

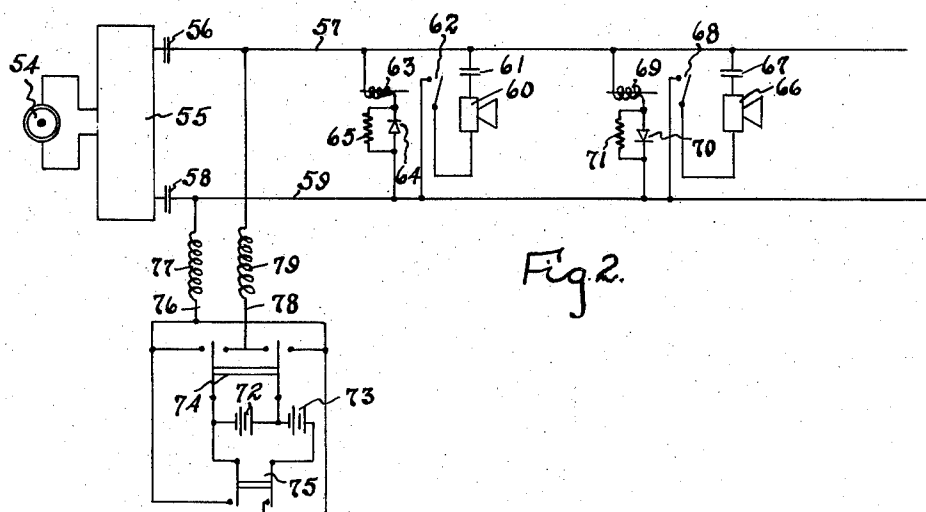
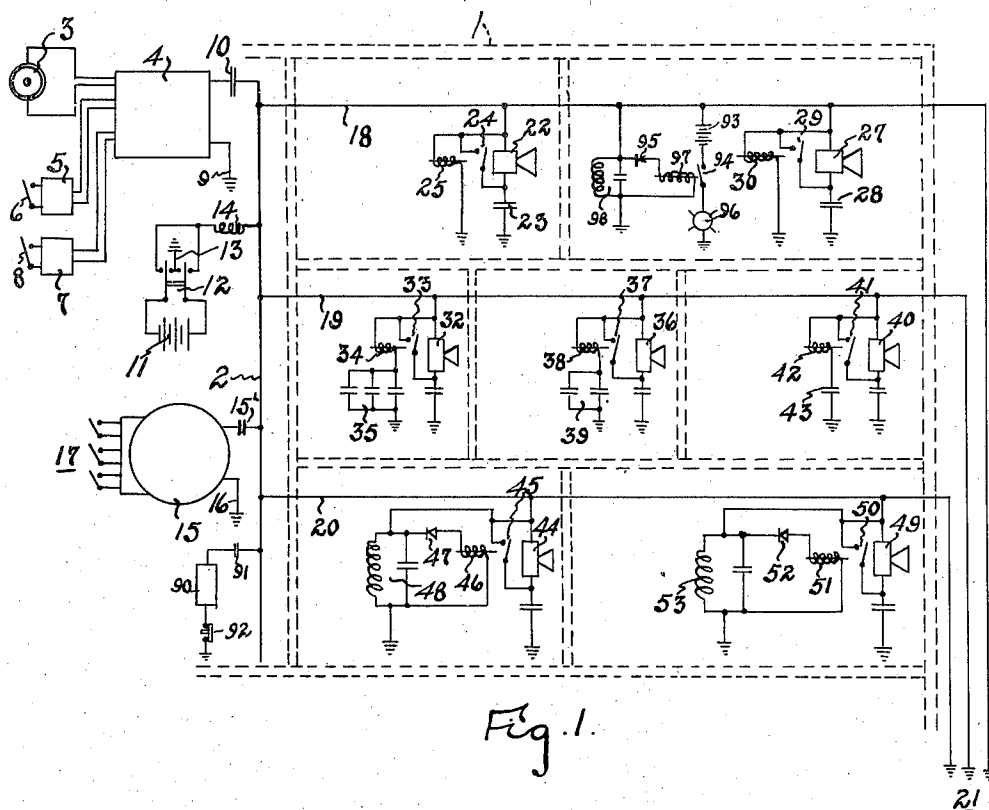
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SIGNALING SYSTEM

