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INTERCOMMUNICATION SYSTEM

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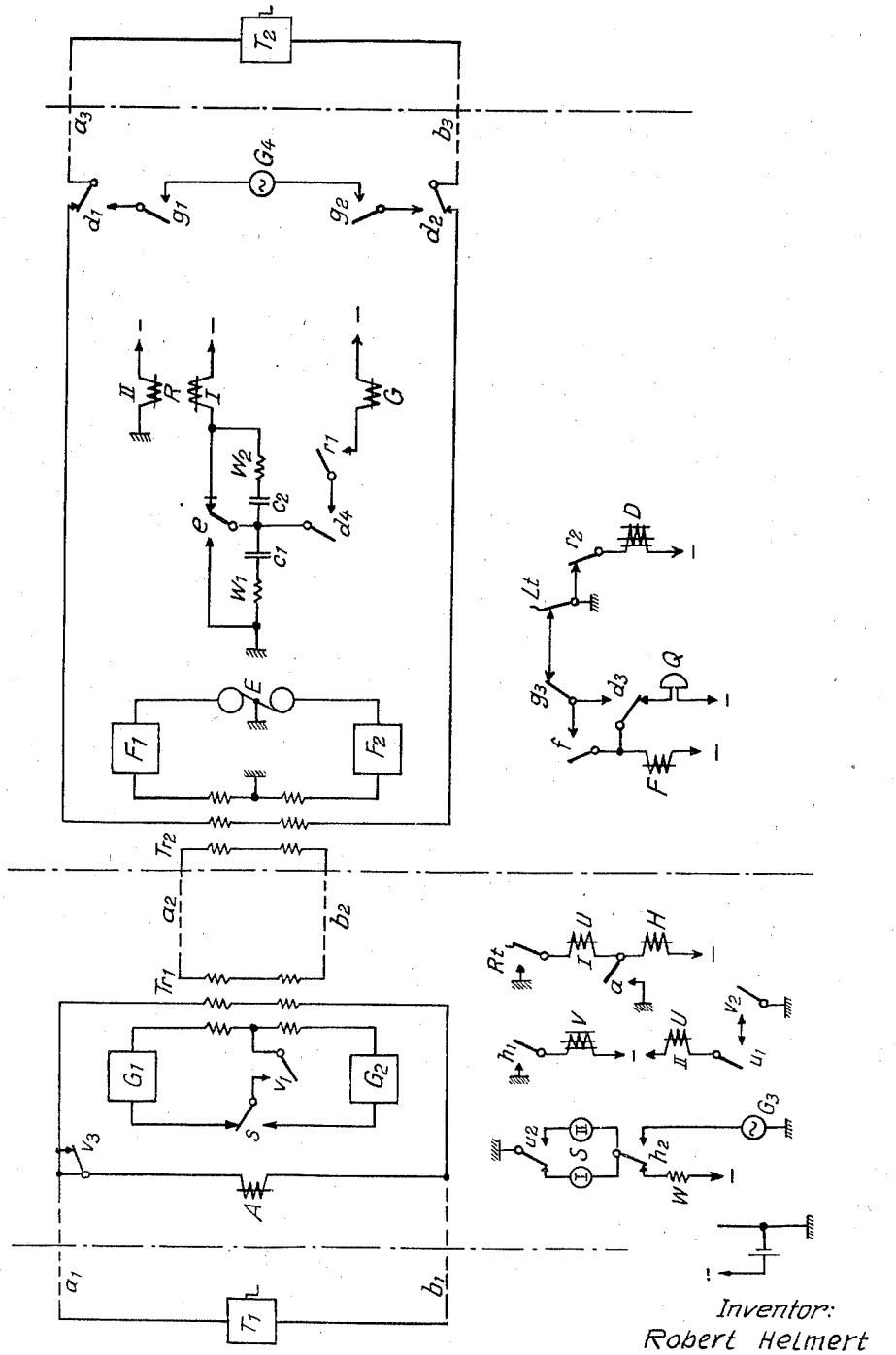

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INTERCOMMUNICATION SYSTEM

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This invention relates to intercommunication systems, and more particularly to signaling arrangements in telephone systems in which supervisory signals, such as call signals, disconnect signals and the like, are transmitted by alternating currents of different audio frequencies.

