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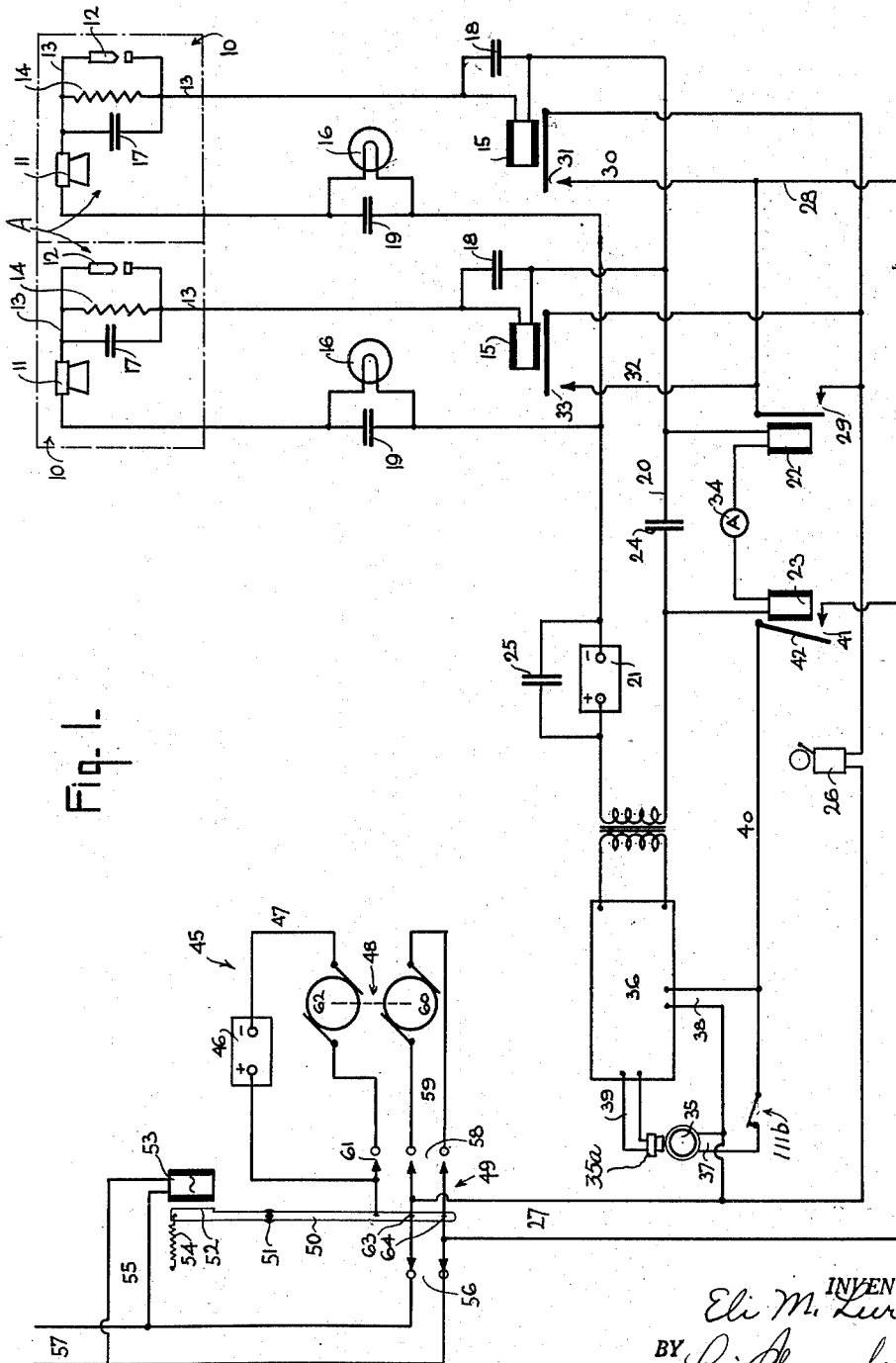
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2,525,697

ALARM SYSTEM FOR HOTELS AND THE LIKE

Filed March 13, 1947

2 Sheets-Sheet 1



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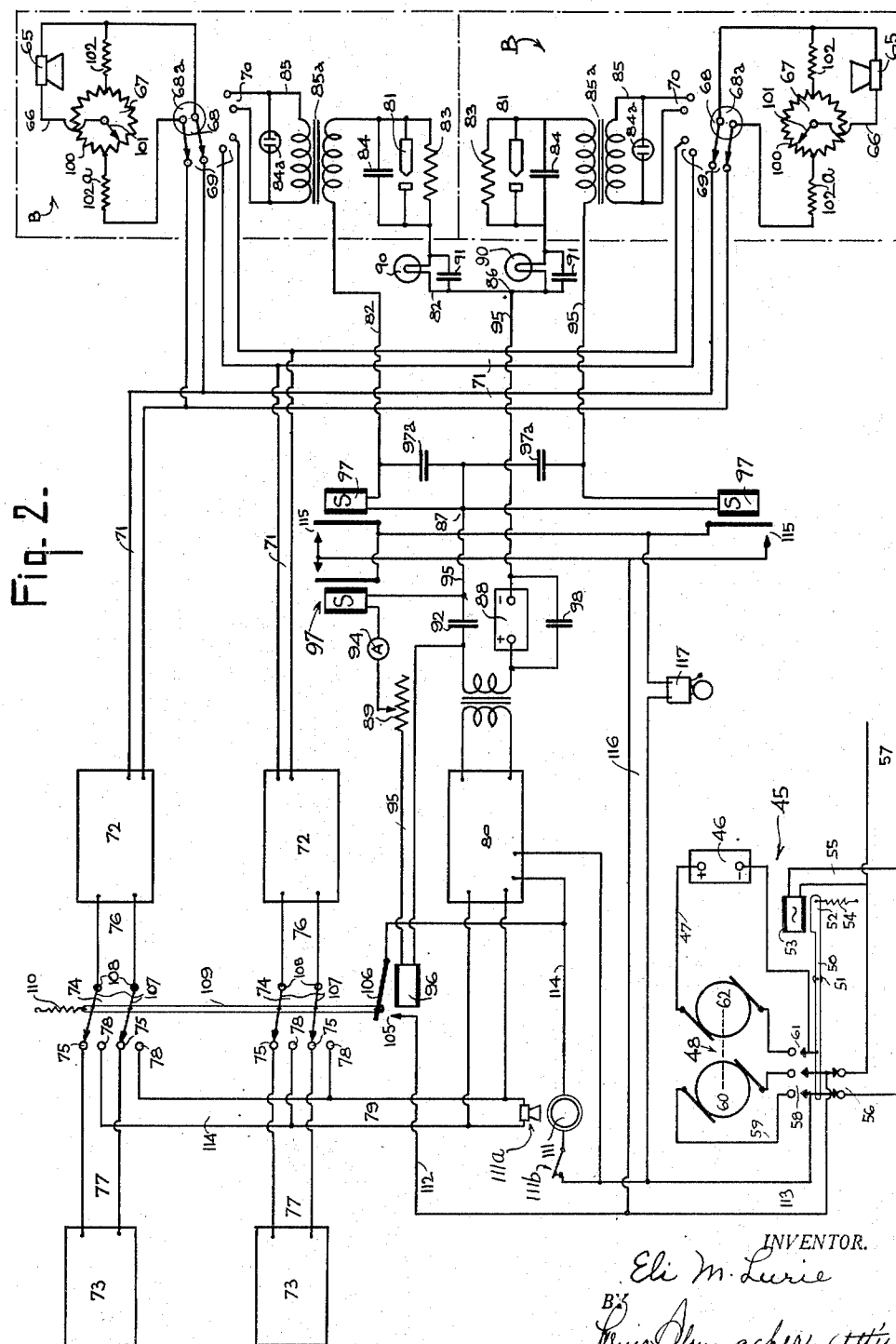
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2 Sheets-Sheet 2



UNITED STATES PATENT OFFICE

2,525,697

ALARM SYSTEM FOR HOTELS
AND THE LIKE

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Application March 13, 1947, Serial No. 734,335

38 Claims. (Cl. 179—5)

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This invention relates to improvements in fire indicator and alarm systems.