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SIGNALING SYSTEM

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This invention relates to a selective signaling system employing a plurality of sound reproducing devices which may be selectively cut in and out of circuit so that the signals may be transmitted to only those reproducing devices which it is desired to operate.

More specifically, this invention consists in a selective signaling system having a plurality of sound reproducing devices connected thereto, all of which may be operated by one or more signal sources, and all of which may be selectively removed from circuit by the transmission of control currents over the system in addition to the signaling current and of characteristics to effect the selective connection and disconnection of the reproducing devices to and from the system.

Still more specifically an object of this invention is to provide an arrangement such as that described above for use in connection with grounded closed impedance signaling networks such as disclosed in United States Patent No. 2,023,857 issued December 10, 1935.

These and many other objects, as will appear from the following description, are secured by means of this invention.

This invention resides substantially in the combination, construction, arrangement, relative location of parts, steps and series of steps, all as will be set forth in full detail in the following description.

In the accompanying drawing,

Figure 1 is a diagrammatic view of one form of system employing a grounded impedance loop; and

Figure 2 is a modified form of the invention employing metallic conductors.

There is disclosed in the above mentioned patent a signaling system particularly associated with structures such as buildings, ships, and the like, in which parts of the structure or adjuncts thereof are interconnected and grounded to form an impedance loop. To this loop are connected one or more grounded signaling devices, and at various spaced points there are connected to the loop grounded signal responsive devices. The signal sources may consist of radio receiving apparatus, microphones, phonographs, and the like for feeding signal energy into the network. The receiving apparatus in the event that a plurality of signal sources are employed, consists of simple radio receivers or other equivalent adjustable to every operation by the energy from any one of the sources.

An important object of this invention is to provide control apparatus for the receiving devices

connected thereto singly or in groups for cutting the receiving apparatus in and out of circuit. There are in addition to the above mentioned sources of signal energy sources of control energy connected to the network for selectively operating the control apparatus for the receiving devices.

Another important object of this invention is to provide a system of this type which is particularly adaptable to be used on shipboard where in an emergency the officers in charge may issue instructions to the crew or particular portions of the crew without disclosure thereof to the passengers, and under desired circumstances issue instructions or information to the passengers to the exclusion of the crew or portions thereof.

As will be apparent from the following description and clear to those skilled in the art, the receiving apparatus may be connected in various combinations so that they may be connected and disconnected either singly or in groups. A basic feature of this invention is the use of control currents for operating the control apparatus which do not interfere with the normal operation of the receiving apparatus and which in turn are not operated by the signal energy.

Referring to Figure 1, there is indicated in dotted lines the framework of a structure such as a building or a ship, which may or may not be made of steel. It is immaterial whether or not the structure is of steel in the particular system disclosed in Figure 1. This structure has been shown divided up into separate rooms or spaces. At 2 is a feeder which connects together the conductors 18, 19 and 20 which extend through the respective floors of the structure and are all grounded as indicated at 21. It is not at all necessary that the conductors 18, 19, and 20 be grounded, although the system works equally well whether they are or are not grounded. In accordance with the disclosure in the above mentioned patent the conductors 18, 19 and 20 may be part of the steel framework of the building, may be the water, gas, and/or heating pipes, or may be one of the wires of the power circuit such as the neutral of a three wire system. In practice it is preferred that the conductors 18, 19 and 20 be the grounded neutral wire of the three wire power circuit normally found in structures of this type. Thus these conductors 18, 19 and 20 are all connected together at one end and are all shown grounded at the other end.

