

[72] Inventor **McNeil Bryan**
3000 E. Hennepin, Minneapolis, Minn.
55413
[21] Appl. No. **799,382**
[22] Filed **Feb. 14, 1969**
[45] Patented **Aug. 24, 1971**

2,827,515 3/1958 Zuber..... 179/5
2,780,671 2/1957 Thery..... 179/5

FOREIGN PATENTS

452,711 11/1934 Great Britain..... 179/5

Primary Examiner—Kathleen H. Claffy

Assistant Examiner—Tom D'Amico

Attorney—Merchant & Gould

[54] SECURITY SYSTEM 2 Claims, 6 Drawing Figs.

[52] U.S. Cl. 179/5 P,
179/90 B

[51] Int. Cl. H04m 11/04

[50] Field of Search..... 179/5, 90 B,
90 BB, 90 BD, 90 ADO, 90 CI; 340/213, 214, 225,
248, 253

[56] References Cited UNITED STATES PATENTS

3,511,933 5/1970 Holmes 179/5
3,124,650 3/1964 Rostad 179/5

ABSTRACT: A plurality of burglar and fire sensors and emergency switches connected to relays for providing output signals upon activation of one of the sensors or switches, which signals activate a desired tape recording that dials a remotely located telephone and provides a voice message thereon. The system includes circuitry which energizes indicators upon the occurrence of internal trouble therein. The system further includes a self-contained power source which automatically switches from line to internal batteries and means for delaying recorded telephone dialing pulses to reduce errors in dialing due to momentary failures of the system.