It is a known expedient to effect supervisory signal transmission over telephone lines by alternately transmitting two different frequencies in a close succession and to cause the receiving apparatus to respond only in cases when these signals arrive in a predetermined manner so as to avoid that the supervisory signaling equipment be released by speech currents.

In one specific aspect of my invention, the receiving equipment of a telephone or other intercommunication system is provided with a particular auxiliary relay, the one winding of which is adapted to be energized and deenergized by condensers which in response to each movement of the armature of a polarized receiving relay are connected to and disconnected from this winding for rendering the auxiliary relay responsive only to the desirable current frequency.

According to another feature of this invention, the auxiliary relay possesses a permanently energized second winding, the effect of which becomes nullified in response to the charge or discharge currents from the condensers for restoring the auxiliary relay to normal in response to incoming signals of the desired frequency. It is thus possible by suitably dimensioning the condensers to cause the auxiliary relay to be maintained operated in response to incoming signals of too low frequency by virtue of the magnetization of the permanently energized winding predominant over that of the second winding, and to prevent this relay from finally releasing in response to incoming signals of excessive frequency, that is, to immediately restore this relay to its operated state if it has been transiently released by the last mentioned excessive frequency signals.

According to a further feature of my invention, a particular slow-acting relay is provided in order to prevent supervisory signals from being indicated on account of a transient release of the auxiliary relay resulting from the magnetization reversal therein in response to incoming signals of excessive frequency.

According to still a further feature, the release of a specific supervisory signal in the receiving equipment in response to incoming signals of the correct frequency is rendered dependent upon the relative position which the armature of the receiving relay mentioned has obtained at the end of incoming alternating signals. This facility involves the beneficial property that a plurality of receiving equipments may be connected to one single communication line. It is thus possible to so adjust the individual receiving apparatus that some thereof may be caused to release a supervisory signal when the armature of the receiving relay is set into one position, while the remaining apparatus may be rendered effective when the armature is set into its opposite position. My invention will be fully understood from the following description taken in conjunction with the accompanying drawing, which shows one embodiment thereof.

In the drawing, T1 and T2 indicate standard telephone sets having an alternating current ringer and a magneto set. In response to the operation of the magneto in station T1, the alternating current relay A becomes energized, thus reverting its contact *a* with the result that the relay H is energized. The relay H reverts its contact *h1* and *h2*, thereby establishing at the contact *h1* an energizing circuit for a slow-to-release relay V. Meanwhile the contact *h2* of the operated relay H has applied an alternating current from a generator G3, e. g. of 50 cycles, to the winding I of a relay S with the result that the two low frequency generators G1 and G2 are intermittently rendered effective by the operation of the contact *s* of relay S since the contact *v1* was closed when the relay V was attracted. The low frequencies from the generators G1 and G2 now are impressed upon tuned amplifiers and rectifiers F1 and F2 over the transformer Tr1, the toll line *a2*, *b2* and the transformer Tr2. The rectifiers F1 and F2 therefore alternately energize the windings of a receiving relay E with the result that the contact *e* of this relay intermittently short-circuits the condensers C1 and C2. These two condensers are charged in a circuit through the winding I of the auxiliary relay R. The mean energization of the winding I of relay R in response to incoming signals of the desired frequency is equal to the permanent energization of the winding II of this relay so that the relay R is caused to release and to revert its contacts *r1* and *r2*. The contact *r2* thus establishes an obvious circuit for a slow-acting relay D which operates after the elapse of a predetermined interval of time. When the operator at the station A1 has finished signaling, the relay A releases and disconnects at its contact *a* the energizing circuit for the relay H which is restored to normal there-