One object of the invention is to furnish improved means applicable to complex organizations such as office and apartment buildings for indicating at a central station or office, the occurrence of an undesired condition such as fire, at any of the different sections, floors, or rooms of the building.

Another object of the invention is to provide the system of the character described having electrical means comprising circuits carrying constant indicator or supervisory currents whereby an operator is instantly notified of the occurrence of a break or defect in the system, and if it is desired, at the individual sections, floors or rooms of the building.

Another object of the invention is to provide an improved system of the nature set forth having improved means whereby signals are also caused at the different sections or rooms of the building in an automatic manner when a fire or other undesired condition occurs, and whereby, if required, the operator may furnish an announcement to the different rooms or locations in the event of any emergency which may be independent of said fire or condition.

Another object of the invention is to provide an improved system wherein the signaling means in the different sections or rooms of the building may comprise lighting devices or electromagnetic speakers, the former to warn deaf persons, and the latter to furnish a suitable announcement.

Another object of the invention is to provide an improvement in the art whereby the supervisory current may be substantially increased upon the operation of a thermosensitive device or the like to cause a siren and amplifier or equivalent means to be energized, preferably by closing a normally open circuit therefore.

Another object of the invention is to provide improved means such that the supervisory current forms a continuous check of the condition of the loud speaker circuit, but without producing hum or other distortions in the loud speaker, particularly when the latter is not in use for transmitting announcements or the like; and the improvement further comprises the utilization of a direct current in such supervisory circuit whereby vibration in the speaker in response thereto is avoided.

Another object of the invention is to furnish an improvement whereby a plurality of radio receiver channels are adapted to selectively oper-

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ate the speaker member in a system of the nature disclosed.

Another object is to provide an improvement whereby the occurrence of a fire causes the speaker members to be automatically connected to a siren and amplifier or equivalent alarm device, with the radio receiver channels being automatically disconnected if such channels are used.

Another object is the provision of an improvement comprising a station selector switch at the speaker member which when in off position is connected to energize the speaker member from the siren and amplifier or the like, and also to energize a neon light if desired.

Another object of the invention is to furnish an improvement comprising a volume control switch adapted to permit the speaker member to be energized to transmit an alarm signal in the zero position of the switch.

Another object of the invention is to provide an improvement whereby the supervisory circuit will not affect the speaker member to produce an objectionable hum therein, this circuit preferably carrying a direct current which may be associated with the speaker circuit to produce different novel effects.

Another object is to furnish a circuit system coordinated with the speaker member in an improved manner such that the impedance of various signal devices and the like will not affect the speaker.

Another object of the invention is to provide an improvement whereby the system is automatically connected to be energized by energy supplied from a storage battery in the event of failure of the regular source of house current.

Other objects and advantages of the invention will become apparent as the specification proceeds.

With the aforesaid objects in view, the invention comprises the novel features, combinations and arrangements of parts hereinafter described in their preferred embodiments, pointed out in the subjoined claims, and illustrated in the annexed drawing, wherein like parts are designated by the same reference characters, throughout the several views.

In the drawing:

Figure 1 is a schematic diagram showing a system embodying the invention.

Fig. 2 is a similar view of a modification.

The advantages of the invention as here outlined are best realized when all of its features and instrumentalities are combined, but useful em-

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bodiments may be produced involving less than the whole.

It will be obvious to those skilled in the art to which the invention appertains, that the same may be incorporated in several different constructions. The accompanying drawing, therefore, is submitted merely as showing a preferred exemplification of the invention.

Referring in detail to the drawing, Figure 1 shows a system according to the invention with certain parts located at different sections or rooms of a building or hotel as here indicated in dot-dash lines, such rooms being denoted by the numeral 10. In each of these rooms is provided a unit A these units being identical. While these units are shown in parallel arrangement to each other, they may also be arranged in series, although the former is preferable for reasons hereinafter apparent. Each unit A may include a signal element shown as an electromagnetic loud speaker 11 and a sensing device 12 responsive to an undesired condition such as a fire, in which case the device 12 constitutes a thermosensitive member or switch. The member 12 is normally open, and is set so as to automatically close when a predetermined room temperature has been attained, to thus operate in the presence of a fire. The members 11 and 12 may be connected into suitable protective circuits and are shown arranged in a single circuit 13 which includes a resistor 14 in series with the speaker 11 and in shunt with the member 12. Each circuit 13 may comprise response elements such as a relay 15 and an indicator, such as a lamp 16, which forms part of central response apparatus of the system located at the central station or control room. Across each of the members 12, 15, and 16 are connected the respective condensers 17, 18, and 19. The circuits 13 may connect together into a common circuit 20 of the central response apparatus having a source of direct current such as the common circuit 20 of the central response apparatus also includes additional response elements in the form of relays 22 and 23 of which the former is like the relay 15. The purpose of these several relays will be presently described. Connected across the relays 22 and 23 is a condenser 24, and a condenser 25 is connected across the battery 21. The purpose of the various condensers is to afford a low resistance path to audio or A. C. to the loudspeakers, bypassing the parts which are energized by D. C., and offering high resistance to D. C., and of course the speaker may include a matching transformer if desired.

The battery 21 of the central response apparatus is of a relatively low voltage causing flow of a relatively low sensing or supervisory current in the common circuit 20 and the branch circuits 13 connected thereto. Since the sensing current is a direct current it will not cause vibration of the speaker member 11, and will thus avoid any objectionable hum. The diaphragm of the speaker member may be under a constant tension, but this will be relatively negligible since the current is very small due to the provision of the various resistances in the line. Should the thermostatic switch device 12 close, the current will be substantially increased to cause ample illumination of the lamps 16, but this current will not cause any damage to the speaker member. The supervisory current may cause a slight glow of the indicating or lamp members 16, and thus afford an indication that the circuits 13 and 20 are in proper operating condition.

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To provide fault signal to indicate a break in any of the above mentioned circuits, a bell or other indicator 26 is utilized which may be connected into the main line or source of 110 volt current, this line being indicated at 27. From the latter extends a branch circuit 28 comprising fault responsive means shown as having a switch 29, and a switch 31 in another branch circuit and a further switch 33 in a further branch circuit 32. The relays 15 and 22 hold the switches 29, 31, and 33 in a normal open position, these switches being of a spring type and tending to automatically close when their respective relays become deenergized. It will be perceived that the arrangement is such that upon the closing of any one of the switches 29, 31 or 33, the bell 26 is caused to ring. Because the relays 15 are in the individual circuits 13 for the rooms 10, they will constitute indicators to show quickly the room in which the defect or break in the circuit has occurred, attention being directed to this condition by the bell 26. The relay 22 may be omitted, or the relays 15 may be omitted and only the relay 22 used. Because the circuits 13 connect in parallel relation into the common circuit 20, the relay 22 can afford no indication as to the locality at which the break in the supervisory circuit has occurred. An ammeter 34 may be connected into the circuits 20 to indicate the total amount of current flowing, and this would afford an indication of a break in any of the supervisory circuits by showing a diminished amount of current. The condenser 24 may be in operative relation to this ammeter.