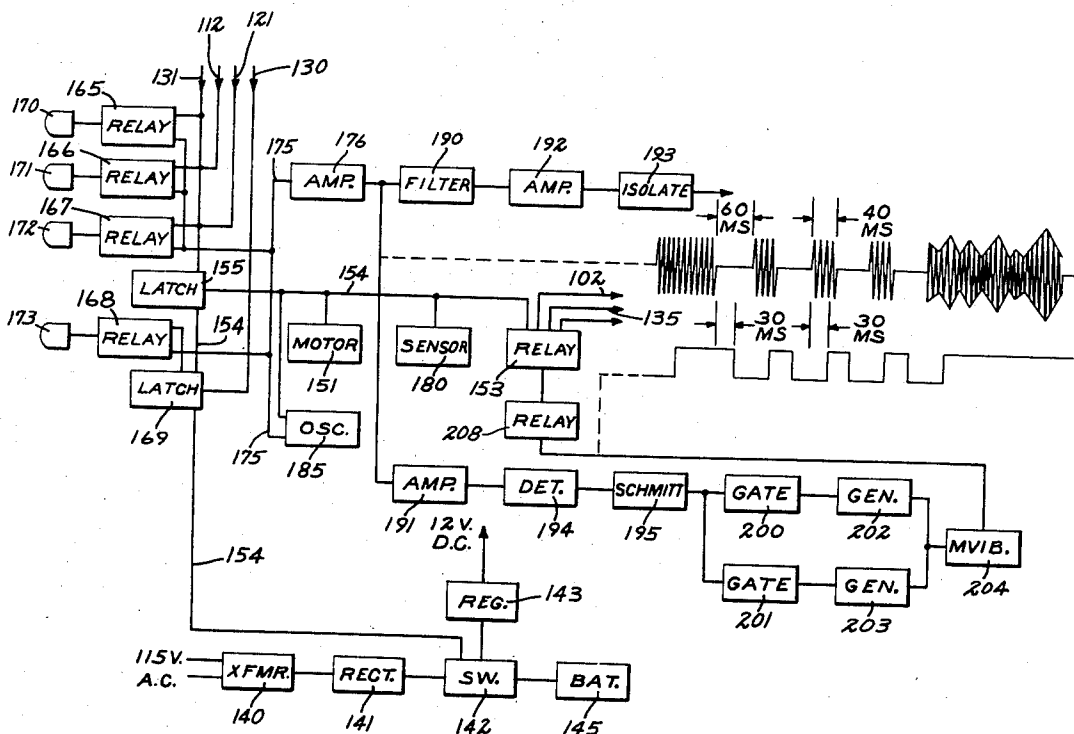


FIG. 1

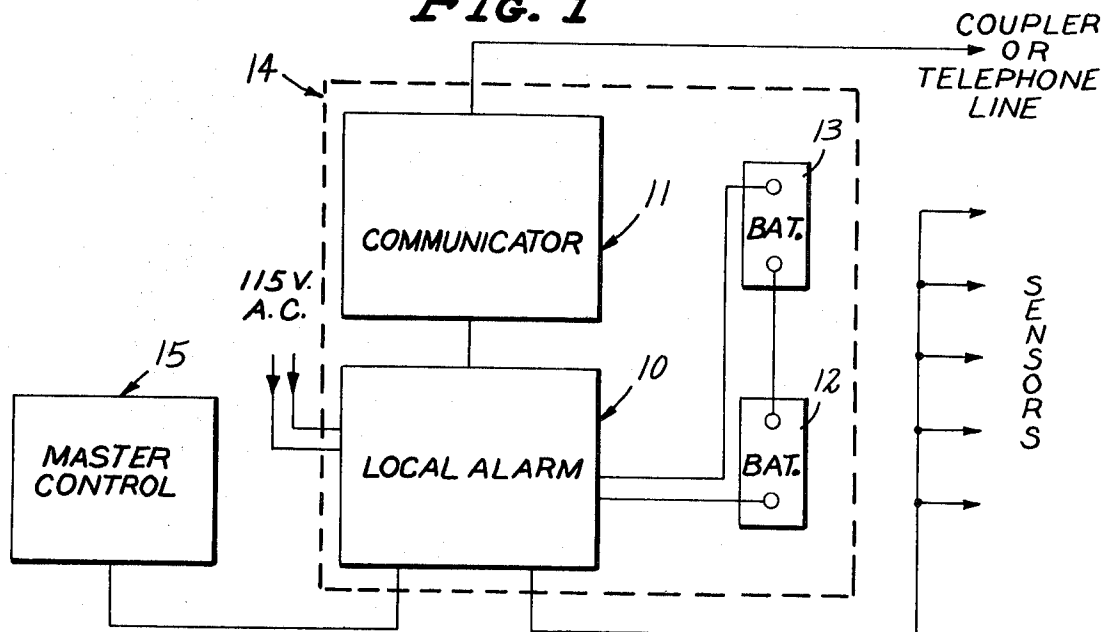
