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H. A. AFFEL

SIGNALING

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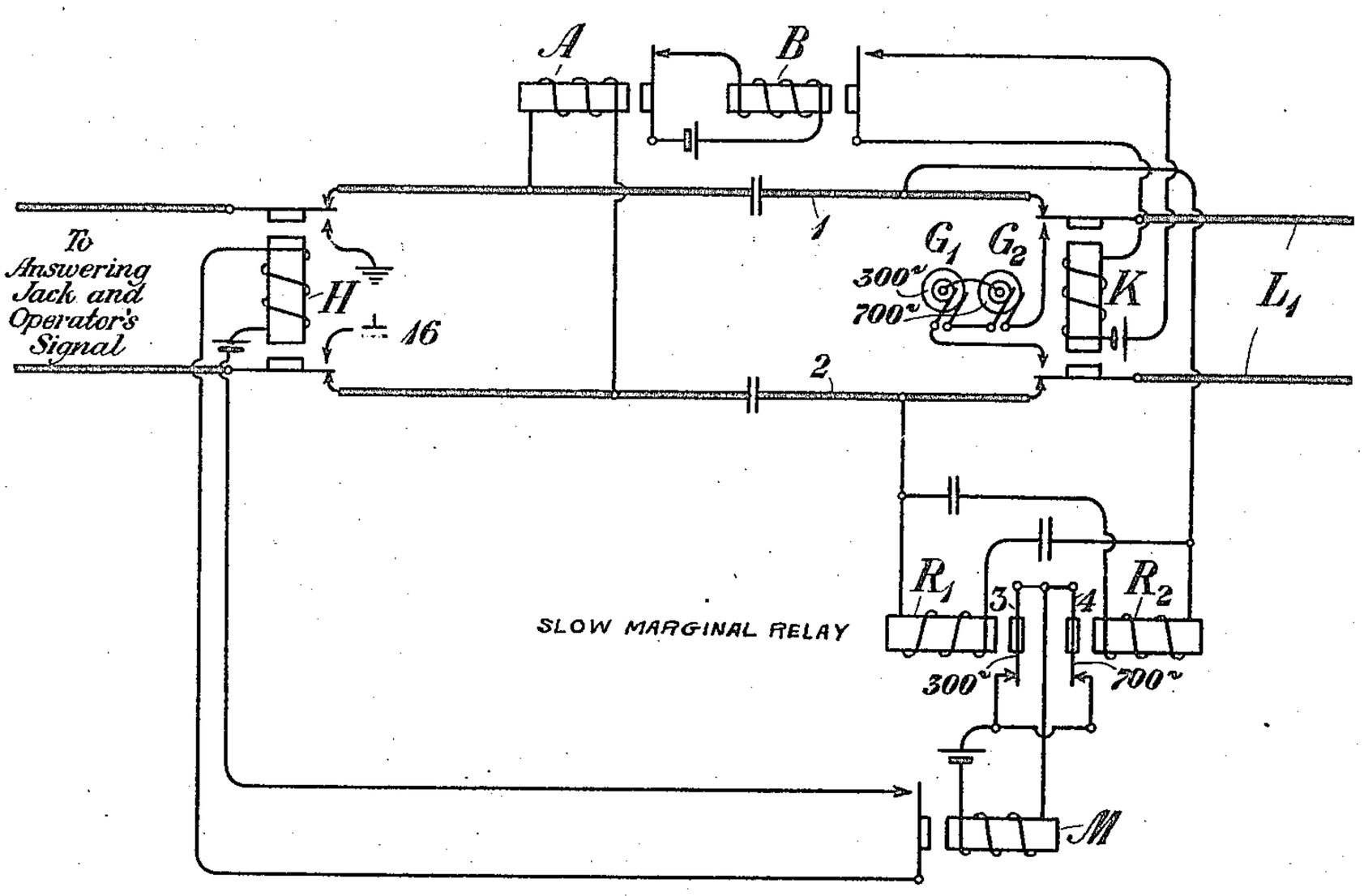

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SIGNALING.

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To all whom it may concern:

Be it known that I, HERMAN A. AFFEL, residing at Brooklyn, in the county of Kings and State of New York, have invented certain Improvements in Signaling, of which the following is a specification.

This invention relates to signaling and is described herein with particular reference to methods of and means for transmitting and receiving ringing signals in telephone transmission systems, although its application is not limited to such systems.

In present day telephone and telegraph practice, it is customary to provide a transmission system with a plurality of channels each of which serves to transmit current independently of the others. Interference between the various channels is prevented by employing for each, different frequencies or bands of frequencies and apparatus selectively responsive thereto. The frequency range is thus divided into a number of levels and a separate transmission channel is provided for each frequency level. Two of the channels used in telephone practice are the voice channel and the ringing channel, the frequency level of the latter being generally below that of the former. In present usual practice, for example, the ringing currents have a frequency of 135 cycles, whereas the components of the voice current have frequencies varying from about 300 to 2000 cycles.

This arrangement necessitates at repeater and similar installations the provision of separate repeating or relaying apparatus for the ringing and voice currents, for the reason that the coils and amplifiers efficient at voice frequencies are inefficient at the ringing frequency and vice versa. My present invention proposes to do away with this duplication of apparatus by raising the ringing channel to the same frequency level as that of the voice channel, so that the same apparatus may be efficiently employed for the transmission of the currents of both.

To prevent false operation of the signaling apparatus by the voice currents, I propose in the present invention, to employ a plurality of signaling currents differing in frequency and a plurality of translating devices selectively responsive to these frequencies. The operator's signal is arranged to respond only when both of these selective devices are simultaneously in an actuated condition.