The responding apparatus of the central station also comprises a signal transmitting system shown as a siren 35, a microphone 35a and an amplifier 36, the latter being shown as having a transformer whose secondary is in the circuit 20. The siren and amplifier are connected to the main line 27 in parallel relation to each other by their individual branch circuits 37 and 38 and the siren output is connected through microphone 35a to the amplifier 36 at 39. The supervisory direct current in the circuit 20 will have no effect upon the amplifier and the latter is normally deenergized because the circuits of the amplifier and siren include a common branch 40 having a normally open switch 41.

The relay 23 is inoperative to cause closing of the switch 41 in response to the supervisory current. Upon operation of the thermostat, switch 12 closes causing a shunting of its resistor 14 and a substantial flow of current, sufficient to fully energize the relay 23. The latter acts upon the armature 42 to close the switch 41. Thus the siren and amplifier are energized and their output is sufficiently great to properly activate the speaker member 11 irrespective of the supervisory current that may be flowing. Accordingly, the operator may send any suitable alarm, announcement and instructions to the occupants in the various rooms in the building or hotel, and if preferred a suitable preset announcement or oscillation signal may be transmitted as a warning. It will be appreciated that the supervisory current may be so small as to offer no material opposition to the signal energy from the amplifier 36.

In the event that the battery 21 becomes deenergized, the switches such as 29, 31, 37 of the response relays 15, 22 automatically close to cause ringing of the alarm and all the lamps 16 will be dark and the ammeter 34 will show zero, thus quickly indicating the source of trouble.

In the event that the regular house current in

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the line 27 should fail, due to damage caused by fire or otherwise, an auxiliary unit 45 comes into operation to supply energy from a storage battery 46. To the latter is connected a circuit 47 comprising motor-generator unit 48, and cooperative herewith is a switch device 49. The latter is diagrammatically shown as including a member 50 pivoted at 51 and having an armature 52 for a relay 53. A tension coil spring 54 urges the armature away from the relay 53. The latter is connected by a circuit 55 into the circuit 57 and is normally energized to swing the lever switch member 50 to close the switch 56 in order to maintain a connection between the main building line 57 and the main house line 27. The switch member 50 also carries a switch 58 for a circuit 59 comprising the generator 60. There is also a switch 61 operated by the member 49 for controlling the circuit 47 of the motor 62. It will now be apparent that if there is a failure of current in the line 57 which feeds house line 27, the relay 53 is deenergized, whereupon the spring 54 swings the switch arm counterclockwise to close the switches 58 and 61. Thus the circuit is closed between the battery and the motor 62, and the circuit is closed between the house line 27 and the generator 60. Certain corresponding contacts of the switches 56 and 58 may be interconnected as at 63, 64 so that the generator current feeds into the house line 27 in the same manner as in the case of the main line 57.

Certain advantages of the invention may be realized by omitting the electromagnetic speaker members 11 and the amplifier 35 and the siren 35, since the relays 15, 22, and 23 can be used in coordination with the thermostatic devices 12 according to the circuits herein disclosed to furnish an alarm system embodying a supervisory circuit. Although the speaker members 11 are shown in circuit with the devices 12, they may also be disposed in wholly separate circuits embodying the amplifier and siren members and subject to the control of the relay 23 and its switch 41, and in that case the speaker members will not be influenced at all by the supervisory current. The embodiment of the invention shown in Fig. 1 permits the use of a much more compact circuit, and it provides for a check-up of the circuits of the speaker members by the supervisory current. In the various forms of the invention as referred to herein, the device 45 may be employed.

In Fig. 2 is shown a modification of the invention generally similar to that of Fig. 1 except that it combines therein the employment of various radio receiver channels having electromagnetic speaker members 65 which may be used to transmit music or alarm signals. A particular feature of this modification is that the alarm signal or announcement can be transmitted regardless of the position of the station selector switch or of the volume control switch or both.

Each room or section of the building may contain a unit B comprising the speaker member 65. Such building may include a plurality of like units B connected in series. The units B shown are connected in parallel for reasons hereinafter apparent. Although only two such units have been shown, it will be understood that the system may employ a great many of them all combined into a single circuit as hereinafter indicated. A circuit 66 for the speaker member may include a volume control switch 67 later described and a station selector switch 68 of any suitable character. The switch 66 is diagrammatically shown

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as including a plurality of arms having a suitable pivotal mounting 68a, these arms being engageable with a series of pairs of contacts 69 for different radio channels. When the switch 68 is turned to a cut-off position, it engages a pair of contacts 70, the purpose of which will be presently described. From the contacts 69 extend different circuits or radio receiver channels 71 connected to respective amplifiers 72 having their individual radio receivers or equivalent devices 73. Any suitable switches 74 may be provided with contacts 75 for connecting the amplifier circuits 76 to the receiver circuits 77. These switches 74 are provided with other contacts 78 connected to a circuit 79 of amplifier 80 and a microphone 111a for a siren 111. The switch 74 is preferably automatically shifted from contacts 75 to contacts 78 to connect the siren 11 to an amplifier 72. This operation may also be manually performed. A switch such as 74 is provided for each of the channels 71. Normally the tenants in the building manipulate the switches 68 to connect the speaker member 65 to a selected channel and control the volume of reception by means of the switches 67. The switches 74 permit the receivers 73 to be cut off so that an alarm signal may be transmitted for all of the channels 71.

To indicate an undesired condition, such as fire, each room is provided with a suitable thermosensitive means 81 serving as a switch in its individual circuit 82 which leads to the control room of the building. Each of these circuits is adapted to carry a constant low voltage small current, for which reason a resistor 83 is connected across each thermostatic switch 81. Preferably a condenser 84 is connected across the resistor so that the latter shall not materially influence the impedance of the circuit. Extending from the off-position contacts 70, of the switch 68, is a circuit 85, and between the latter and the circuit 82 is a transformer 85a. The circuit 85 may contain a neon light 84a or similar signal device which is adapted to be energized by a very small current of low voltage. The light forms a visual alarm indicator for persons who may be deaf. The direct current of the supervisory circuit 82 will not cause this light to be energized even though the circuit be closed by the engagement of the switch at the off position contacts 70. However, at certain times, as hereinafter described, the amplifier 80 sends an alternating current signal through the circuit 82 to energize the light or signal 84a, and the latter is intended to be of such nature as to be responsive under these conditions.

The circuits 82 may be interconnected at 86, 87 to form a common circuit 95 in the control room, into which the circuits 82 extend. This common circuit 95 includes a battery 88 to furnish the direct current for the supervisory circuits including the common circuit. The voltage in these circuits is adjustable by a variable resistance 89. Each circuit 82 may have an indicator such as a lamp 90 located in the control room, and across each lamp is connected a condenser 91. Likewise a condenser 92 may be connected across the variable resistance 89 and across the ammeter 94 which is used to indicate the total amount of the supervisory current. In the individual circuits 82 are disposed signals S or relays 97 having switches 115. Across these relays are connected condensers 97a. A similar relay may be furnished if desired in the common circuit 95 and either or both arrangements may be employed. The common circuit 95 may also include a relay 96 having

a switch 105 comprising a spring armature 106. A condenser 98 is connected across the battery 88. The purpose of the condensers 91, 92, 93 and 97a is to produce circuits which will not affect the impedance caused by the speaker members 65, although the latter may have a matching transformer if desired. The amplifier 80 is connected in the common circuit 95 at its output transformer in the usual manner.

