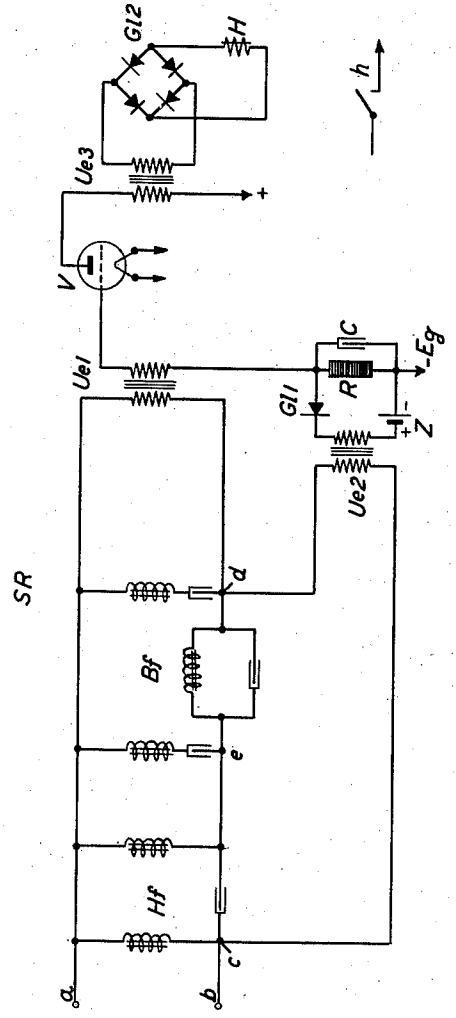
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TELEPHONE SYSTEM

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TELEPHONE SYSTEM

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This invention relates to telephone systems and particularly to signaling with voice frequency currents.

It is the object of the invention to prevent the false operation of voice operated signal receivers in response to other voice frequency signals or disturbances within the voice frequency range.

It is known in automatic telephone systems to control the switching operations necessary for establishment of a desired connection by the transmission of alternating current signals over the talking conductors of a line which signals are of a certain frequency or frequency combination within the voice frequency range. In some cases it is found desirable to effect certain signals by voice currents in which case in addition to the signal receivers serving for the transmission of voice frequency signals, special signal receivers arranged in accordance with this invention are provided for responding to the voice currents. A feature of the invention is a signal receiving circuit arrangement in which means are provided for preventing the operation of the voice operated signal receivers in response to signal currents or other like disturbances of certain frequencies in the voice frequency range.

The features of the invention will be more completely described by considering a signal receiver arranged in accordance therewith, one such circuit arrangement being represented schematically in the drawing which forms a part of this specification. The invention is not limited in its application to the specific arrangement shown in the drawing but is in general applicable to any signal receiver adapted to respond to voice frequency currents.

Referring to the drawing, *a*, *b*, represent the terminals of a line over which signaling and voice currents are transmitted and SR represents a signal receiver which comprises a high pass filter H*f*, a band suppression filter B*f*, a thermionic tube V, transformers Ue1, Ue2 and Ue3, and a signal receiving relay H.

The so-called high pass filter H*f* chokes the frequencies containing low frequency disturbances and passes frequencies above 250 cycles. The band suppression filter B*f* is tuned to a narrow band, for example 400 to 550 cycles, including the band, for example 400 to 450 cycles, which is employed for directive signaling over the line. The filters H*f* and B*f* in series connect the line to the primary winding of the input transformer Ue1, the secondary winding of which is connected to the grid of tube V. A grid biasing control circuit comprising a dry rectifier GL1, the secondary winding of transformer Ue2, resistor R, capacitor C, and source of potential Z are connected in circuit between the secondary winding of transformer Ue1 and the source of grid biasing potential E*g*. The source of potential Z, which may be a storage battery or a primary battery comprising one or more cells, is so poled with respect to the rectifier GL1 that this source is ineffective to create a current through the rectifier. The primary winding of transformer Ue2 is connected to filters H*f* and B*f* at points *c* and *d*. The anode circuit of tube V includes the primary winding of the transformer Ue3, the secondary winding of which is connected through rectifier GL2 to the winding of the signal receiving relay H. The rectifier GL2 is represented as being a full-wave rectifier comprising dry rectifying elements. The signal receiving relay H has one or more contacts, only one being shown and this being designated *h*.