Connected to the common feeder 2 is a source of signal energy comprising the microphone 3 which feeds into any suitable form of amplifying

device 4. This amplifying device is grounded at 9 and is connected to the common feeder 2 through a condenser 10. This condenser is of a capacity to pass the signal currents from the amplifier 4.

It may be noted that the microphone 3 is also intended to represent other suitable forms of signal energy such as the magnetic pick-up of a phonograph or a radio receiving set, the output of which would be fed into the amplifier 4. It is to be noted that several of these different types of signal sources may be connected to the amplifier or each may be provided with its own grounded amplifier connected to the common feeder 2. In other words, a plurality of signal currents may be impressed upon the network simultaneously if sufficiently separated in frequency so as not to cause interference. At 5 and 7 are oscillators each tuned to a different frequency and connected to the input of the amplifier so that control currents of different frequencies and different from those of the signal currents may be applied to the network. The oscillators 5 and 7 are provided with control switches 6 and 8 respectively so that they may be selectively connected in circuit.

Another source of signal energy is shown comprising a battery 11 connected to a double pole, double throw switch 12. This switch is connected as a reversing switch so that the common feeder 2 may be polarized either positive or negative as desired. To accomplish this two of the contacts of the switch are connected through choke coil 14 to the common feeder 2 and two of them are grounded as at 13. Those skilled in the art will see that at one position of switch 12 the positive pole of the battery 11 is connected to the common feeder and in its other position the negative pole is connected to the common feeder. In each case the other pole of the battery is grounded at 13. Choke coil 14 prevents the alternating currents from the other sources from being short circuited to ground at 13 when switch 12 is closed.

At 15 is still another source of control energy as for example generating currents of lower frequencies than those generated by the oscillators 5 and 7. This generator 15 which may for the purposes of this disclosure be termed a low frequency generator, is shown grounded at 16 and connected to the common feeder 2 through condenser 15'. It is shown provided with three control circuits selectively operable to impress any one of three low frequencies between the common feeder and ground. Condenser 15' prevents the short circuiting of current source 11 through the generator 15.

Connected to the impedance network comprising the feeder 2 and grounded conductors 18, 19 and 20 are a series of reproducing devices 22, 27, 32, 36, 40, 44 and 49, all of which are connected to ground through a condenser. These reproducing devices may be loud speakers or complete radio receiving sets including loud speakers, as will be apparent from the disclosure in the above mentioned patent. The speaker 22 which is connected to the conductor 18 is grounded through the condenser 23 and similarly the speaker 27 is grounded through the condenser 28. Shunted around these receivers respectively are the switches 24 and 29. Switch 24 is operated by the polarized magnet 25 and switch 29 is operated by an oppositely polarized magnet 30. The winding of magnet 25 is grounded and the winding of magnet 30 is grounded.

The speakers or sound reproducing devices 32, 36 and 40 are connected to the conductor 19 and to ground through condensers as shown. They are respectively shunted by switches 33, 37 and 41. These switches are respectively operated by magnets 34, 38 and 42. Each of these magnets is grounded through condenser systems 35, 39 and 43 respectively of different capacities, and hence different impedances.

The speakers or sound reproducing devices 44 and 49 are connected to the conductor 20 and individually to ground through condensers as before. They are respectively shunted by switches 45 and 50. These switches are respectively operated by magnets 46 and 51. Magnet 46 is in series through the rectifier 47 with a resonant circuit 48 comprising an inductance and a condenser in parallel. This resonant circuit is connected between the conductor 20 and ground. Similarly, the magnet 51 is connected in series with the rectifier 52 and to the tuned circuit 53 comprising inductance and a capacity, which tuned circuit is connected between the conductor 20 and ground. The impedance of these two circuits is different so that each is operated by currents of different frequency. It is to be noted that all of the circuits which shunt the sound reproducing or signal responsive devices are in circuit between their respective conductors and ground through condensers the value of which is such that the various signaling currents may pass therethrough and operate the sound reproducing devices. If these sound reproducing devices comprise tunable radio receiving sets employing conductors and amplifiers in accordance with common practice, it is apparent that a plurality of signals may be impressed upon the network such as a plurality of radio broadcast programs and then each signal responsive device may be tuned as desired to be operated by any one of the signal currents. Likewise, when desired either alone or in addition to the radio programs phonograph currents may be impressed on the network and speech may be impressed thereon by means of the microphone 3. The listeners at the signal responsive devices may tune them to receive any of these programs.

