliary relay, means controlled by said first auxiliary relay for energizing said second auxiliary relay, contacts on said second auxiliary relay for opening the circuit of said first auxiliary relay, means for opening the circuit of said impulse repeating relay responsive to the release of said first auxiliary relay, and means responsive to the release of said impulse repeating relay for opening the circuit of said second auxiliary relay provided said impusle receiving relay has previously released.

8. In a telephone system, a normally open line, an impulse correcting device in said line comprising an impulse receiving relay, an impulse repeating relay and two auxiliary relays, means for transmitting pulses of current over said line to intermittently energize said impulse receiving relay, means controlled by said impulse receiving relay for energizing said impulse repeating relay, means controlled by said impulse repeating relay for successively operating said two auxiliary relays, means jointly controlled by said two auxiliary relays for opening the circuit of said impulse repeating relay to cause it to deenergize, and means for maintaining said impulse repeating relay inoperative should said impulse receiving relay again operate before said two auxiliary relays have restored to normal.

9. In a telephone system, a normally open line, an impulse correcting device in said line comprising an impulse receiving relay, an impulse repeating relay and two auxiliary relays, means for transmitting pulses of current over said line to intermittently energize said impulse receiving relay, means controlled by said impulse receiving relay for energizing said impulse repeating relay, means controlled by said impulse repeating relay for successively operating said two auxiliary relays, means jointly controlled by said two auxiliary relays for opening the circuit of said impulse repeating relay to cause it to deenergize, means for maintaining said impulse repeating relay inoperative should said impulse receiving relay again operate before said two auxiliary relays have restored to normal, and means controlled by said impulse repeating relay for transmitting pulses of current of uniform duration independent of the duration of the received impulses.

10. In an impulse correcting repeater, a line relay adapted to be intermittently energized responsive to impulses, a repeating relay, a circuit for said repeating relay extending through normally open contacts on said line relay, means controlled by said repeating relay for opening said first circuit after the same is closed by said line relay, a locking circuit for holding said repeating relay momentarily, and means for opening said locking circuit a predetermined time after said first circuit is opened.

In witness whereof, I hereunto subscribe my name this 3rd day of January, A. D. 1928.

HANS VON BECKERATH.