In the circuit described, the amplifier 80 is normally deenergized and the supervisory direct current has no effect thereon nor upon the speaker members 65. The supervisory current may cause a faint glow in the lamps 90 to indicate that the circuits 82 are unbroken. The volume control switch 67 may be like that shown in my co-pending application, Serial No. 703,438 filed October 15, 1946 for Radio Receiving Amplifying System and Variable Volume Control Switch Therefor. This may be a circular resistance member 100 having a rotary switch arm 101 connected into the circuit 66. The resistance 100 is tapped at diagrammatically opposed points through resistances 102 and 102a into the circuit 66. Accordingly the switch arm may be turned continuously in either direction to vary the volume between low or zero volume positions at the resistances 102, 102a the latter being utilized to pass a small signal current that will not produce an appreciable audible effect at the speaker member 65.

Resistance 102, which may be omitted, limits the maximum voltage to speaker 65 and hence the maximum volume of sound, while resistance 102a is computed for a minimum volume of sound to be produced by the speaker when the switch 67 is in "off position." Should the switch 63 be in off position at the contacts 70, the amplifier 80 will send a signal through circuits 82 and 95 and thence into circuit 85 and into the circuit 66 to produce the relatively powerful alarm signal or announcement, and also cause illumination of the neon light 84a. When this occurs, the supervisory current will have no material effect, and this current and the signal energy from the amplifier 80 may flow simultaneously into circuits 82 and 95.

If a fire occurs at any one of the units B, its thermostatic switch 81 closes causing the flow of a substantially greater direct current in the circuits 82 and 95. This causes illumination of the lamp 90 corresponding to the particular switch 81 and thus indicating to the operator the location of the fire. It also causes the relay 96 to be so powerfully energized as to attract the armature 106 and close the switch 105, it being understood that the normal supervisory current is insufficient to cause such operation. This operation of the armature 106 causes movement of the switch 74 to disconnect the amplifier 72 from the radio receiver 73 and to connect the amplifiers 72 to the siren 111. A schematic drawing of the switch 74 shows the switch arms 107 thereof as having double pole, switch arms 107 for operative engagement with either of the pairs of contacts 75 and 78, the contacts 78 being connected to the circuit 114 of the siren 111. The switch arm 107 may be regarded as pivoted at 108, and a series of such switch arms may be pivotally interconnected by a rod 109 which is linked to the armature 106. A tension coil spring 110 serves to return the switch arms 107 to the position shown. It will be understood that this showing of the switches 74 is primarily for convenience in the drawing and that any suitable lost motion arrangement may be provided at the arms or at the armature for prop-

er operation of the rod 109. The rod 109 may be manually operated back or forth according to certain emergency conditions.

The closing of the switch 105 by the relay 96 causes operation of the oscillator, or siren device 111 which is connected through a manual switch 111b into a circuit 112 leading from the main building line 113 that carries any suitable house current preferably a 110 volt A. C. current. When the switch 105 closes the circuit 112, there is also closed the circuit 114 which comprises the amplifier 80 and the siren circuit.

Should a break occur in any of the circuits 82 or 95, the switch 115 will close to close the circuit 116 which leads from the main building line 113 which includes a bell or signal 117. The spring switch 115 is normally kept open by the relay 97 which is energized by the constant supervisory current. Closing of the switch 115 will thus indicate a break in a circuit or a failure of the battery 88. The different relays 97 are located in the control room, and as soon as the bell 117 rings, the operator may readily examine all of the relays to determine which is closed and this may be used to indicate the particular circuit 82 in which the break might occur. Thus a more satisfactory indication would be obtained than by observing the lamps 90 which may have only a very slight glow that goes out when a break occurs in their respective circuits.

In the absence of any house current due to failure caused by fire or otherwise, the device 45 hereinbefore described will operate to furnish energy from a battery 46 so that the motor generator 48 will supply current of proper voltage to the building line 113.

The operation of the device will now be briefly described. The supervisory current has no effect upon the speakers 65, but if a break occurs in the branch circuit 82, the relays 97 will be deenergized so that the bell 117 will sound. If the thermostatic switch 81 closes, the relay 96 will be energized to close the switch 105 to energize the siren and amplifier, 111, 80, and also swing all the switches 74 from their respective radio receiver channels 71 into connection with the amplifier 80 whereby the alarm is transmitted through the speakers 65. Since the device 111a may also represent a microphone, the operator may send a suitable announcement through the speakers. In course of such operation, the supervisory current need have no effect. In ordinary use the tenant of the building may turn the station selector switch 68 to any desired radio channel 71 or to an off position of the contacts 70. If the switch 68 is connected to one of the channels 71, the alarm signal will be transmitted from the siren or microphone 111 to the different amplifiers 72. If the switch 68 is in the off position, the siren 111 will cause the amplifier 80 to transmit the signal or announcement through the circuits 82 and 95, switch 68 and circuit 66 to the speaker member 65, and the neon light 84a will be energized. If the volume control switch 67 is in off position, the signal energy, regardless whether it comes from the channels 71 or from the amplifier 80, will flow through the resistances 102 to operate the speaker 65. If the house current should fail, the device 45 will automatically supply energy from a battery 46 through a motor generator. Should the battery 88 fail, the bell 117 will sound, and it will be understood that this battery 88 may be replaced by taking the current from the line 113 through a suitable step-down transformer and a rectifier in the well understood manner.

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The term electromagnetic loud speaker is intended to include any type of dynamic or loud speaker with or without a permanent magnet.

I claim:

1. In an electrical protective system having a protective circuit connected and arranged to carry sensing current between response apparatus and a plurality of sensing elements positioned at a plurality of different protected locations; means whereby said response apparatus is operable in an inactive condition in which it does not transmit signals and means whereby said response apparatus is operable in an active condition in which it transmits electric response signals of wavy character differentiating said signals from changes in the level of said sensing current; means whereby said circuit, said sensing elements and said response apparatus are settable and adjustable to maintain said sensing current at a normal level at which said response apparatus remains in inactive condition; each of said sensing elements including means whereby said sensing elements are actuated by abnormal conditions at the respective location for changing the normal level of said sensing current and thereby actuating said response apparatus to activated condition; a plurality of signalling elements at said different locations including means whereby said signalling elements are operated to produce a signalling action when actuated by response signals transmitted from said response apparatus and to remain substantially inoperable by the presence or absence of sensing current.

2. In an electrical protective system having a protective circuit connected and arranged to carry sensing current between response apparatus and a plurality of sensing elements positioned at a plurality of different protected locations; means whereby said response apparatus is operable in an inactive condition in which it does not transmit signals, means whereby said response apparatus is operable in an active condition in which it transmits electric response signals of wavy character differentiating said signals from changes in the level of said sensing current; means whereby said circuit, said sensing elements and said response apparatus are settable and adjustable to maintain said sensing current at a normal level at which said response apparatus remains in inactive condition; each of said sensing elements including means whereby said sensing elements are actuated by abnormal conditions at the respective location for changing the normal level of said sensing current and thereby actuating said response apparatus to activated condition; a plurality of signalling elements at said different locations including means whereby said signalling elements are operated to produce a signalling action when actuated by response signals transmitted from said response apparatus and to remain substantially inoperable by the presence or absence of sensing current; said response apparatus including fault responsive means operative by a change of said sensing current from said normal level to indicate presence of a fault on said circuit.