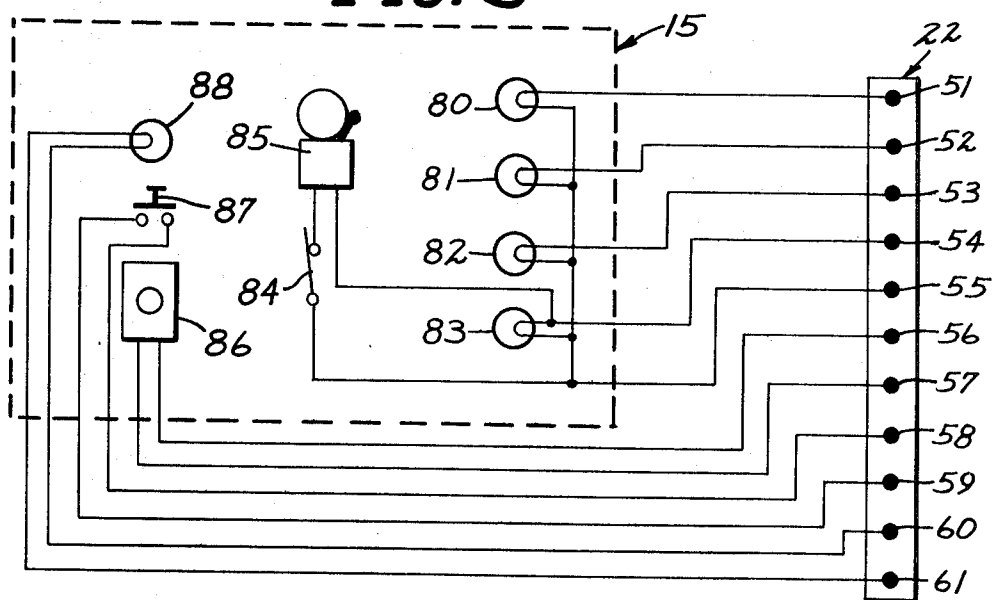
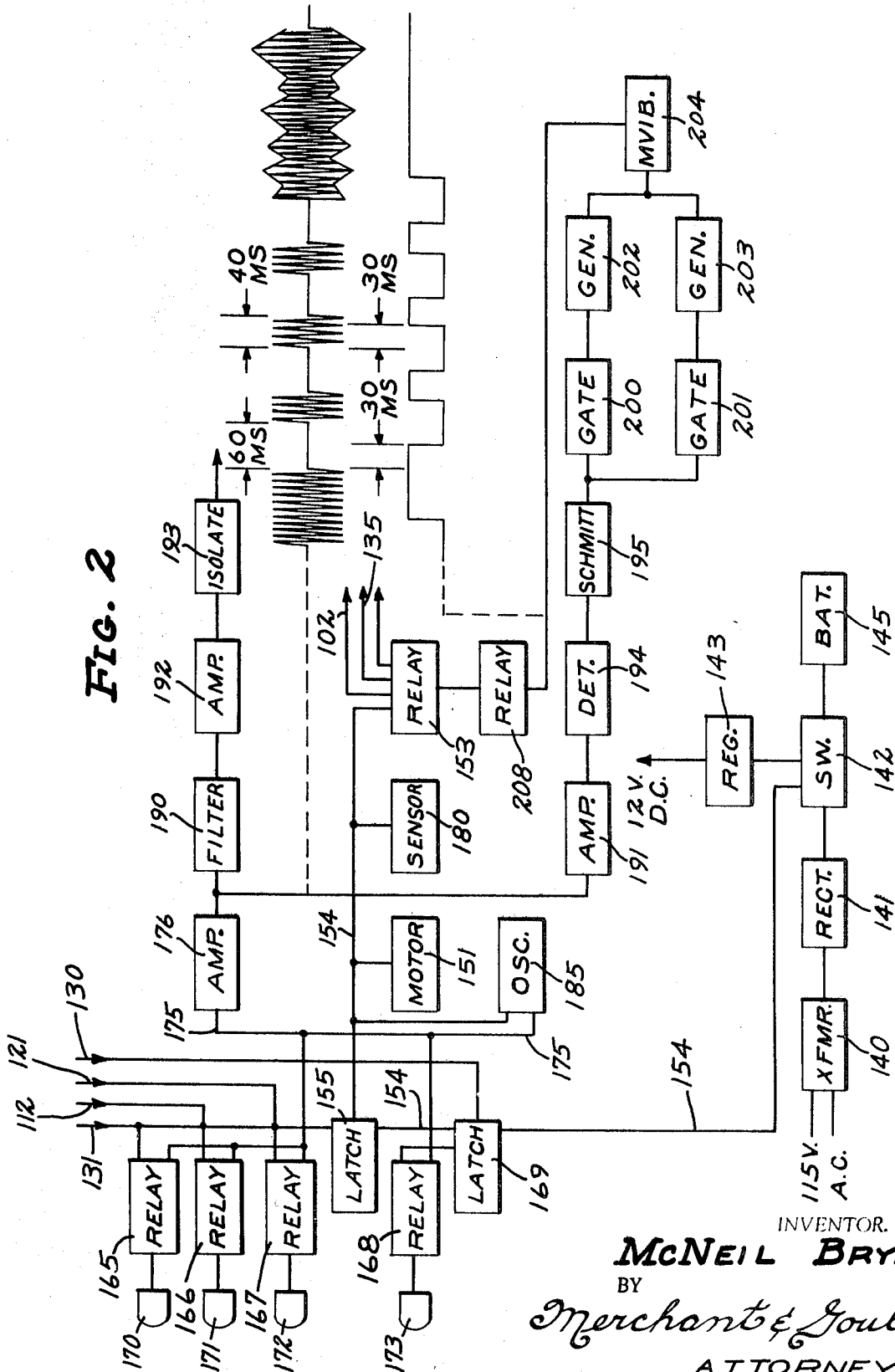


