

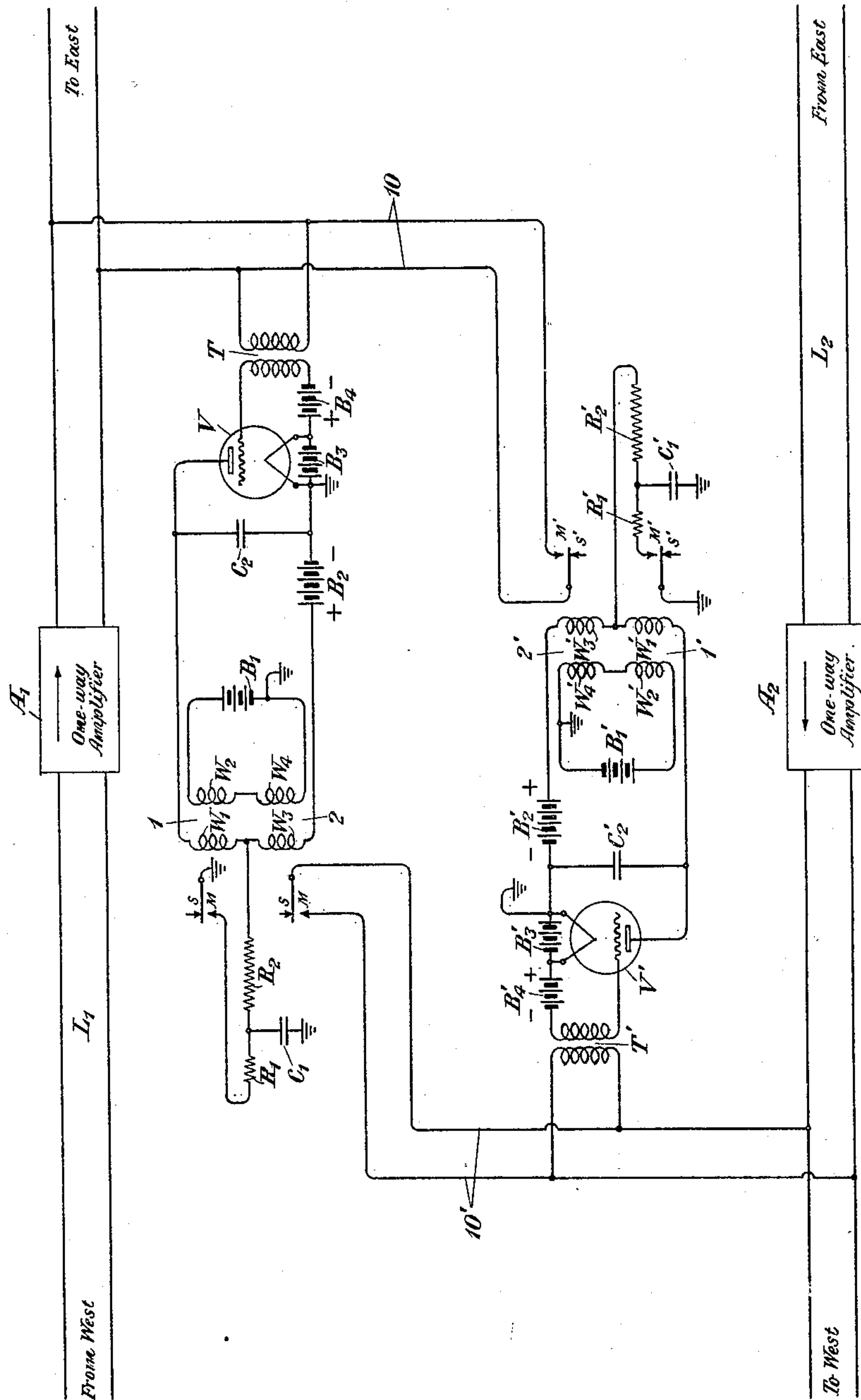
March 31, 1931.

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1,798,202

RELAY ARRANGEMENT FOR USE WITH VOICE OPERATED DEVICES

Filed Oct. 28, 1926



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RELAY ARRANGEMENT FOR USE WITH VOICE-OPERATED DEVICES

Application filed October 28, 1926. Serial No. 144,848.

This invention relates to improvements in relay arrangements, and more particularly to relay arrangements suitable for controlling voice operated devices in signaling systems, such, for example, as echo suppressors or voice operated repeaters.

Voice operated devices of the prior art have usually depended on the feature of the quick operation of a relay when the voice currents arrive and upon a definite "hang-over" time in the release of this relay after the voice currents have ceased. One of the arrangements heretofore utilized for accomplishing these two results depended upon the operation of one or more slow-release relays by the voice operated relay, in which case a sacrifice is made as regards quick operation due to the tandem operation of relays. In another arrangement, a combination of two or more voice-operated relays with several slow-release relays is made to act simultaneously upon the circuit to be controlled. In such cases complicated interlocking features are necessary which materially increase the possibility of maintenance troubles.