3. In an electrical protective system having a protective circuit connected and arranged to carry sensing current between response apparatus and a plurality of sensing elements positioned at a plurality of different protected locations; means whereby said response apparatus is operable in an inactive condition in which it does not transmit signals, means whereby said response apparatus is operable in an active condition in which it

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transmits electric response signals of wavy character differentiating said signals from changes in the level of said sensing current; means whereby said circuit, said sensing elements and said response apparatus are settable and adjustable to maintain said sensing current at a normal level at which said response apparatus remains in inactive condition; each of said sensing elements including means whereby said sensing elements are actuated by abnormal conditions at the respective location for changing the normal level of said sensing current and thereby actuating said response apparatus to activated condition; a plurality of signalling elements at said different locations including means whereby said signalling elements are operated to produce a signalling action when actuated by response signals transmitted from said response apparatus and to remain substantially inoperable by the presence or absence of sensing current; a plurality of channels for transmitting different electrical program signals; individual selector elements for the respective signal elements at said different locations selectively settable in different settings and including means for actuating the associated signal element to produce a signalling action either by signals transmitted through said protective circuit or through one of said channels; said system operating to transmit response signals from said response apparatus to said signal elements in each of said settings of said selector elements.

4. In an electrical protective system having a protective circuit connected and arranged to carry sensing current between response apparatus and a plurality of sensing elements positioned at a plurality of different protected locations; means whereby said response apparatus is operable in an inactive condition in which it does not transmit signals, means whereby said response apparatus is operable in an active condition in which it transmits electric response signals of wavy character differentiating said signals from changes in the level of said sensing current; means whereby said circuit, said sensing elements and said response apparatus are settable and adjustable to maintain said sensing current at a normal level at which said response apparatus remains in inactive condition; each of said sensing elements including means whereby said sensing elements are actuated by abnormal conditions at the respective location for changing the normal level of said sensing current and thereby actuating said response apparatus to activated condition; a plurality of signalling elements at said different locations connected to said circuit including means whereby said signalling elements are operated to produce a signalling action when actuated by response signals transmitted through said circuit and to remain substantially inoperable by the presence or absence of sensing currents in said circuit.

5. In an electrical protective system having a protective circuit connected and arranged to carry sensing current between response apparatus and a plurality of sensing elements positioned at a plurality of different protected locations; means whereby said response apparatus is operable in an inactive condition in which it does not transmit signals, means whereby said response apparatus is operable in an active condition in which it transmits electric response signals of wavy character differentiating said signals from changes in the level of said sensing current; means whereby said circuit, said sensing elements and said response apparatus are settable and ad-

justable to maintain said sensing current at a normal level at which said response apparatus remains in inactive condition; each of said sensing elements including means whereby said sensing elements are actuated by abnormal conditions at the respective location for changing the normal level of said sensing current and thereby actuating said response apparatus to activated condition; a plurality of signalling elements at said different locations connected to said circuit including means whereby said signalling elements are operated to produce a signalling action when actuated by response signals transmitted through said circuit and to remain substantially inoperable by the presence or absence of sensing current in said circuit; said response apparatus including fault responsive means controlled by said sensing current to indicate presence of a fault on said circuit.

6. In an electrical protective system having a protective circuit connected and arranged to carry sensing current between response apparatus and a plurality of sensing elements positioned at a plurality of different protected locations; means whereby said response apparatus is operable in an inactive condition in which it does not transmit signals, means whereby said response apparatus is operable in an active condition in which it transmits electric response signals of wavy character differentiating said signals from changes in the level of said sensing current; means whereby said circuit, said sensing elements and said response apparatus are settable and adjustable to maintain said sensing current at a normal level at which said response apparatus remains in inactive condition; each of said sensing elements including means whereby said sensing elements are actuated by abnormal conditions at the respective location for changing the normal level of said sensing current and thereby actuating said response apparatus to activated condition; a plurality of signalling elements at said different locations connected to said circuit including means whereby said signalling elements are operated to produce a signalling action when actuated by response signals transmitted through said circuit and to remain substantially inoperable by the presence or absence of sensing current in said circuit; a plurality of channels for transmitting different electrical program signals; individual selector elements for the respective signal elements at said different locations selectively settable in different settings and including means for actuating the associated signal element to produce a signalling action either by signals transmitted through said protective circuit or through one of said channels; said response apparatus including a control means operative upon actuation of said response apparatus to cause transmission of response signals to said signalling means irrespective of the setting of said selector elements.

7. In an electrical protective system having a protective circuit connected and arranged to carry sensing current between response apparatus and a plurality of sensing elements positioned at the plurality of different protected locations; means whereby said response apparatus is operable in an inactive condition in which it does not transmit signals and means whereby said response apparatus is operable in an active condition in which it transmits electric response signals of wavy character differentiating said signals from changes in the level of said sensing current; means whereby said sensing elements and said

response apparatus are settable and adjustable to maintain said sensing current at a normal level at which said response apparatus remains in inactive condition; each of said sensing elements including means whereby said sensing elements are actuated by abnormal conditions at the respective location for changing the normal level of sensing current and thereby actuating said response apparatus to activated condition; and a plurality of signalling elements at said different locations including means whereby said signalling elements are operated to produce a signalling action when actuated by response signals transmitted from said response apparatus, and to remain substantially inoperable by the presence or absence of sensing current; said sensing current being substantially unidirectional, said signals being alternating electric signals.

8. In an electrical protective system having a protective circuit connected and arranged to carry sensing current between response apparatus and a plurality of sensing elements positioned at the plurality of different protected locations; means whereby said response apparatus is operable in an inactive condition in which it does not transmit signals and means whereby said response apparatus is operable in an active condition in which it transmits electric response signals of wavy character differentiating said signals from changes in the level of said sensing current; means whereby said sensing elements and said response apparatus are settable and adjustable to maintain said sensing current at a normal level at which said response apparatus remains in inactive condition; each of said sensing elements including means whereby said sensing elements are actuated by abnormal conditions at the respective location for changing the normal level of sensing current and thereby actuating said response apparatus to activated condition; and a plurality of signalling elements at said different locations including means whereby said signalling elements are operated to produce a signalling action when actuated by response signals transmitted from said response apparatus, and to remain substantially inoperable by the presence or absence of sensing current; said response apparatus being actuated to an active condition by an increase of said sensing current above said normal level.

9. In a protective system as claimed in claim 8, said sensing current being substantially unidirectional, said signals being alternating electric signals.

10. In an electrical protective system having a protective circuit connected and arranged to carry sensing current between response apparatus and a plurality of sensing elements positioned at the plurality of different protected locations; means whereby said response apparatus is operable in an inactive condition in which it does not transmit signals and means whereby said response apparatus is operable in an active condition in which it transmits electric response signals of wavy character differentiating said signals from changes in the level of said sensing current; means whereby said sensing elements and said response apparatus are settable and adjustable to maintain said sensing current at a normal level at which said response apparatus remains in inactive condition; each of said sensing elements including means whereby said sensing elements are actuated by abnormal conditions at the respective location for changing the normal level of sensing current and thereby ac-

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tuating said response apparatus to activated condition; and a plurality of signaling elements at said different locations including means whereby said signaling elements are operated to produce a signaling action when actuated by response signals transmitted from said response apparatus, and to remain substantially inoperable by the presence or absence of sensing current; said response apparatus including fault response means operative by a change of said sensing current from said normal level to indicate presence of a fault in said circuit; said sensing current being substantially unidirectional, said signals being alternating electric signals.