FIG. 3



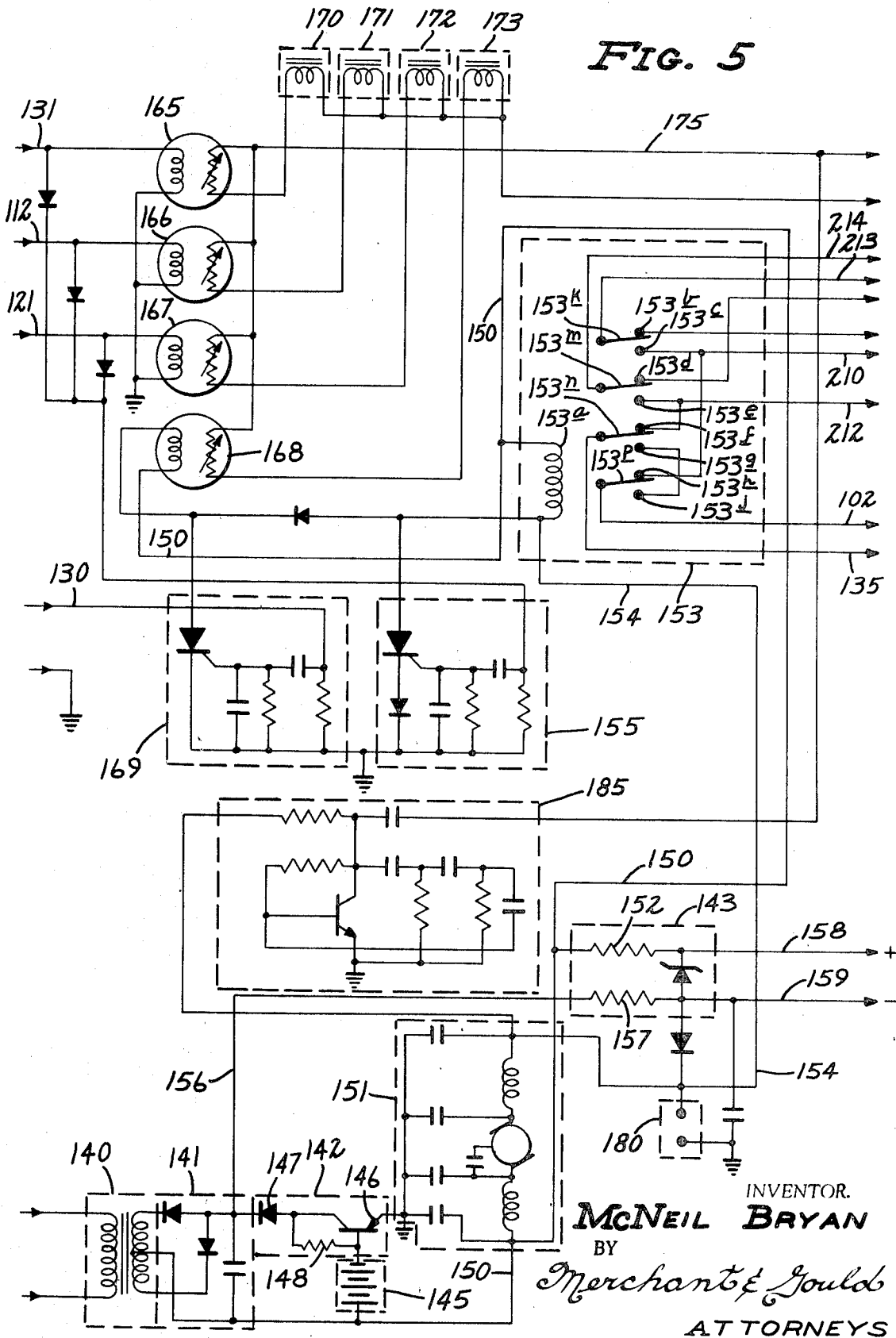
INVENTOR.
McNEIL BRYAN
 BY
Merchant & Gould
 ATTORNEYS