A description of the operation of this signal receiver, in response to current incoming over the line to terminals *a*, *b*, follows. When voice current signals are received over the line, all frequencies above 250 cycles are impressed through transformer Ue1 on the grid of the amplifier tube V. The anode circuit current is thereby increased sufficiently to cause the operation of relay H, the desired switching operation being effected at contacts *h*. The filter B*f* constitutes a low impedance shunt across the primary winding of transformer Ue2 for all frequencies except those between 450 and 550 cycles so that the primary winding of transformer Ue1 is energized by all current passed by filter H*f* but the primary winding of transformer Ue2 is energized only by that part of the current which is between 450 and 550 cycles. The electromotive force thus induced in the secondary winding of transformer Ue2 is, on one-half of the wave, poled in the same direction as the cell Z and therefore ineffective to create a current through rectifier GL1; but on the other half of the wave this electromotive force is opposed to the electromotive force of cell Z and if of greater magnitude than the electromotive force of cell Z would be effective to create a current through rectifier GL1. However, the electromotive force induced in the secondary winding of transformer Ue2 by frequencies between 450 and 550 cycles when occurring in voice currents is not of sufficient magnitude to overcome cell Z and produce a current through rectifier GL1. Therefore, when voice currents are being received, the bias of the grid of tube V is affected only by the electromotive force in-

duced in the secondary winding of transformer Ue1 and consequently the operation of tube V and relay H is not affected by the occurence of these frequencies in the speech signal.

If now signals comprising voice frequency currents of 400 to 450 cycles are transmitted over the line, for example for the purpose of controlling the operation of selective switching equipment (not shown), these signals are prevented from operating the signal receiving relay H in the following manner. The amplitude of these signals is of considerably greater value than the amplitude of the 400 to 550 cycle currents which are included in the speech currents and consequently on half of the wave, the electromotive force induced in the secondary winding of transformer Ue2 creates a current through rectifier GL1, resistor R and cell Z, which current causes an increase in the drop in potential across resistor R. This increase in the drop in potential across resistor R acts as an additional negative grid bias of sufficient magnitude to block tube V and prevent the operation of relay H.

In like manner any disturbance currents below 250 cycles through the primary windings of transformers Ue1 and Ue2 in series, if of sufficient amplitude to otherwise cause the operation of relay H, are effective to overcome the electromotive force of cell Z and block tube V and thereby prevent the operation of relay H.

What is claimed is:

1. In a signaling system, a signal receiver comprising a relay, operatively responsive to voice modulated currents, and means responsive only to signaling current of certain frequencies within the voice range for preventing the operation of said relay, said means being operatively unaffected by voice modulated current of said certain frequencies.

2. A signaling system, according to claim 1 wherein said means comprises a band suppression filter tuned to said certain frequencies.

3. A signaling system, according to claim 1 wherein said means comprises a rectifier arrangement which distinguishes between the amplitude of voice modulated currents of said certain frequencies and the amplitude of signaling currents of said certain frequencies.

4. A signaling system, according to claim 1 wherein said means comprises a band suppression filter tuned to said certain frequencies and a rectifier arrangement which distinguishes between the amplitude of voice modulated currents of said certain frequencies and the amplitude of signaling currents of said certain frequencies.

5. A signaling system, according to claim 1 wherein said means comprises a rectifier and a source of potential poled opposite to the pass direction of the rectifier.

6. A signaling system, according to claim 1 wherein said means comprises a rectifier and a source of potential poled opposite to the pass direction of the rectifier and of sufficient magnitude to neutralize the effect of signaling currents of said certain frequencies.

7. A signaling system, according to claim 1 wherein said means comprises a transformer and a rectifier arrangement which distinguishes between the amplitude of voice modulated currents of said certain frequencies and the amplitude of signaling currents of said certain frequencies.

8. A signaling system, according to claim 1 wherein said means comprises a band suppression filter tuned to said certain frequencies, and a rectifier arrangement which distinguishes between the amplitude of voice modulated currents of said certain frequencies and the amplitude of signaling currents of said certain frequencies, the terminals of said filter being inductively connected to said rectifier arrangement.

9. In a signaling system, according to claim 1, a filter for choking interference currents of a certain frequency range.

10. In a signaling system, according to claim 1 wherein said means comprises a band suppression filter tuned to said certain frequencies, a high pass filter for choking interference currents of a certain frequency range.

11. In a signaling system, a line, a signal receiver comprising a thermionic tube, a transformer coupling the grid of said tube to said line, a band suppression filter tuned to certain frequencies connected between the line and the primary winding of said transformer, a second transformer for coupling the grid of said tube to said line, the primary winding of said second transformer being connected in parallel with said filter, a source of biasing potential and a resistor connected in series with the primary winding of said first-mentioned transformer, and control means comprising a rectifier element and a source of potential poled opposite to the rectifier and connected in series with the secondary winding of said last-mentioned transformer across the terminals of said resistor.

12. In a signaling system, according to claim 11, a signaling relay operatively connected to the anode of said tube.

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