by resetting its contacts *h1* and *h2* into the positions illustrated in the drawing. Now, the winding I of the relay S is energized through a resistance W in such a sense that the low frequency generator G2 remains connected up at contact *s* until the relay V releases with delay and opens its contacts *v1* and *v2*. As a result, the contact *e* of the receiving relay E remains in the position which corresponds to the rectifier F2 so that the condenser C1 is short-circuited. The winding I of relay R is thus energized from the condenser C2 and thus operated. Since the contact *d4* is reverted in response to the operation of the slow-acting relay D the now reverted contact *r1* establishes an energizing circuit for the relay G. In the meantime, that is, before the relay G was energized, the relay F was energized from battery over the contacts *d3* and *g3* and over the key L*t*. Upon energization, the contact *f* of relay F has established a holding circuit for this relay independent of the position of the contact *d3*. The operation of relay G opens the holding circuit for relay F which releases. The contacts *d1* and *d2* of relay D and the contacts *g1* and *g2* of the now energized relay G connects a generator G4 to the receiving station T2 over the line *a3*, *b3* so as to apply alternating call signals thereto until the relay D has released with delay.

If the calling key R*t* is operated, an obvious circuit becomes established through the winding I of relay U and the winding II of relay H. The closed contact *h1* of the last mentioned relay again energizes the relay V, while the contact *v2* establishes a holding circuit for the relay U through its winding II and over the contact *u1* of this relay. The relay U remains operated until the relay V releases with delay. Now, the winding II of relay S receives an alternating current from the generator G3 over the contacts *h2* and *u2*. The effect of this operation is that the auxiliary relay R becomes deenergized so that the relay D is again operated after the elapse of a given interval. The contact *d3* of this relay establishes an energizing circuit for the relay F, the contact *f* of which establishes a holding circuit as heretofore disclosed. When calling key R*t* is again restored to normal, the relay H releases so that its contact *h1* deenergizes V and its contact *h2* becomes restored to the position shown in the drawing. Since the relay U is now operated, the winding II of relay S is so energized through the resistance W and the contacts *h2* and *u2* that the contact of this relay remains in the position shown in the drawing, that is, toward the generator G1 until the relay V again releases with a given delay of time. The armature *e* of the relay E thus remains in a position which corresponds to the operating condition of the rectifier F1 with the result that the relay R is again caused to deenergize. However, due to position of armature C the relay G cannot be energized so that the relay F remains energized over the contact *g3* as mentioned above so that the ringer Q becomes operated until the key L*t* is actuated, whereupon the relay F releases.

The invention above described is by no means restricted to the embodiment mentioned. The receiving relay E may likewise be controlled by a line over which telegraphic signals are transmitted. The single difference between the telegraphic signals and the signal by which the relay R as heretofore embodied is influenced consists in the frequency, that is, the frequency generated by the generator G3 must in a telegraph system be higher than the maximum velocity of telegraph operation.

What is claimed is:

1. In an electric communication system employing means for transmitting supervisory signals of different frequencies, supervisory signal equipment for receiving and indicating said signals comprising an auxiliary relay comprising at least one winding, condensers, a relay selectively responsive to supervisory signals of different frequencies for selectively charging said condensers in the same sense through said winding and alternately discharging said condensers dependent upon the frequency of a received supervisory signal, and indicating means controlled by said relays.

2. An electric communication system comprising means for selectively transmitting signals of two different frequencies, and receiving equipment for said signals comprising a first relay having a permanently energized winding and a second winding, a source of voltage connected to said relay, a second relay selectively responsive to said signals, a air of condensers connected to said second winding and controlled by said second relay, said second relay being connected to said condensers so that a signal of one frequency charges one of said condensers through said second winding and discharges the other of said condensers and a signal of another frequency charges the other of said condensers in the same sense through said second winding and discharges the first mentioned condenser, and indicating means under control of said relays comprising means responsive in a predetermined manner to the energization of said relays by a signal of one frequency and responsive in a second predetermined manner to the energization of said relays by a signal of another frequency.

3. Supervisory signal equipment as defined in claim 1, in which two condensers are provided and are alternately short-circuited by said second-mentioned relay for causing the charge currents from the said condensers to flow through the said winding.

4. An electric communication system as defined in claim 2, in which the charge and discharge currents of the said condensers oppose the current flowing through the said permanently energized winding.

5. Supervisory signal equipment as defined in claim 1, in which the operation of said indicating means depends upon the position of the armature of said second-mentioned relay at the end of incoming signaling currents.

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