FIG. 2



INVENTOR.
McNEIL BRYAN
 BY
Merchant & Gould
 ATTORNEYS

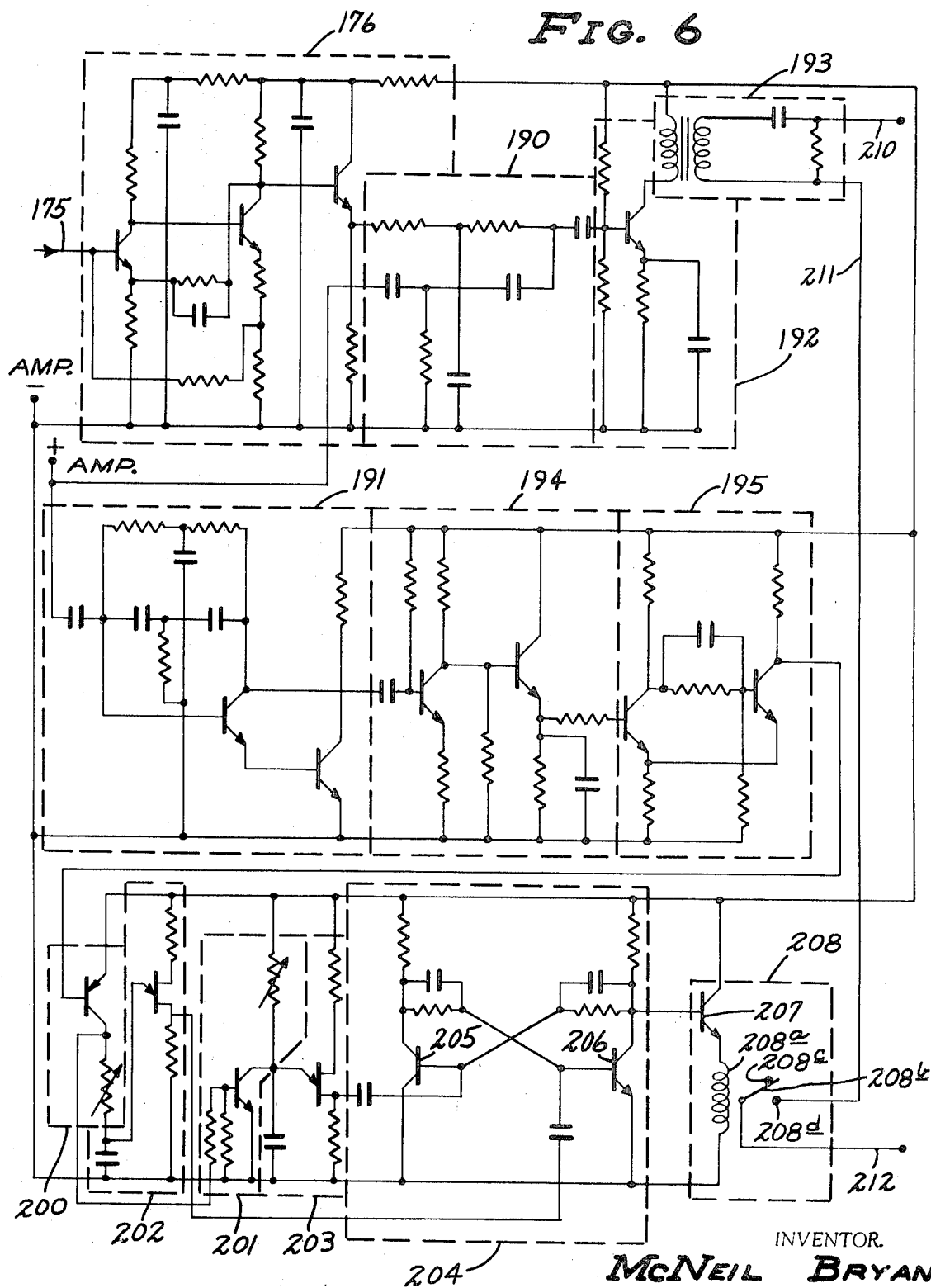
FIG. 5



INVENTOR.
McNEIL BRYAN
BY

Merchant & Gould
ATTORNEYS

FIG. 6



INVENTOR.

McNEIL BRYAN

BY

Merchant & Gould

ATTORNEYS

SECURITY SYSTEM

BACKGROUND OF THE INVENTION

1. Field of the Invention

Security systems are useful in the home and in certain commercial structures to warn the occupants of impending danger, such as intruders, fire, etc. In general these systems include a plurality of sensors distributed strategically around the structure to be protected and attached to circuitry designed to sound an appropriate alarm upon the operation of one or more of the sensors. The alarm may be various types of indicators, such as bells, lights, etc., contained within the structure or the circuitry may automatically dial a predetermined number, such as the nearest fire station, police station, etc., and give a voice message when the remote telephone is answered.

2. Description of the Prior Art

Many prior art devices contain pluralities of sensors for fire and burglary. Further, many of these devices have electrical circuitry for automatically dialing the telephone and transmitting a voice message thereover. However, these prior art systems have many disadvantages in that activating more than one type of sensor can produce confusion in the electronics. Also, these systems and devices contain no apparatus for monitoring internal failures and correct operation of the system can only be checked through the complete operation thereof. In addition to the above the prior art devices and systems are limited in that most of them only incorporate burglar and fire sensors and additional types of sensors cannot be incorporated therein.

SUMMARY OF THE INVENTION

The present invention pertains to a security system including a plurality of condition responsive means attached to relay means through electrical circuitry so as to supply a predetermined output signal, which is in turn attached to memory means connected to dial predetermined remote telephones and supply a voice message thereto and circuitry for continually monitoring the correct operation of substantial portions of the system and for providing an indication of a failure therein.

It is an object of the present invention to provide a new and improved security system.

It is a further object of the present invention to provide an improved security system having a plurality of condition responsive means sensitive to a plurality of different conditions and electrical circuitry attached thereto having a priority system whereby only the higher priority signal is transmitted in the event of a plurality of conditions occurring simultaneously.

It is a further object of the present invention to provide an improved security system wherein the electronic circuitry substantially prevents dialing errors due to momentary failures in the memory circuit.

It is a further object of the present invention to provide a security system which may be easily adapted to include a number of additional condition responsive means, such as emergency switches, circuits operable upon the occurrence of internal trouble, etc.

These and other objects of this invention will become apparent to those skilled in the art upon consideration of the accompanying specification, claims, and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Referring to the drawings, wherein like characters indicate like parts throughout the figures:

FIG. 1 is a block diagram of the overall system;

FIG. 2 is a block diagram of the communicator;

FIG. 3 is a schematic drawing of the master control circuit;

FIG. 4 is a schematic drawing of the local alarm circuit; and

FIGS. 5 and 6 are schematic drawings of the communicator, shown in block diagram in FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, a simple block diagram of the complete system is illustrated. A block 10 labeled "local alarm" is connected to a second block 11 labeled "communicator." The local alarm 10 has two series connected batteries 12 and 13 connected thereto. The local alarm 10, communicator 11, and batteries 12 and 13 are contained within a convenient housing 14 which is situated at some position within the house or other structure to be protected, so as to be convenient for servicing but difficult for intruders or fire to render inoperative. A block 15 labeled "master control" is connected to the local alarm 10 and adapted to be positioned at some convenient place, such as the master bedroom. A plurality of lines indicate connection of sensors to the local alarm 10 and a pair of leads indicate attachment to a suitable source of power, such as 115 volts AC. Also, a lead indicates a connection between the communicator 11 and a telephone line or a dial pulse coupler belonging to the telephone company providing the telephone service. These various lines connected to the local alarm 10 and the communicator 11 will be described in more detail presently.

In the schematic diagram, FIG. 4, the various components of the local alarm 10 are enclosed within a dotted line block designated 10. Three terminal boards 20, 21 and 22 are illustrated in FIG. 4 outside of the dotted block 10, but it should be understood that these terminal boards 20, 21 and 22 might be located within the local alarm or at any other convenient position. The terminal board 20 contains 25 terminals numbered 23 through 47. The terminal board 21 contains three terminals numbered 48 through 50. The terminal board 22 contains 11 terminals numbered 51 through 61. The terminal board 22 connects various leads from the master control 15 to the terminal board 20 and is illustrated in FIG. 3. The schematic diagram of FIG. 3 illustrates the various components of the master control 15 within a dotted line box designated 15.