One of the novel features of the arrangements of this invention consists in the method employed to secure the so-called "hang-over" time of the echo-suppressing relay in the case of echo suppressors or the switching relay in the case of voice operated repeaters when voice currents cease, without affecting adversely the time of operation of this relay when the voice currents begin. This is accomplished by combining a slow electrical circuit with the usual vacuum tube detector circuit in which the relay windings are included. As a result, a relay, which has its windings connected into the combined circuits, will operate quickly and release slowly, the time of releasing being determined largely by the constants of the slow electrical circuit. Other features and purposes of the invention will appear more fully from the detailed description thereof hereinafter given.

The invention may be more fully understood from the following description, together with the accompanying drawing, in which is shown a circuit diagram illustrating the invention as applied to a four-wire

echo suppressor. The showing of the invention as incorporated in a four-wire echo suppressor is for purposes of illustration only and the invention is not thus limited in its application.

In the arrangements of the invention illustrated in the drawing as incorporated in a four-wire echo suppressor, the two functions of quick operation and slow release are accomplished by two relays. Both of these relays are operated simultaneously upon the arrival of the voice currents, but only one of them, which may be termed the "control" relay 1, releases immediately after the voice currents cease. The other relay, termed the "line" relay 2, which suppresses the echoes, remains operated for a definite time after the control relay has been released. This interval of time can be varied over wide limits. If the control relay should operate and release in such a fashion that the periods of time during which it remains released are shorter than the specified "hang-over" time of the line relay, then the line relay will remain operated. The latter relay will be released only in case the control relay remains released for a period of time which is slightly greater than the hang-over period.

A detailed description of the operation of the arrangements is as follows: assume that a speaker is talking over the circuit L_1 from west to east. The voice currents will then pass through the amplifier A_1 to the distant listener. Part of this current reaches the transformer T which is connected to the line at the output of the amplifier A_1 and is then applied to the vacuum tube detector V . The resulting plate current in the output of the vacuum tube operates the two relays 1 and 2 by flowing through the windings W_1 and W_2 , respectively. The windings W_3 and W_4 are biasing windings which are supplied with current from the battery B_1 and which are necessary in the case of polar relays. In the case of the utilization of neutral relays, however, these windings would not be used since the biasing action might then be performed by means of retractive springs fastened to the relay armatures.

The operation of the two relays has the

following effect: the line relay 2 short-circuits the east-to-west line and also the input to the other half of the echo suppressor, thereby suppressing the echoes coming from the east-to-west line and also preventing the operation of the second half of the echo suppressor. The control relay 1 discharges the condenser C_1 through the resistance R_1 to ground and increases the operating current of the line relay. The increased operating current is due to the circuit which is established from the plate battery B_2 through the relay winding W_3 , resistances R_2 and R_1 , armature and M contact of the control relay to ground, and has no other effect than to hold the armature of relay 2 more firmly on its M contact.

If the speaker stops talking, the plate current of the detector will fall to zero and the control relay 1 will release under the influence of the biasing current in winding W_2 . The line relay 2, however, will not release immediately due to the fact that a charging current is drawn from battery B_2 by the condenser C_1 . This current flows through the large resistance R_2 and the winding W_3 of the relay and keeps the relay operated until the condenser has become sufficiently charged. After the charging current has fallen sufficiently in value so that its magnetic effect upon the armature of the relay is less than that of the biasing current in winding W_4 , the line relay will release and remove the short-circuit from the east-to-west line. If the speaker resumes talking, the above operation will be repeated.

The hang-over time of relay 2 depends upon the values of R_2 , C_1 and the biasing current in W_4 . The time can be changed by changing either one of these values but in practice it will probably be desirable to change either R_2 or C_1 . It should be evident that the hang-over time can be kept fairly constant, since R_2 and C_2 will remain constant and there will be very little change in the biasing current of the relay due to normal variations in the voltage of battery B_1 . This also applies to neutral relays, although to a less extent, due to possible variations in spring tension.

During actual operating conditions on a circuit, the control relay 1 will follow the fluctuations of the voice current quite faithfully, while the line relay 2 will remain on its M contact. This is due to the fact that the condenser C_1 will be charged and discharged rapidly by the operation of the control relay, so that an operating current will keep flowing through the winding W_3 of the line relay. The latter relay will, therefore, remain operated and will release only in case the control relay remains on its S contact for an interval of time longer than the hang-over time of relay 2.

For certain voice-operated devices it is de-

sirable that the full hang-over time of the line relay should occur only if the control relay remains operated for an appreciable length of time. This is to prevent short induced clicks due to switching impulses on the same or on adjacent circuits from locking up the devices for the full hang-over period. The proposed arrangement can be made to take care of this feature by making the resistance R_1 large so that the condenser C_1 will become only partially discharged during the time of such clicks. Consequently the hang-over time will be decreased because the initial charging current will be lower in magnitude.