In a system of this type when applied on shipboard for example, it provides a network over which an officer of the vessel may send instructions to preselected signal responsive devices, or to all of them. Thus in an emergency an officer may issue instructions for example to the engine room to the exclusion of the rest of the crew and the passengers. This is obviously highly desirable under certain circumstances where information properly given to the crew should not be disclosed to the passengers for fear of creating a panic or at least upsetting the passengers. When he wishes to send instructions to all of the stations at which the signal responsive devices are placed, he need only talk into the microphone since all switches are open and all signal responsive devices are operable. When he wishes, however, to cut particular signal responsive devices out of circuit he may do so by operating switches 6, 8, 12 and 17 in any desired combination. When switch 12 is in one position a signal current will go out from battery 11 to the network to cause switch 24 for example to close, it being assumed that magnet 25 is polarized and the polarity of the signal current corresponding to the closed position of switch 12 energizes winding 25 so as to magnetize its core and close switch 12. Thus the signal responsive de-

vice 22 is short circuited and it, as well as all similarly arranged signal responsive devices is cut out of circuit. If switch 12 is closed in its other position, switch 29 will be closed in a similar manner to cut out the circuit to signal responsive device 27 and all devices similarly arranged. However, none of the other signal responsive devices are cut out of circuit since the circuits for the control magnets for their switches will not pass the direct current supplied from the source 11.

If it is desired to disconnect one or more of the signal responsive devices connected to the conductor 19 one or more of the switches 17 of the low frequency generator are operated. Thus the low frequency current sent over the network if the uppermost switch 17 is closed may energize for example magnet 42 because the impedance of condenser 43 is selected with respect to the value of the impedance of the magnet 42 so as to be resonant at that frequency. Thus switch 41 is closed and signal responsive device 40 is cut out of circuit. The same would happen to all similarly arranged signal responsive devices. If the middle switch 17 is closed a lower frequency is sent over the network causing magnet 38 to be energized since the condenser system 39 is selected with respect to the value of the impedance of magnet 38 so as to be resonant at that frequency. Thus switch 37 closes and signal responsive device 36 is cut out of circuit. If the lowermost switch 17 is closed a still lower frequency is impressed on the network and magnet 34 is energized since condenser system 35 is selected with respect to the value of the impedance of magnet 34 so as to be resonant at the frequency. Thus switch 33 is closed and signal responsive device 32 is short circuited. Thus each switch cuts out one of the speakers on conductor 19 without affecting the others. Of course, more than one switch 17 may be closed to cut out more than one of these signal responsive devices. It is of course apparent to those skilled in the art that these relays instead of being electrically tuned as disclosed in the drawing may be mechanically tuned to be selectively operated by signals of different frequencies.

Either of the signal responsive devices 44 or 49, or both of them, may be cut out of circuit by operating switches 6 and 8. It may be assumed for example that when switch 6 is closed a current of a frequency is sent over the network which may pass through the rectifier 52 in sufficient volume to operate magnet 51 and close switch 50. However the circuit 48, being tuned to a different frequency, the voltage drop across it is not sufficient to operate relay 46, so that speaker 44 remains in circuit. Similarly, when switch 8 is closed magnet 46 is energized to close switch 45.

