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SIGNALING DEVICE

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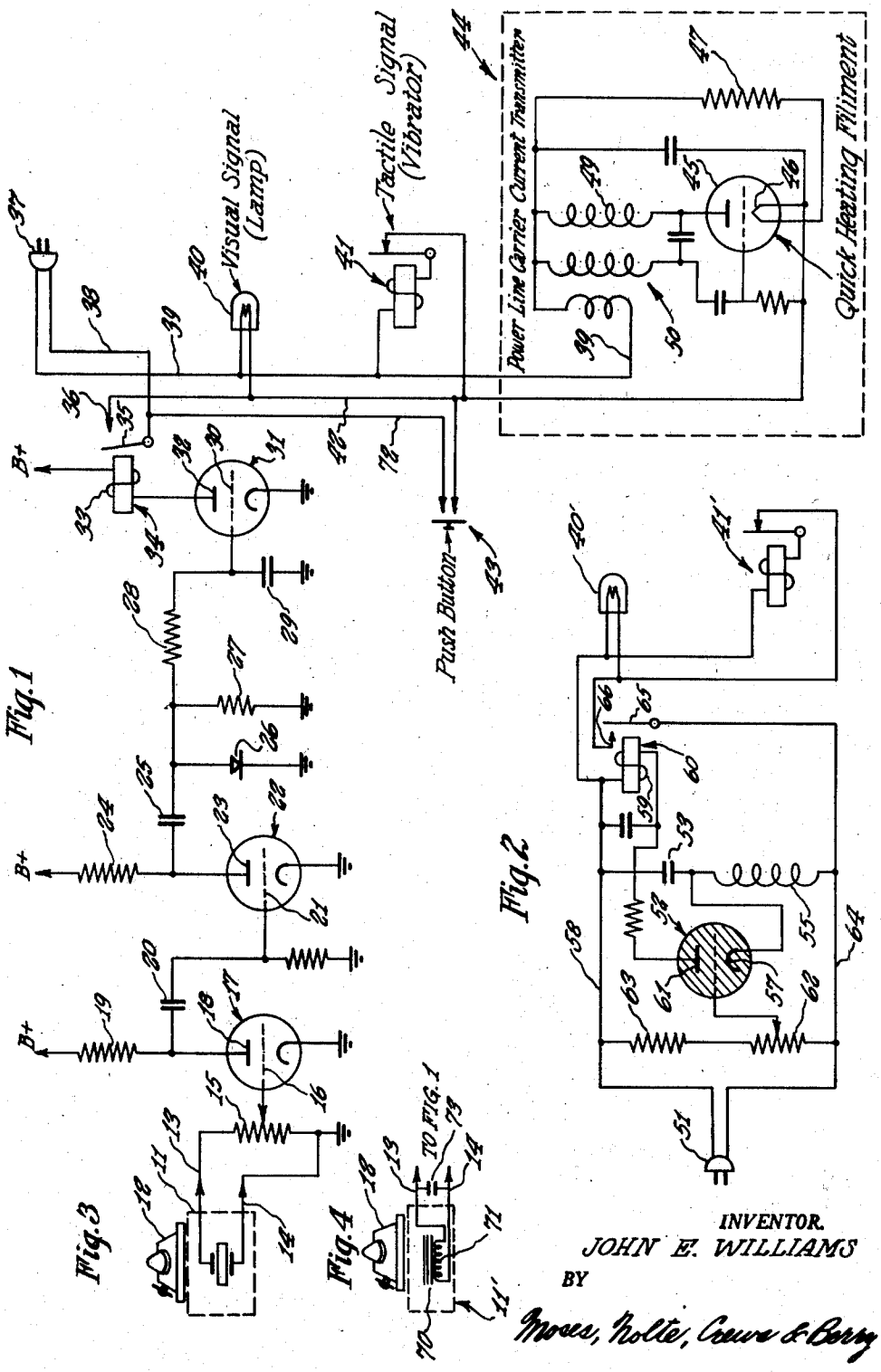


Fig. 1

Fig. 2

Fig. 3

Fig. 4

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SIGNALING DEVICE

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1 Claim. (Cl. 177—335)

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The present invention pertains to signaling devices and more particularly to signaling devices adapted to attract the attention of persons who are hard of hearing.

An object of the invention is to convert an audible signal into a signal of a different type which can be readily detected by a person whose acuity of auditory perception is seriously impaired.

A further object of the invention is to provide such a converting device which will produce both a visual signal and a tactile signal in response to a signal which should be normally audible to a person whose hearing is unimpaired.

Another object of the invention is to provide means for conveniently reproducing the signal at one or more locations a short distance removed from the principal signal.

Other and further objects will become apparent upon reading the following specification together with the accompanying drawing forming a part hereof.

Referring to the drawing:

Fig. 1 is a circuit diagram of an embodiment of the invention.

Fig. 2 is a circuit diagram of a remote receiving apparatus for use with the embodiment illustrated in Fig. 1.