The operation of the second half of the echo suppressor shown on the sketch is identical with that described above. In this case operation of the relays occurs for voice currents transmitted from east to west through the amplifier A_2 . The various elements in the second half of the echo suppressor are identical with those in the first half and like elements are designated with the same letters, but with the addition of a prime.

While the invention has been disclosed as embodied in certain specific arrangements which are deemed desirable, it is understood that it is capable of embodiment in many and other widely varied forms without departing from the spirit of the invention as defined in the appended claims.

What is claimed is:

1. A transmission line over which signaling currents are transmitted, a control relay and a line relay having operating windings connected in a common initial energizing circuit, means in said circuit common to both windings to determine the energization of said operating windings under the control of signaling currents transmitted over said line, a condenser, a charging circuit for said condenser including a winding of said line relay but not a winding of said control relay, and switching means controlled by said control relay for discharging said condenser, said switching means being ineffective to produce initial energization of the winding of said line relay.

2. A transmission line over which signaling currents are transmitted, a control relay and a line relay having operating windings connected in a common initial energizing circuit, means in said circuit common to both windings to determine the energization of said operating windings under the control of signaling currents transmitted over said line, and a slow electrical circuit controlled by said control relay and connected to a winding of said line relay to retard the release of said line relay, without being effectively connected to said control relay, and said control relay being ineffective to produce initial energization of said line relay.

3. A transmission line over which voice currents are transmitted, a control relay and

a line relay having operating windings connected in a common initial energizing circuit, means in said circuit common to both windings to determine the energization of said operating windings under the control of signaling currents transmitted over said line, a condenser, a charging circuit for said condenser including a winding of said line relay but not a winding of said control relay, a resistance in said charging circuit to limit the rate of charging, a discharge circuit for said condenser controlled by said control relay, and a resistance in said discharge circuit to limit the rate of discharging, said control relay being ineffective to produce initial energization of said line relay.

4. A transmission line over which voice currents are transmitted, a control relay and a line relay having operating windings connected in a common initial energizing circuit, means in said circuit common to both windings to determine the energization of said operating windings under the control of signaling currents transmitted over said line, a condenser, a charging circuit for said condenser including a winding of said line relay but not a winding of said control relay and a resistance to limit the rate of charging, a discharge circuit for said condenser controlled by said control relay, said control relay being ineffective to produce initial energization of said line relay, and a resistance for so adjusting the characteristics of said discharge circuit that substantially full discharge will occur only if the control relay remains operated longer than a definite length of time.

5. A transmission line over which voice currents are transmitted, a control relay and a line relay having operating windings connected in a common initial energizing circuit, means in said circuit common to both windings to determine the energization of said operating windings under the control of signaling currents transmitted over said line, a condenser, a charging circuit for said condenser including a winding of said line relay but not a winding of said control relay and a resistance to limit the rate of charging, a discharge circuit for said condenser controlled by said control relay said control relay being ineffective to produce initial energization of said line relay, and a resistance in said discharge circuit adjusted to limit the rate of discharge so that substantially full discharge of the condenser and therefore the full line relay hang-over period will be obtained only if the control relay remains operated longer than a definite length of time, and a partial hang-over period will be obtained if the control relay remains operated for a period of time less than said definite length of time.

6. A transmission line over which voice currents are transmitted, a control relay and a line relay having operating windings con-

nected in a common initial energizing circuit, means in said circuit common to both windings to determine the energization of said operating windings under the control of signaling currents transmitted over said line, a condenser, a charging circuit for said condenser including a winding of said line relay but not a winding of said control relay, a resistance in said charging circuit to limit the rate of charging, a discharge circuit for said condenser controlled by said control relay, said control relay being ineffective to produce initial energization of said line relay, and a resistance in said discharge circuit adjusted to limit the rate of discharge so that substantially full discharge and consequently the full line relay hang-over period will be obtained only if the control relay remains operated longer than a definite length of time, and a partial hang-over period will be obtained if the control relay remains operated for a period of time less than said definite length of time, the length of said partial hang-over period being a function of the period of time during which the control relay remains operated.

7. A transmission line over which signaling currents are transmitted, a control relay and a line relay having operating windings connected in a common initial energizing circuit, means in said circuit common to both windings under the control of signaling currents transmitted over said line, a slow electrical circuit controlled by said control relay and connected to a winding of said line relay to retard the release of said line relay without being effectively connected to said control relay, and said control relay being ineffective to produce initial energization of said line relay, and means associated with said slow electric circuit for varying the retarding effect thereof.

8. In an echo suppressor device operating between the sides of a four-wire system, the method of retarding by a relay operatively connected to one side of said system the release of a second relay also operatively connected to the same side of said system and operating for disabling the other side of the system, which consists of initially discharging a condenser associated with a winding of the second mentioned relay by the operation of the first mentioned relay, and permitting the charging current of said condenser to retard the release of the second mentioned relay upon the release of the first mentioned relay.

In testimony whereof, I have signed my name to this specification this 27th day of October, 1926.

JOSEPH HERMAN.