Figure 1 also shows a further feature incorporated into the system which may be selectively operated. In this case the signal responsive device is a bell, light, or other form of indicator. One of the uses of this system is to indicate an open circuit for example, and another use would be for direct signaling purposes. In Figure 1 there is shown at 90 a source of alternating current of any suitable form which is grounded through a normally closed switch 92 and connecting to the main feeder 2 through a condenser 91. The value of the condenser is selected so as to prevent interaction or interflow of currents between the source 90 and the other sources connected to the common feeder. Connected be-

tween the conductor 18 and ground is a tuned circuit 98 comprising an inductance and capacity in parallel and tuned to the frequency of the source 90. Shunted across the condenser in series is a magnet winding 97 and a rectifier 95. The magnet 97 is arranged to operate and hold open a switch 94 which is itself biased to close when magnet 97 is deenergized. Switch 94 is in series with current source 93 and the signal device 96, which has been indicated as a lamp. This series circuit is connected between conductor 18 and ground. In the normal operation of this system the current sent over the network from the source 90 is of a frequency not to interfere or cause the operation of any of the other devices connected to the network. But, on the other hand, when impressed across the tuned circuit 98, the voltage drop thereacross is sufficient to energize magnet 97, thus holding switch 94 open. If an open circuit occurs between the source 90 and the tuned circuit 98, magnet 97 will be deenergized and switch 94 will close causing the signal device 96 to operate. Thus an undesired break in the circuit is indicated.

When switch 92 is opened it is possible to signal to the point at which the device 96 is located. Such an arrangement is particularly useful on shipboard where the signal device is operated upon the occurrence of an open circuit, indicating trouble thereon. It is of course apparent to those skilled in the art that the current source 93 should not be a form to interfere with or cause the undesired operation of any of the other selecting means. It has only been indicated in the drawing as a battery to indicate generally a current source, although it would be immaterial during the short time that the circuit to the signal device 96 is to be closed if the application of the source 93 to the network did cut out one or more of the signal responsive devices, as would be the case, for example, if the current from the source 93 should operate either of the magnets 25 or 30, or even both of them. In the best practice the source 93 would be of such a nature as not to cause switches 24 and 29 to close even though the circuit to the signal device 96 is normally only closed for a short time.

It will be noted then that with the various types of control circuits disclosed a great variety of control currents may be impressed upon the network singly and in combination to selectively remove any desired combination of signal responsive devices from circuit. Those that remain in circuit may be operated by the signal currents as before described.

An object of this invention is to associate with a network energized with signal currents such as radio programs for example, a public address system by means of which communications may be sent over the network either to selected stations or to all stations provided with signal responsive devices. Thus, with this arrangement, an officer on the bridge of a ship may talk only to the engine room, or to the radio room, or, when desired, to all the passengers' cabins and all stations supplied with signal responsive devices. Hence, in the case of an emergency, the officer on the bridge may issue instructions and advice to any part or to all parts of the ship.

The invention has been shown applied to an ungrounded conductive network. In this case the microphone 54 is shown feeding into a suitable amplifier 55 the output terminals of which are connected respectively through the condensers 56 and 58 to the conductors 57 and 59. Here

again there may be impressed upon the conductors either through the amplifier 55, or in parallel therewith, one or more additional signals such as radio programs, electric phonograph currents, and the like. Connected between these conductors are the signal responsive devices 60 and 66 in series respectively with the condensers 61 and 67 and the switches 62 and 68. Connected across these conductors is a magnet 63, the winding of which is in series with rectifier 64 and shunted by a high resistance 65. Likewise, a magnet 69 has its winding connected across the conductors in series with the rectifier 70, which is shunted by the high resistance 71. The rectifiers are operable by current of opposite polarity. Connected across the conductors through the high choke coils 77 and 79 are the direct current sources 72 and 73. The choke coils 77 and 79 are of an inductance such as to provide a high impedance path for the signal currents. Direct current source 72 is connectable across the conductors 57 and 59 through the coils 77 and 79 and conductors 76 and 78 respectively by means of a double pole double throw switch 74. This switch acts as a reversing switch so that the current source 72 may be connected to the conductors 57 and 59 to make either conductor positive or negative. A second direct current source 73 is connectable in series with the source 72 to the conductors 57 and 59 by means of the double pole single throw switch 75. Switches 62 and 68 are normally open. When switch 74 is in one position switch 62 for example is operated, and when switch 74 is in the other position, switch 68 is operated. When it is desired to operate both switches 62 and 68, switch 75 is closed sending sufficient current through the high resistances 65 and 71 to operate both relays 63 and 69.