Fig. 3 is a diagrammatic representation of a piezoelectric vibration pickup device for use with Fig. 1.

Fig. 4 is a diagrammatic representation of an electromagnetic pickup device for use with Fig. 1 instead of the piezoelectric pickup device of Fig. 3.

Referring to Fig. 3, a vibration responsive piezoelectric pickup or transducer device 11 is shown arranged to be placed in direct mechanical contact with a telephone subscriber set 12 which is indicated diagrammatically as being of the combined type in which the ringer is contained within the hand set mounting. In the case of telephone apparatus in which the ringer is enclosed in a separate subscriber set housing, the piezoelectric vibration pickup 11 will be placed in direct mechanical contact with the subscriber set housing in which the ringer is enclosed.

Piezoelectric vibration pickup 11 is relatively insensitive to ordinary sound frequencies and is so constructed that it responds with maximum sensitivity to low frequency vibrations in the general range of the 20 cycle frequency commonly employed for the operation of telephone ringers.

Fig. 4 shows modified form of pickup or transducer 11' comprising a magnetizable core 70 disposed in electromagnetically responsive relationship to a coil 71 which consists of a suitable number of turns of wire connected intermediate conductors 13 and 14. The core 70 may be so positioned that it is influenced by the stray electromagnetic field of the ringer of telephone instrument 12 thereby inducing a voltage in coil 71 upon energization of the ringer. The coil 71 is shown shunted by a capacitor 73 which may be selected to produce resonance at the frequency of the alternating current used for operation of the ringer. This will produce increased sensitivity at the desired frequency and reduced sensitivity to stray magnetic fields of other frequencies. Instead of resonating coil 71 at the frequency of the alternating current resonance at some multiple of this frequency other than unity may be desirable in certain instances. It may also be positioned in the earth's field or in a stronger permanent magnetic field so that the mechanical vibrations accompanying operation of the ringer will cause the core or coil or both to change position relative to the permanent field, thereby inducing a voltage in coil 71 which is developed as a result of mechanical vibration independently of the further voltage which may be induced as a result of the stray magnetic field of the ringer.

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The output of the piezoelectric vibration pickup 11 or electromagnetic pickup 11' is applied via conductors 13 and 14 to a potentiometer 15 which in turn, is shown connected to the grid 16 of a triode designated generally as 17 which forms a part of a two-stage amplifier. The anode 18 of triode 17 is connected through a coupling resistor 19 to a suitable source of anode potential designated B+. The output of triode 17 is taken via coupling capacitor 20 to grid 21 of a further amplifier triode 22.

Anode 23 of triode 22 is energized through a coupling resistor 24 from the anode supply source designated B+. The output of triode 22 is applied via coupling capacitor 25 to a rectifier 26. The output of rectifier 26 develops a negative potential across resistor 27 which is in turn applied through a low pass filter combination of resistor 28 and capacitor 29 to grid 30 of a triode 31. The anode 32 of triode 31 is energized from anode supply B+ through the operating winding 33 of a relay designated generally as 34.

The normal potential on grid 30 of triode 31 is such that the anode current will be sufficient to maintain relay 34 in an energized condition. Accordingly, armature 35 of relay 34 will nor-

mally be attracted and the circuit between armature 35 and contact 36 will be held open.

The contacts 35—36 of relay 34 are included in a circuit which comprises a plug 37 adapted to establish connection to a suitable source of commercial electric power and is indicated as being connected at one side within the apparatus to a conductor 72 and at the other side via conductor 39 to a visual signal represented illustratively as a lamp 40 and a tactile signal indicated by way of illustration as a vibrator 41. The energizing circuit for these two signals may be completed by connecting conductor 72 to conductor 42. The energizing circuit may be thus completed by closure of relay contacts 35—36 or by closing the contacts of a push button 43.

Response characteristics of vibration detector 11 of Fig. 3 or detector 11' of Fig. 4 are such that either of these detectors is relatively unresponsive to ordinary sounds. It is arranged to be sensitive however to low frequencies such as those produced by the mechanical contact of the telephone ringer clapper with the gongs. Undesired response to ordinary sounds such as room noise, for example, will be further attenuated by a low pass filter shown as comprising resistor 28 and capacitor 29. Upon receipt of an alternating current generated in piezoelectric pickup 11 in response to mechanical vibration, an appropriate predetermined portion of such current is taken from sensitivity control potentiometer 15 and is applied through the two stage resistance coupled amplifier comprising triodes 17 and 22 to the rectifier 26. Rectifier 26 is shown connected to increase the negative bias on the grid 30 of triode 31 thereby causing relay 34 to release. Upon releasing, relay 34 closes contacts 35—36 establishing a connection from conductor 72 to conductor 42, thereby energizing both visual signal 40 and tactile signal 41.

A time delay effect may be derived by proper selection of the time constants of resistors 27—28 and capacitor 29 so that by applying an unusually strong signal to grid 16 of amplifier triode 17, the duration of the release interval of relay 34 may be prolonged beyond that which is normally incidental to the periodic operation of the ringer contained within the telephone instrument 12. If desired, separate timing means may be similarly employed.