11. In an electrical protective system having a protective circuit connected and arranged to carry sensing current between response apparatus and a plurality of sensing elements positioned at the plurality of different protected locations; means whereby said response apparatus is operable in an inactive condition in which it does not transmit signals and means whereby said response apparatus is operable in an active condition in which it transmits electric response signals of wavy character differentiating said signals from changes in the level of said sensing current; means whereby said sensing elements and said response apparatus are settable and adjustable to maintain said sensing current at a normal level at which said response apparatus remains in inactive condition; each of said sensing elements including means whereby said sensing elements are actuated by abnormal conditions at the respective location for changing the normal level of sensing current and thereby actuating said response apparatus to activated condition; and a plurality of signaling elements at said different locations including means whereby said signaling elements are operated to produce a signaling action when actuated by response signals transmitted from said response apparatus, and to remain substantially inoperable by the presence or absence of sensing current; said response apparatus including fault response means operative by a change of said sensing current from said normal level to indicate presence of a fault in said circuit; said response apparatus being actuated to transmit response signals in response to an increase of said sensing current and being actuated to indicate a fault in response to a decrease of said sensing current.

12. In a protective system as claimed in claim 11, said sensing current being substantially unidirectional, said signals being alternating electric signals.

13. In an electrical protective system having a protective circuit connected and arranged to carry sensing current between response apparatus and a plurality of sensing elements positioned at the plurality of different protected locations; means whereby said response apparatus is operable in an inactive condition in which it does not transmit signals and means whereby said response apparatus is operable in an active condition in which it transmits electric response signals of wavy character differentiating said signals from changes in the level of said sensing current; means whereby said sensing elements and said response apparatus are settable and adjustable to maintain said sensing current at a normal level at which said response apparatus remains in inactive condition; each of said sensing elements including means whereby said sensing elements are actuated by abnormal conditions at the respective location for changing

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the normal level of sensing current and thereby actuating said response apparatus to activated condition; and a plurality of signaling elements at said different locations including means whereby said signaling elements are operated to produce a signaling action when actuated by response signals transmitted from said response apparatus, and to remain substantially inoperable by the presence or absence of sensing current; said response apparatus including fault response means operative by a change of said sensing current from said normal level to indicate presence of a fault in said circuit; said circuit including a plurality of different circuit portions connected at said different locations to said sensing elements and said fault responsive means including a plurality of different sensing elements selectively actuable by the sensing current in the different circuit portions to indicate presence of a fault in a circuit portion.

14. In a protective system as claimed in claim 13, said sensing current being substantially unidirectional, said signals being alternating electric signals.

15. In an electrical protective system having a protective circuit connected and arranged to carry sensing current between response apparatus and a plurality of sensing elements positioned at the plurality of different protected locations; means whereby said response apparatus is operable in an inactive condition in which it does not transmit signals and means whereby said response apparatus is operable in an active condition in which it transmits electric response signals of wavy character differentiating said signals from changes in the level of said sensing current; means whereby said sensing elements and said response apparatus are settable and adjustable to maintain said sensing current at a normal level at which said response apparatus remains in inactive condition; each of said sensing elements including means whereby said sensing elements are actuated by abnormal conditions at the respective location for changing the normal level of sensing current and thereby actuating said response apparatus to activated condition; and a plurality of signaling elements at said different locations including means whereby said signaling elements are operated to produce a signaling action when actuated by response signals transmitted from said response apparatus, and to remain substantially inoperable by the presence or absence of sensing current; said response apparatus including fault response means operative by a change of said sensing current from said normal level to indicate presence of a fault in said circuit; said circuit including a plurality of different circuit portions connected at said different locations to said sensing elements and said fault responsive means including a plurality of different sensing elements selectively actuable by the sensing current in the different circuit portions to indicate presence of a fault in a circuit portion, said response apparatus being actuated to transmit response signals in response to an increase of said sensing current and being actuated to indicate a fault in response to a decrease of said sensing current.

16. In a protective system as claimed in claim 15, said sensing current being substantially unidirectional, said signals being alternating electric signals.

17. In an electrical protective system having a protective circuit connected and arranged to carry sensing current between response apparatus

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and a plurality of sensing elements positioned at the plurality of different protected locations; means whereby said response apparatus is operable in an inactive condition in which it does not transmit signals and means whereby said response apparatus is operable in an active condition in which it transmits electric response signals of wavy character differentiating said signals from changes in the level of said sensing current; means whereby said sensing elements and said response apparatus are settable and adjustable to maintain said sensing current at a normal level at which said response apparatus remains in inactive condition; each of said sensing elements including means whereby said sensing elements are actuated by abnormal conditions at the respective location for changing the normal level of sensing current and thereby actuating said response apparatus to activated condition; and a plurality of signaling elements at said different locations including means whereby said signaling elements are operated to produce a signaling action when actuated by response signals transmitted from said response apparatus, and to remain substantially inoperable by the presence or absence of sensing current; a plurality of channels for transmitting different electrical program signals; individual selector elements for the respective signal elements at said different locations selectively settable in different settings and including means for actuating the associated signal element to produce a signaling action either by signals transmitted through said protective circuit or through one of said channels; a means whereby said system is operative to transmit response signals from said response apparatus to said signal elements in each of said settings of said selector elements; said sensing current being substantially unidirectional, said signals being alternating electric signals.

18. In an electrical protective system having a protective circuit connected and arranged to carry sensing current between response apparatus and a plurality of sensing elements positioned at the plurality of different protected locations; means whereby said response apparatus is operable in an inactive condition in which it does not transmit signals and means whereby said response apparatus is operable in an active condition in which it transmits electric response signals of wavy character differentiating said signals from changes in the level of said sensing current; means whereby said sensing elements and said response apparatus are settable and adjustable to maintain said sensing current at a normal level at which said response apparatus remains in inactive condition; each of said sensing elements including means whereby said sensing elements are actuated by abnormal conditions at the respective location for changing the normal level of sensing current and thereby actuating said response apparatus to activated condition; and a plurality of signaling elements at said different locations including means whereby said signaling elements are operated to produce a signaling action when actuated by response signals transmitted from said response apparatus, and to remain substantially inoperable by the presence or absence of sensing current; a plurality of channels for transmitting different electrical program signals; individual selector elements for the respective signal elements at said different locations selectively settable in different settings and including means for actuating the associated signal

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element to produce a signaling action either by signals transmitted through said protective circuit or through one of said channels; a means whereby said system is operative to transmit response signals from said response apparatus to said signal elements in each of said settings of said selector elements; said response apparatus being actuated to transmit response signals in response to an increase of said sensing current and being actuated to indicate a fault in response to a decrease of said sensing current.

19. In a protective system as claimed in claim 18, said sensing current being substantially unidirectional, said signals being alternating electric signals.

20. In an electrical protective system having a protective circuit connected and arranged to carry sensing current between response apparatus and a plurality of sensing elements positioned at the plurality of different protected locations; means whereby said response apparatus is operable in an inactive condition in which it does not transmit signals and means whereby said response apparatus is operable in an active condition in which it transmits electric response signals of wavy character differentiating said signals from changes in the level of said sensing current; means whereby said sensing elements and said response apparatus are settable and adjustable to maintain said sensing current at a normal level at which said response apparatus remains in inactive condition; each of said sensing elements including means whereby said sensing elements are actuated by abnormal conditions at the respective location for changing the normal level of sensing current and thereby actuating said response apparatus to activated condition; and a plurality of signaling elements at said different locations connected to said protective circuit and including means whereby said signaling elements are operated to produce a signaling action when actuated by response signals transmitted from said response apparatus, and to remain substantially inoperable by the presence or absence of sensing current; said sensing current being substantially unidirectional, said signals being alternating electric signals.