For systems of this type when used on shipboard the arrangement of Figure 1 is highly desirable in that it employs means for short circuiting the various reproducing devices as distinguished from the arrangement where these devices are actually cut out of circuit. For reasons of safety a signaling system on shipboard must always be operative. Any arrangement which employs switches for disconnecting the reproducing devices is not acceptable for use on shipboard because of the danger of the failure of the switches to work, thus rendering the devices inoperative when they are most needed. In the system of Figure 1 the reproducing devices are always in circuit, and while they may at times operate when it is not desired to operate them because of trouble with the short circuiting systems, this is far more desirable than any arrangement where the reproducing devices might fail to work when needed. The short circuiting arrangement of Figure 1 is highly advantageous in a system employing a low impedance network with the reproducing devices grounded through the high impedance condensers since the short circuiting of one or more of the reproducing devices does not perceptibly vary the volume of sound reproduction from the other reproducing devices.

The impedances in circuit with the sound reproducing devices are preferably high capacity condensers such as for example electrolytic condensers whose impedance is so high that when the sound reproducing devices are short circuited the network is not grounded through an impedance sufficiently low to effect any noticeable reduction in the volume of sound produced from the other reproducing devices which are not short

circuited. To look at it in another way, the high impedance of the condensers in circuit with the sound reproducing devices protects all of the other sound reproducing devices which are not short circuited against low impedance grounding, with the result that the volume reduction of the operative devices is not noticeable. Again, as pointed out above, the short circuiting arrangement is preferable from the disconnecting arrangement of Figure 2 in that the operation of the reproducing devices is not dependent upon the operability of the short circuiting switches.

The impedance of the grounded conductors 18, 19 and 20 is relatively higher than the impedance in the circuits of the signal responsive devices so that energy sources are not directly short circuited to ground. In cases where it is necessary additional impedance may be included in the conductors 18, 19 and/or 20.

From the above description the operation of 20 this system under the various possible operating conditions will be apparent.

Those skilled in the art will readily appreciate that the systems disclosed indicate the large number of various combinations which may be effected so that any desired combinations of operable signal responsive devices may be secured. We do not, therefore, desire to be strictly limited to the disclosure as given for purposes of illustration, but rather to the scope of the appended claims.

What we seek to secure by United States Letters Patent is:

1. In a signaling system the combination comprising a grounded conductive network having inherent distributed impedance, a grounded source of signal energy connected to said network, a plurality of grounded signal responsive devices connectable to said network, electrically operated means for cutting said devices from operative connection with said network, and grounded means connected to said network for impressing selective control currents on the network to effect selective operation of said electrically operated means.

2. In a signaling system the combination comprising a grounded conductive network having inherent distributed impedance, a grounded source of signal energy connected to said network, a plurality of grounded signal responsive devices connected to said network, electrically operated means for cutting said devices from operation by said network, grounded means connected to said network for impressing control currents on the network to effect operation of said electrically operated means, and means in circuit with said signal responsive devices of high impedance with respect to said control currents.

3. In a signaling system the combination comprising a conductive network, a source of signal energy connected to said network, a plurality of signal responsive devices, means for selectively connecting said devices to and disconnecting them from said network, and a plurality of current sources of different characteristics connected to said network for effecting selective operation of said selective means.