Where it is desired to produce supplementary visual and tactile signals in response to operation of the ringer within telephone instrument 12 but with the supplementary signals in rooms adjacent to or at a short distance from the room in which principal signals 40 and 41 are situated, a power line carrier current transmitter unit may be energized simultaneously with the energization of signals 40 and 41. Such a unit is shown and is of conventional construction being designated generally as 44. Power line carrier current transmitter unit 44 is shown illustratively as comprising a triode 45 having a quick heating filament 46 which is energized through a voltage dropping resistor 47. Anode 48 of triode 45 is energized from conductor 39 of the power line through a winding 49 of an oscillator coil designated generally as 50. The oscillator circuit in itself forms no part of the present invention and it is therefore not described in detail. Any desired form of oscillator circuit may be used. The output of the oscillator which comprises triode 45, however, is applied to power line conductors 38 and 39 and it is transmitted over the usual power supply wiring to other power supply outlets within the same premises. In some instances the signal may be effectively transmitted to adjoining buildings, depending upon the carrier frequency transmission characteristics of the power supply system.

A receiving unit for picking up the signal transmitted by power line carrier current transmitter unit 44 is shown in Fig. 2. This unit comprises a plug 51 which is adapted for connection to a suitable power supply outlet and which will therefore receive signals applied to conductor 39 of Fig. 1. The receiver comprises a gas filled triode 52 which may be of the cold cathode type and which therefore normally draws no energy from the power supply. A capacitor 53 is shown connected in series with an inductive reactor 55. The circuit constants are so selected that the circuit comprising capacitor 53 and reactor 55 is resonant at or near the signal frequency produced by power line carrier current transmitter unit 44. Upon receipt of a signal, the potential at cathode 57 of gas filled triode 52 is instantaneously rendered more negative thereby causing ionization of the gas within the triode. Upon ionization, triode 52 becomes conductive and current from the power line via conductor 58 flows through the winding 59 of relay 60 to the anode 61 of triode 52.

The sensitivity of the receiver of Fig. 2 may be adjusted by the control potentiometer 62 which is shown connected in series with a fixed resistor 63 between power line conductors 58 and 64. This potentiometer will vary the effective grid bias on triode 52 and also vary the amount of received signal applied to this grid. Upon ionization of the gas within triode 52, relay 60 is immediately energized and closes its contacts 65—66. Closure of contacts 65—66 of relay 60 completes the circuit from power line conductor 64 to visual signal 40' and tactile signal 41', which are similar in all respects to visual signal 40 and tactile signal 41, respectively, at the originating location illustrated in Fig. 1.

It will thus be seen that the ringing signal of the telephone instrument 12 is converted into both a visual signal and a tactile signal each of which will readily attract the attention of a person who is hard of hearing. This is accomplished without any direct electrical connection to the telephone circuits thereby avoiding any possibility of interconnection between the power supply and telephone systems through insulation failure or other faults of a similar character. Such interconnections can be extremely hazardous, not so much from the standpoint of the subscriber at whose premises the fault occurs, as from the standpoint of other subscribers whose instrumentalities are connected to the same telephone system by insulation of relatively low breakdown voltage characteristics. It is extremely desirable, therefore, to provide effective and dependable electrical separation between the telephone and power systems. While this might be effected by means of a suitable relay, the present invention permits the same result to be obtained and at the same time prevents any complications from the standpoint of responsibility for maintenance and the possibility of causing an inadvertent connection between the telephone and power systems.

The invention further provides two types of signals which will readily attract the attention of a person who is hard of hearing and which signals will operate in response to the mechanical

vibration of the ringer within the telephone instrument 12.

Where a power line carrier transmitting device 44, as indicated in Fig. 1, is utilized in conjunction with one or more receiving instruments as shown in Fig. 2, the push button 43 of Fig. 1 may be used to summon the person who is hard of hearing in the same manner as if a telephone call were being received. Thus the device is suitable for use as a paging or call system.

I have shown what I believe to be the best embodiments of my invention. I do not wish, however, to be confined to the embodiments shown, but what I desire to cover by Letters Patent is set forth in the appended claim.

I claim:

In a device which is responsive to mechanical vibrations of the character produced by the operation of a telephone ringer, a transducing means disposed to receive the vibrations and convert them into an electrical current of relatively low frequency, and amplifier for amplifying the low frequency currents, a rectifier for converting the amplified currents into a unidirectional current, a vacuum tube having a control grid, an anode and a cathode, the unidirectional current being applied to the control grid to vary the anode cathode current of the vacuum tube, a relay connected in the anode cathode circuit of the tube and responsive to

variation of the magnitude of the current, a signal operative to attract the attention of a deaf person responsive to actuation of the relay, a power line carrier current transmitter energized simultaneously with the signal, a receiver responsive to the carrier current transmitter, and a further signal controlled by the receiver and operative to attract the attention of a deaf person at a location spaced from the location of the first-named signal.

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