21. In an electrical protective system having a protective circuit connected and arranged to carry sensing current between response apparatus and a plurality of sensing elements positioned at the plurality of different protected locations; means whereby said response apparatus is operable in an inactive condition in which it does not transmit signals and means whereby said response apparatus is operable in an active condition in which it transmits electric response signals of wavy character differentiating said signals from changes in the level of said sensing current; means whereby said sensing elements and said response apparatus are settable and adjustable to maintain said sensing current at a normal level at which said response apparatus remains in inactive condition; each of said sensing elements including means whereby said sensing elements are actuated by abnormal conditions at the respective location for changing the normal level of sensing current and thereby actuating said response apparatus to activated condition; and a plurality of signaling elements at said different locations connected to said protective circuit and including means whereby said signaling elements are operated to produce a signaling action when actuated by response signals transmitted from said response apparatus, and to remain

substantially inoperable by the presence or absence of sensing current; said response apparatus being actuated to transmit response signals in response to an increase of said sensing current and being actuated to indicate a fault in response to a decrease of said sensing current.

22. In a protective system as claimed in claim 21, said sensing current being substantially unidirectional, said signals being alternating electric signals.

23. In an electrical protective system having a protective circuit connected and arranged to carry sensing current between response apparatus and a plurality of sensing elements positioned at the plurality of different protected locations; means whereby said response apparatus is operable in an inactive condition in which it does not transmit signals and means whereby said response apparatus is operable in an active condition in which it transmits electric response signals of wavy character differentiating said signals from changes in the level of said sensing current; means whereby said sensing elements and said response apparatus are settable and adjustable to maintain said sensing current at a normal level at which said response apparatus remains in inactive condition; each of said sensing elements including means whereby said sensing elements are actuated by abnormal conditions at the respective location for changing the normal level of sensing current and thereby actuating said response apparatus to activated condition; and a plurality of signaling elements at said different locations connected to said protective circuit and including means whereby said signaling elements are operated to produce a signaling action when actuated by response signals transmitted from said response apparatus, and to remain substantially inoperable by the presence or absence of sensing current; said response apparatus including fault responsive means controlled by said sensing current to indicate presence of a fault on said circuit; said sensing current being substantially unidirectional, said signals being alternating current signals.

24. In an electrical protective system having a protective circuit connected and arranged to carry sensing current between response apparatus and a plurality of sensing elements positioned at the plurality of different protected locations; means whereby said response apparatus is operable in an inactive condition in which it does not transmit signals and means whereby said response apparatus is operable in an active condition in which it transmits electric response signals of wavy character differentiating said signals from changes in the level of said sensing current; means whereby said sensing elements and said response apparatus are settable and adjustable to maintain said sensing current at a normal level at which said response apparatus remains in inactive condition; each of said sensing elements including means whereby said sensing elements are actuated by abnormal conditions at the respective location for changing the normal level of sensing current and thereby actuating said response apparatus to activated condition; and a plurality of signaling elements at said different locations connected to said protective circuit and including means whereby said signaling elements are operated to produce a signaling action when actuated by response signals transmitted from said response apparatus, and to remain substantially inoperable by the presence or absence of sensing current; said response ap-

paratus including fault responsive means controlled by said sensing current to indicate presence of a fault on said circuit; said response apparatus being actuated to transmit response signals in response to an increase of said sensing current and being actuated to indicate a fault in response to a decrease of said sensing current.

25. In a protective system as claimed in claim 24, said sensing current being substantially unidirectional, said signals being alternating electric signals.

26. In an electrical protective system having a protective circuit connected and arranged to carry sensing current between response apparatus and a plurality of sensing elements positioned at the plurality of different protected locations; means whereby said response apparatus is operable in an inactive condition in which it does not transmit signals and means whereby said response apparatus is operable in an active condition in which it transmits electric response signals of wavy character differentiating said signals from changes in the level of said sensing current; means whereby said sensing elements and said response apparatus are settable and adjustable to maintain said sensing current at a normal level at which said response apparatus remains in inactive condition; each of said sensing elements including means whereby said sensing elements are actuated by abnormal conditions at the respective location for changing the normal level of sensing current and thereby actuating said response apparatus to activated condition; and a plurality of signaling elements at said different locations connected to said protective circuit and including means whereby said signaling elements are operated to produce a signaling action when actuated by response signals transmitted from said response apparatus, and to remain substantially inoperable by the presence or absence of sensing current; said response apparatus including fault responsive means controlled by said sensing current to indicate presence of a fault on said circuit; said circuit including a plurality of different circuit portions connected at said different locations to said sensing elements and said fault responsive means including, a plurality of different sensing elements selectively actuable by the sensing current in the different circuit portions to indicate presence of a fault in a circuit portion.

27. In a protective system as claimed in claim 26, said sensing current being substantially unidirectional, said signals being alternating electric signals.

28. In an electrical protective system having a protective circuit connected and arranged to carry sensing current between response apparatus and a plurality of sensing elements positioned at the plurality of different protected locations; means whereby said response apparatus is operable in an inactive condition in which it does not transmit signals and means whereby said response apparatus is operable in an active condition in which it transmits electric response signals of wavy character differentiating said signals from changes in the level of said sensing current; means whereby said sensing elements and said response apparatus are settable and adjustable to maintain said sensing current at a normal level at which said response apparatus remains in inactive condition; each of said sensing elements including means whereby said sensing elements are actuated by abnormal conditions at the respective location for changing the normal

level of sensing current and thereby actuating said response apparatus to activated condition; and a plurality of signaling elements at said different locations connected to said protective circuit and including means whereby said signaling elements are operated to produce a signaling action when actuated by response signals transmitted from said response apparatus, and to remain substantially inoperable by the presence or absence of sensing current; said response apparatus including fault responsive means controlled by said sensing current to indicate presence of a fault on said circuit; said circuit including a plurality of different circuit portions connected at said different locations to said sensing elements and said fault responsive means including a plurality of different sensing elements selectively actuable by the sensing current in the different circuit portions to indicate presence of a fault in a circuit portion, said response apparatus being actuated to transmit response signals in response to an increase of said sensing current and being actuated to indicate a fault in response to a decrease of said sensing current.

29. In a protective system as claimed in claim 28, said sensing current being substantially unidirectional, said signals being alternating electric signals.

30. In an electrical protective system having a protective circuit connected and arranged to carry sensing current between response apparatus and a plurality of sensing elements positioned at the plurality of different protected locations; means whereby said response apparatus is operable in an inactive condition in which it does not transmit signals and means whereby said response apparatus is operable in an active condition in which it transmits electric response signals of wavy character differentiating said signals from changes in the level of said sensing current; means whereby said sensing elements and said response apparatus are settable and adjustable to maintain said sensing current at a normal level at which said response apparatus remains in inactive condition; each of said sensing elements including means whereby said sensing elements are actuated by abnormal conditions at the respective location for changing the normal level of sensing current and thereby actuating said response apparatus to activated condition; and a plurality of signaling elements at said different locations connected to said protective circuit and including means whereby said signaling elements are operated to produce a signaling action when actuated by response signals transmitted from said response apparatus, and to remain substantially inoperable by the presence or absence of sensing current; a plurality of channels for transmitting different electrical program signals; individual selector elements for the respective signal elements at said different locations selectively settable in different settings and including means for actuating the associated signal element to produce a signaling action either by signals transmitted through said protective circuit or through one of said channels; a means whereby said system is operative to transmit response signals from said response apparatus to said signal elements in each of said settings of said selector elements; said sensing current being substantially unidirectional, said signals being alternating electric signals.