In FIG. 4 a two-wire loop including a first wire 65 and a second wire 66 has a plurality of fire sensors 67 connected in parallel between the wires 65 and 66. One end of the wire 65 is connected to the terminal 23 and the other end is connected to the terminal 26. One end of the wire 66 is connected to the terminal 24 and the other end is connected to the terminal 25. An outside bell is connected across the terminals 27 and 28. An inside bell is connected across the terminals 29 and 30. The terminal 31 is connected to the terminal 55 of the terminal board 22. Terminal 32 is connected to the terminal 54 of the terminal board 22. A plurality of emergency switches 68 are connected in parallel across the terminals 33 and 34. In addition, the terminals 56 and 57 of the terminal board 22 are connected in parallel with the terminals 33 and 34. The terminal 35 is connected to the terminal 53 and the terminal 36 is connected to the terminal 51 of the terminal board 22.

A second double-wire loop, including a wire 69 and a wire 70 has a plurality of normally open burglary sensors 71 connected in parallel therebetween and a plurality of normally closed or shorted burglary sensors 72 connected in series with the wire 69. One end of the wire 69 is connected to the terminal 37 and the other end is connected to the terminal 40. One end of the wire 70 is connected to the terminal 38 and the other end is connected to the terminal 39. A normally open pressure switch 73 is connected between the wires 69 and 70 to provide a third type of burglary sensor. The pressure switch 73 is the type that might be in a pressure mat or the like located, for example, at the bottom of a stairs so that a burglar entering the enclosure without disturbing any of the burglary sensors 71 and 72 would produce a short between the wires 69 and 70 upon stepping on the mat at the bottom of the stairs.

The terminal 41 is connected to one side of a green light 74 and the terminal 42 is connected to one side of a red light 75. The green light 74 is an optional light associated with the

system which indicates that the burglary loop, wires 69 and 70, is in operating condition. That is, the burglary loop is in operating condition when all of the doors and windows are closed so that the sensors 71 and 72 are in the correct operating position. The opposite side of the green light 74 and the red light 75 are connected together and to the terminal 45. A pushbutton switch 76 is connected between the terminals 43 and 44. The pushbutton switch 76 places the system in an operating condition, as will be described presently, and causes the red light 75 to be energized. The pushbutton switch 76 is a momentary switch and will be located at some convenient place, such as near exits. Generally at least one pushbutton switch 76 will be located external of the building and will be operated by a key so that the last person leaving the building can activate the system. A pressure switch 77, similar to the pressure switch 73, is connected between the terminals 42 and 43 and operates to deactivate the burglary system upon the closure thereof. In general the pressure switch 77 would be located at the top of the stairs with the switch 73 at the bottom thereof. Thus, an occupant going down the stairs would deenergize the burglary system but a burglar going up the stairs would activate it. The terminals 42, 43, 44, 45 and 47 are connected to terminals 60, 58, 59, 61 and 52, respectively, of terminal board 22. Terminals 48 and 49 of terminal board 21 are adapted to have a suitable source of power attached thereto, such as 115 volts AC Terminal 50 on terminal board 21 is connected to a suitable ground.

Referring to FIG. 3 a schematic diagram of the master control 15 is illustrated and the connection thereof to the terminal board 22. Included within the master control 15 are four lights 80 through 83 which operate as indicators for the four different conditions to which this embodiment of the system is sensitive. One side of each of the lights 80 through 83 is connected to the terminal 55 and to one side of a silence switch 84. The other side of each of the lights 80 through 83 is connected to the terminals 51 through 54, respectively. The opposite side of the silence switch 84 is connected to one side of an alarm bell 85. The opposite side of the alarm bell 85 is connected to the terminal 54. An emergency switch 86 is connected between the terminals 56 and 57, which is in parallel with the emergency switches 68 previously described. A pushbutton switch 87 is connected between the terminals 58 and 59, which is in parallel with the pushbutton switch 76 previously described. A red light 88 is connected between the terminals 60 and 61, which is in parallel with the red light 75 previously described. Thus, a master control panel 15 is provided which contains all of the indicators necessary to determine the operation of the system and a pushbutton switch 87 for activating the burglary system.