4. In a signaling system the combination comprising a grounded conductive network, a grounded source of signal energy connected to said network, a plurality of grounded signal responsive devices, and grounded means connected to said network for selectively connecting said devices to and disconnecting them from said network.

5. In a signaling system the combination comprising a grounded conductive network, a grounded source of signal energy connected to said network, a plurality of grounded signal responsive devices, and grounded means for selectively supplying currents of different characteristics to said network to effect selective operation of said selective means to connect said devices as selected to the network.

6. In a signaling system of the type described the combination comprising a conductive network, a plurality of signal responsive devices each including a normally open switch connected to said network, an impedance in circuit with each device, and selective means for selectively operating said switches to connect said devices to said network in selected groups.

7. In a signaling system of the type described the combination comprising a conductive network, a plurality of signal responsive devices each including a normally open switch connected to said network, an impedance in circuit with each device, and means for selectively operating said switches to connect selected ones of said devices to said network, said means including sources of current of different characteristics selectively operable.

8. In a system of the type described the combination comprising a conductive grounded network, a grounded source of signal energy connected to said network, a plurality of grounded signal responsive devices connected to said network, an impedance in circuit with each signal responsive device, selectively operable means for cutting said signal responsive devices in and out of circuit, and a plurality of grounded current sources connected to said network for selectively supplying currents of different characteristics to the network to selectively operate said means.

9. In a system of the type described the combination comprising a conductive grounded network, a grounded source of signal energy connected to said network, a plurality of grounded signal responsive devices connected to said network, an impedance in circuit with each signal responsive device, selectively operable means for cutting said signal responsive devices in and out of circuit, and means for selectively supplying current of each polarity to said network to selectively operate said means.

10. In a system of the type described the combination comprising a conductive grounded network, a grounded source of signal energy connected to said network, a plurality of grounded signal responsive devices connected to said network, an impedance in circuit with each signal responsive device, selectively operable means for cutting said signal responsive devices in and out of circuit, and means for selectively supplying currents of different frequencies to said network to selectively operate said means.

11. In a public address system the combination comprising a conductive network, means for impressing voice currents on said network, a plurality of devices responsive to said voice currents connected to said network, each through an im-

pedance, means for cutting said devices in and out of circuit, and means for selectively supplying currents of different characteristics to said network to effect selective operation of said means.

12. In a public address system the combination comprising a closed grounded conductive loop, a grounded source of signal currents connected to said loop, a plurality of grounded signal responsive devices connected to said loop each device having in circuit with it an impedance, means for cutting said devices in and out of circuit, and selectively operable means for supplying currents of different characteristics to the loop to effect selective operation of said means.

13. In a system of the type described the combination comprising a conductive network, a source of signal energy connected to said network, a plurality of signal responsive devices connected to said network, a switch for each device for short circuiting it, magnets for operating said switches, circuits for said magnets connected to said network and including rectifiers, and means for selectively supplying currents of different polarity to said network to selectively operate said magnets.

14. In a system of the type described the combination comprising a conductive network, a grounded source of signal energy connected to said network, a plurality of grounded signal responsive devices connected to said network through high impedances, electrically operated relays for short circuiting said devices, and selectively operable means for supplying currents to said network to effect selective operation of said means, said impedances protecting the operating devices from loss of operating current.

15. In a system of the type described the combination comprising a low impedance conductive network, a grounded source of signal energy connected to said network, a plurality of signal responsive devices connected to said network, connections including high impedances for grounding said devices, grounded electrically operated relays for short circuiting said devices individually, and grounded selectively operable means connected to said network for supplying currents of different characteristics thereto to effect selective operation of said relays, the operating devices remaining operative at full volume because of the high impedance in circuit with the devices which are not operated.

16. In a signaling system of the type described the combination comprising a conductive network, a source of signal energy connected to said network, a plurality of signal responsive devices, means for selectively connecting said devices to the network to effect selective operation thereof, a signal device, and means for rendering said signal device operative upon the development of an open circuit in the network.

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