31. In an electrical protective system having a protective circuit connected and arranged to carry sensing current between response apparatus

and a plurality of sensing elements positioned at the plurality of different protected locations; means whereby said response apparatus is operable in an inactive condition in which it does not transmit signals and means whereby said response apparatus is operable in an active condition in which it transmits electric response signals of wavy character differentiating said signals from changes in the level of said sensing current; means whereby said sensing elements and said response apparatus are settable and adjustable to maintain said sensing current at a normal level at which said response apparatus remains in inactive condition; each of said sensing elements including means whereby said sensing elements are actuated by abnormal conditions at the respective location for changing the normal level of sensing current and thereby actuating said response apparatus to activated condition; and a plurality of signaling elements at said different locations connected to said protective circuit and including means whereby said signaling elements are operated to produce a signaling action when actuated by response signals transmitted from said response apparatus, and to remain substantially inoperable by the presence or absence of sensing current; a plurality of channels for transmitting different electrical program signals; individual selector elements for the respective signal elements at said different locations selectively settable in different settings and including means for actuating the associated signal element to produce a signaling action either by signals transmitted through said protective circuit or through one of said channels; a means whereby said system is operative to transmit response signals from said response apparatus to said signal elements in each of said settings of said selector elements; said response apparatus being actuated to transmit response signals in response to an increase of said sensing current and being actuated to indicate a fault in response to a decrease of said sensing current.

32. In a protective system as claimed in claim 31, said sensing current being substantially unidirectional, said signals being alternating electric signals.

33. In a protective system as claimed in claim 1, at least some of said signaling elements including an electrically actuated sound reproducing device for generating sound corresponding to signals transmitted through said circuit; and a volume control arrangement for at least one of said sound reproducing devices comprising a resistance structure extending along a loop-like endless path and forming a substantially continuous endless resistance path, a contact element continuously movable along said continuous path and arranged to establish electrical contact engagement with successive elements of said endless resistance path, a relatively fixed element of said endless resistance path being connected to one supply circuit portion of said circuit supplying signals to said reproducing device, circuit connections for completing supply connections from said circuit to said reproducing device including a circuit connection connecting said contact element to one terminal of said sound reproducing device, and a rotatably actuated control member manually actuable for moving said contact element endlessly along said endless resistance path so that in each complete cycle of movement of said contact element over the entire length of said endless resistance path—from a position corresponding to minimum volume of

sound output—the volume of sound output will gradually increase to a maximum volume and then gradually decrease to a minimum volume.

34. In a protective system as claimed in claim 2, at least some of said signaling elements including an electrically actuated sound reproducing device for generating sound corresponding to signals transmitted through said circuit; and a volume control arrangement for at least one of said sound reproducing devices comprising a resistance structure extending along a loop-like endless path and forming a substantially continuous endless resistance path, a contact element continuously movable along said continuous path and arranged to establish electrical contact engagement with successive elements of said endless resistance path, a relatively fixed element of said endless resistance path being connected to one supply circuit portion of said circuit supplying signals to said reproducing device, circuit connections for completing supply connections from said circuit to said reproducing device including a circuit connection connecting said contact element to one terminal of said sound reproducing device, and a rotatably actuated control member manually actuatable for moving said contact element endlessly along said endless resistance path so that in each complete cycle of movement of said contact element over the entire length of said endless resistance path—from a position corresponding to minimum volume of sound output—the volume of sound output will gradually increase to a maximum volume and then gradually decrease to a minimum volume.

35. In a protective system as claimed in claim 3, at least some of said signaling elements including an electrically actuated sound reproducing device for generating sound corresponding to signals transmitted through said circuit; and a volume control arrangement for at least one of said sound reproducing devices comprising a resistance structure extending along a loop-like endless path and forming a substantially continuous endless resistance path, a contact element continuously movable along said continuous path and arranged to establish electrical contact engagement with successive elements of said endless resistance path, a relatively fixed element of said endless resistance path being connected to one supply circuit portion of said circuit supplying signals to said reproducing device, circuit connections for completing supply connections from said circuit to said reproducing device including a circuit connection connecting said contact element to one terminal of said sound reproducing device, and a rotatably actuated control member manually actuatable for moving said contact element endlessly along said endless resistance path so that in each complete cycle of movement of said contact element over the entire length of said endless resistance path—from a position corresponding to minimum volume of sound output—the volume of sound output will gradually increase to a maximum volume and then gradually decrease to a minimum volume.

36. In a protective system as claimed in claim 4, at least some of said signaling elements including an electrically actuated sound reproducing device for generating sound corresponding to signals transmitted through said circuit; and a volume control arrangement for at least one of said sound reproducing devices comprising a resistance structure extending along a loop-like end-

less path and forming a substantially continuous endless resistance path, a contact element continuously movable along said continuous path and arranged to establish electrical contact engagement with successive elements of said endless resistance path, a relatively fixed element of said endless resistance path being connected to one supply circuit portion of said circuit supplying signals to said reproducing device, circuit connections for completing supply connections from said circuit to said reproducing device including a circuit connection connecting said contact element to one terminal of said sound reproducing device, and a rotatably actuated control member manually actuatable for moving said contact element endlessly along said endless resistance path so that in each complete cycle of movement of said contact element over the entire length of said endless resistance path—from a position corresponding to minimum volume of sound output—the volume of sound output will gradually increase to a maximum volume and then gradually decrease to a minimum volume.

37. In a protective system as claimed in claim 5, at least some of said signaling elements including an electrically actuated sound reproducing device for generating sound corresponding to signals transmitted through said circuit; and a volume control arrangement for at least one of said sound reproducing devices comprising a resistance structure extending along a loop-like endless path and forming a substantially continuous endless resistance path, a contact element continuously movable along said continuous path and arranged to establish electrical contact engagement with successive elements of said endless resistance path, a relatively fixed element of said endless resistance path being connected to one supply circuit portion of said circuit supplying signals to said reproducing device, circuit connections for completing supply connections from said circuit to said reproducing device including a circuit connection connecting said contact element to one terminal of said sound reproducing device, and a rotatably actuated control member manually actuatable for moving said contact element endlessly along said endless resistance path so that in each complete cycle of movement of said contact element over the entire length of said endless resistance path—from a position corresponding to minimum volume of sound output—the volume of sound output will gradually increase to a maximum volume and then gradually decrease to a minimum volume.

38. In a protective system as claimed in claim 6, at least some of said signaling elements including an electrically actuated sound reproducing device for generating sound corresponding to signals transmitted through said circuit; and a volume control arrangement for at least one of said sound reproducing devices comprising a resistance structure extending along a loop-like endless path and forming a substantially continuous endless resistance path, a contact element continuously movable along said continuous path and arranged to establish electrical contact engagement with successive elements of said endless resistance path, a relatively fixed element of said endless resistance path being connected to one supply circuit portion of said circuit supplying signals to said reproducing device, circuit connections for completing supply connections from said circuit to said reproducing device including a circuit connection connecting

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said contact element to one terminal of said sound reproducing device, and a rotatably actuated control member manually actuatable for moving said contact element endlessly along said endless resistance path so that in each complete cycle of movement of said contact element over the entire length of said endless resistance path—from a position corresponding to minimum volume of sound output—the volume of sound output will gradually increase to a maximum volume and then gradually decrease to a minimum volume.

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