Referring to FIG. 4, the fire channel includes a pair of relays 90 and 91. Relay 90 includes a coil 90a, a moveable contact arm 90b and first and second stationary contacts 90c and 90d, with the arm 90b biased into engagement with the contact 90d when the coil 90a is deenergized. Similarly relay 91 includes a coil 91a, a moveable contact arm 91b and two stationary contacts 91c and 91d, with the arm 91b biased into engagement with the contact 91d when the coil 91a is deenergized. Although the relay 90 is located in the fire channel, the operation thereof provides a signal at the contact 90d, which signal is indicative of trouble or a failure in the fire circuit. The emergency channel includes a relay 92, similar to the relays 91 and 90, having a coil 92a, moveable contact arm 92b, a first contact 92c and a second contact 92d, with the arm 92b being biased into engagement with the contact 92d when the coil 92a is deenergized. The burglary channel includes three relays 93, 94 and 95, with the relays 93 and 95 being similar to the relay 90 and the relay 94 being a bistable relay. Relay 93 has a coil 93a, a moveable contact arm 93b and a pair of stationary contacts 93c and 93d, with the arm 93b being biased into engagement with the contact 93d when the coil 93a is deenergized. The relay 95 has a coil 95a, a moveable contact arm 95b and a pair of stationary contacts 95c and 95d, with the arm 95b being biased into engagement with the contact 95d when

the coil 95a is deenergized. The bistable relay 94 has a coil 94a and a pair of moveable contact arms 94b and 94c connected together for simultaneous movement. The arm 94b has a pair of stationary contacts 94d and 94e associated therewith and the contacts 94c has a pair of stationary contacts 94f and 94g associated therewith. The arms 94b and 94c are connected so that when the arm 94b is engaged with the contact 94d the arm 94c is engaged with the contact 94f. Since the relay 94 is a bistable relay the arms 94b and 94c are not biased in either direction but will remain engaged with a given pair of contacts, even after power is removed from the coil 94a, until power is again applied to the coil 94a. The trouble or supervisory channel includes a relay 96 in addition to the relay 90 already described. Relay 96 is similar to relay 90 and has a coil 96a, a moveable contact arm 96b and a pair of stationary contacts 96c and 96d, with the arm 96b being biased into engagement with the contact 96d when the coil 96a is deenergized.

To provide a proper source of power for the operation of the portions of the system described above, the AC voltage supplied to the terminals 48 and 49 of the terminal board 21 is connected through a fuse to the primary of a transformer 97. The secondary of the transformer 97 is connected to a full-wave rectifying bridge 98 having a filter capacitor 99 attached across the output thereof. AC is also supplied from the secondary of the transformer 97 to a second power supply in the electronic circuitry which will be described in conjunction with FIG. 5. The positive terminal of the rectifying bridge 98 is connected through a diode 100 to a line 101. The positive terminal also has a line 102 coming directly therefrom, which line 102 forms a portion of a supervisory loop, and the other end of which is connected to circuitry in FIG. 5 as will be explained presently. The negative terminal of the rectifying bridge 98 is connected through an on-off switch 103 to a line 104. In addition to the 115 volt AC power supply described above an emergency DC supply is included which automatically supplies power to the system when the 115 volt AC fails. The emergency supply includes a battery (not shown) the positive terminal of which is connected to a terminal 105 and the negative terminal of which is connected to a terminal 106. The terminal 105 is connected through a diode 107 to the line 101 and the terminal 106 is connected directly to the negative terminal of the rectifying bridge 98. The rectifying bridge 98 is designed so that the voltage normally on the line 101 is slightly higher than the battery voltage applied to the terminal 105, whereby the diode 107 is back-biased and no current flows therethrough. With a failure of the rectifying bridge 98 the current is free to flow from the battery through the diode 107 to the line 101 with substantially no interruption of power on the line 101.

The positive line 101 from the power supply is connected to the terminal 37 on the terminal board 20, the arm 93b of relay 93, the arm 94b of relay 94 and the arm 95b of relay 95. The coil 93a is connected between terminals 39 and 40. The negative line 104 from the power supply is connected to one side of the coil 95a, one side of the coil 94a, one side of a resistor 110, and terminal 45 on the terminal board 20. The other side of the coil 95a is connected to terminal 47 on the terminal board 20, arm 94c of relay 94, a switch 111 for optionally connecting an outside bell to the burglar channel, terminal 95c of the relay 95 and a burglary channel output 112, the further connection of which will be explained presently. The opposite side of the coil 94a is connected to the terminal 43 on terminal board 20. The opposite side of the resistor 110 is connected to the terminal 38 on the terminal board 20. The terminal 95d is connected to the terminal 26 on the terminal board 20 and to the arm 91b of the relay 91. The stationary contact 94f of the relay 94 is connected to the stationary contact 93d of the relay 93. The stationary contacts 94g and 94e have no connection thereto. The stationary contact 94d is connected to the terminal 42 on the terminal board 20. The stationary contact 93c of the relay 93 is connected to the terminal 41 on the terminal board 20. The anode of a diode 115 is connected to the terminal 41 and the cathode is connected to the terminal 44 on

the terminal board 20. The anode of a diode 116 is connected to the terminal 42 and the cathode is connected to the terminal 44 through the diode 115 to one of the contacts of the pushbutton switch 76.