A good understanding of the invention may now be had from the following description thereof, having reference to a specific form of embodiment of the invention, shown in diagrammatic view in the accompanying drawing.

In this drawing reference character L_1 designates a telephone line which is associated by the back contacts of a relay K with switchboard conductors 1 and 2, which in turn are associated by the back contacts of a relay H, with the usual operator's answering jack and signal device (not shown). The front contacts of the relay K are associated with generators G_1 and G_2 which are herein illustrated as connected in series with each other, and assumed to have frequencies of 300 and 700 cycles respectively, it being understood, however, that other connections of the generators and other frequencies may be employed. The circuit of the relay K is controlled by means of a relay B, which in turn is controlled by the relay A. The last mentioned relay is bridged across conductors 1 and 2 and arranged to respond to current applied to the switchboard conductors 1 and 2 when the operator actuates the ringing key of the cord, as usual in the art.

The signal receiving apparatus comprises relays R_1 and R_2, which are bridged across switchboard conductors 1 and 2, the circuit or R_1 being tuned to 300 cycles and that of R_2 to 700 cycles by means of the condensers shown in the drawing. The relays govern contacts 3 and 4, which are of the vibrating reed type, the contact 3 being arranged to respond only to current of 300 cycles and the contact 4 to 700 cycles. These contacts are connected in parallel with each other and govern the circuit of a relay M, which in turn governs the circuit of the relay H. By virtue of the parallel connection of the contacts 3 and 4 the circuit of relay M is broken only when both contacts are vibrating simultaneously. The relay H serves to apply a source of 16 cycle current to the conductors leading to the operator's signal, so that the same is actuated in the manner commonly understood.

To send a signal over the line L the operator associates her cord with the jack corresponding to this line and actuates her

ringing key. This causes current to flow over the back contacts of relay H through the winding of relay A, so that the same breaks the circuit of relay B, which closes its back contact and causes thus the operation of the relay K. This relay closes its front contacts and causes current from both generators G_1 and G_2 to flow out over the line to the distant station, where it serves to actuate signal responsive apparatus which may be similar to that of the local station, the operation of which apparatus is described below. The distant station is provided also with sources of 300 and 700 cycle currents for purposes of signaling to the operator at the local station, and the apparatus for applying these sources simlutaneously to the line may be similar to that just described for the local station.

When the operator at the distant station causes the application of the 300 and 700 cycle currents to line L the same flow over the back contacts of relay K into the circuit of relays R_1 and R_2 respectively. These relays operate their contacts 3 and 4 and break, thus, the circuit of the relay M which closes its back contact and causes the operation of the relay H. This relay associates 16 cycle current with the conductors leading to the operator's signal and causes thus the response of the operator's signaling lamp.

False operation of the signals by the voice channel currents in the same line—the apparatus of this channel having been omitted from the drawing for sake of simplicity—is prevented by reason of the fact that the simultaneous presence of both signaling currents in the line conductors is required to cause the response of the operator's signal. These currents, moreover, must be of certain minimum duration and amplitude in order to cause the actuation of relays R_1 and R_2. The frequencies of the generators should be far enough apart and non-multiples of each other in order to prevent the response of one reed to current of the frequency of the other. Although the signaling frequencies are herein assumed as 300 and 700 cycles, it is to be understood that any other suitable frequencies substantially within or close to the voice range are also applicable in the practical operation of the signaling systems of this invention.

Although I have herein shown and described only one form and arrangement of apparatus embodying the invention and only one form of method for practicing the same, it is readily understood that various changes and modifications may be made therein within the scope of the following claims without departing from the spirit and scope of this invention.

What I claim is:

1. In a telephone system, composite ringing apparatus comprising a source of low frequency ringing current and a second source of a plurality of frequencies in the voice range, a signal device receptive to the low frequency and a second signal device responsive to the plurality of frequencies when said plurality of frequencies are received simultaneously only, means associated with the latter signal device for connecting the low frequency source to the line, and means associated with the former signaling device to connect the voice frequency source to the line.

2. In combination, a telephone line, signal transmitting and receiving apparatus associated with the terminals thereof, said transmitting apparatus comprising a source of a plurality of frequencies in the voice range and said receiving apparatus comprising devices selectively responsive to currents of said frequencies, a source of impulses of different frequency, a relay controlled by said receiving apparatus and adapted to open the telephone line and connect thereto the source of impulses of different frequency and means for rendering said relay responsive only to the simultaneous operation of said selective devices.

3. In combination, a telephone line, signal transmitting and receiving apparatus associated with the terminals thereof, said transmitting apparatus comprising a source of a plurality of frequencies in the voice range and said receiving apparatus comprising devices selectively responsive to currents of said frequencies, a source of low frequency ringing current and a circuit controlled by the said selectively responsive devices for connecting the low frequency source to the line only on the simultaneous operation of the selective devices.

4. In a telephone system, a line and a switchboard circuit, composite ringing apparatus comprising a source of low frequency ringing current and a second source of a plurality of frequencies in the voice range, a signal device responsive to the low frequency coming from the switchboard circuit, a relay controlled thereby and adapted, on operation, to connect said source of voice frequencies to the line, a relay responsive to the simultaneous receipt of a plurality of voice frequencies only, a relay controlled thereby and itself adapted to interrupt the voice channel and connect thereto the low frequency ringing source.

In testimony whereof I, have signed my name to this specification this 29th day of March 1920.

HERMAN A. AFFEL.