Thus, power is supplied to the wires 69 and 70 making up the burglary loop at terminals 37 and 38 and the opposite ends thereof have the coil 93a thereacross. When the burglary loop is undisturbed the relay 93 is energized and the arm 93b is engaged with the stationary contact 93c. Power is thereby supplied through the arm 93b and contact 93c, through the diode 115 to one of the contacts of the pushbutton switch 76. If the red light 75 is out the arms 94b and 94c of the relay 94 are engaged with the contacts 94g and 94e, respectively. Depressing the pushbutton switch 76 energizes the coil 94a which moves the arms 94b and 94c into engagement with the contacts 94d and 94f, whereby the red light 75 is energized. With the relay 94 in the ready position any shorting or opening of the burglary loop by activating one of the burglary sensors 71 or 72, deenergizes the coil 93a whereby the arm 93 moves into contact with the stationary contacts 93d (as shown in FIG. 4). Thus, power is supplied through the arm 93b and contact 93d and through the contact and contact 95 and the arm 94c to energize the coil 95a. Energizing the coil 95a moves the arm 95b from engagement with the contact 95d into engagement with the contact 95c, whereby a positive signal is applied to the burglary channel output 112. Simultaneously the positive signal applied to energize the coil 95a is supplied to the burglary light 81 on the master control 15 and may optionally be applied through the switch 111 and diode 117 to an outside bell. It should be understood that the local alarm 10 can be utilized as a complete system and the communicator 11 is not necessary to the operation thereof. However, if a communicator 11 is also included in the system the positive signal at the burglary channel output 112 is supplied to the communicator 11 and will operate in a fashion to be described presently. It should be noted that once the coil 95a is energized power is supplied through the arm 95b and contact 95c to retain the coil 95a energized and the circuit cannot be deenergized until the on-off switch 103 is operated.

The negative line 104 is connected to one side of the coil 92a of the emergency relay 92 and to terminals 28, 29 and 31 on the terminal board 20. The opposite side of the coil 92a is connected to terminals 34 and 35 on the terminal board 20, stationary contact 92c, an emergency bell cutoff switch 120, and an emergency channel output 121. The opposite side of the emergency bell cutoff switch 120 is connected through a diode 122 to terminal 27 on the terminal board 20, which is the positive side of an outside bell 123 the negative side of which is connected to the terminal 28. The negative side of an inside bell 124 is connected to the terminal 29 and the positive side is connected to the terminal 30. The terminal 30 is connected through a diode 125 to the terminal 27. The arm 92b of the relay 92 is connected to terminal 33 on the terminal board 20 and to the stationary contact 91d of the fire channel relay 91. The stationary contact 91d is in turn normally engaged by the arm 91b which is connected to the stationary contact 95d of the burglary channel relay 95. Since the arm 95b of the relay 95 is normally engaged with the stationary contact 95d and is further attached to the positive line 101, power is supplied through the arm 95b and stationary contact 95d and through the arm 91b and stationary contact 91b to the arm 92b of the emergency channel relay 92 and to the terminal 33 of the terminal board 20, which is connected to one side of each of the emergency switches 68 and to one side of the emergency switch 86 in the master control 15. Therefore, depressing one of the emergency switches 68 or the emergency switch 86 shorts the terminal 33 to the terminal 34 which applies power across the coil 92a causing the arm 92b to move into engagement with the stationary contact 92c. Engagement of the arm 92b with the contact 92c locks the relay 92 in the energized position and supplies a signal at the emergency channel output 121. Further, a positive signal is applied through the diode 122 to the outside bell 123 and through the

diodes 122 and 125 to the inside bell 124. The outside the inside bells 123 and 124 can be shut off by opening the emergency bell cutoff switch 120. The signal at the emergency channel output 121 is applied to the communicator 11 and will be discussed in detail presently.

In the fire channel the operation of the relay 91 provides a signal indicative of a fire, or the operation of one of the fire sensors 67, while the relay 90, which is located in the fire channel, provides a signal indicative of trouble or failure in the fire channel. The coil 90a is connected between the terminals 23 and 24 of the terminal board 20, or across one end of the fire sensor loop. One end of the coil 91a is connected to the terminal 25 while the other end is connected to the negative line 104. Thus, since positive voltage is prevalent on terminal 26 of the terminal board 20 through the arm 95b and stationary contact 95d of the burglary channel relay 95, a circuit is completed through the wire 65, coil 90a, the wire 66 and the coil 91a to the negative side of the power supply. Coil 90a of relay 90 is constructed so that it is energized as long as the above-described circuit therethrough is complete. Thus, with the fire sensor loop intact and none of the fire sensors 67 activated, the arm 90b of the relay 90 is engaged with the contact 90c. The arm 90b is further attached to the contact 92d of the emergency channel relay 92 and normally obtains a positive voltage therefrom. The stationary contact 90c has no connections thereto and the stationary contact 90d is connected to a service channel output 130 which supplies a positive signal to the communicator 11, as will be described presently. The contact 90d is also connected to terminal 32 of the terminal board 20 which is attached to the service light 83 of the master control 15. Thus, any break in either of the wires 65 or 66 deenergizes the coil 90a causing the arm 90b to move into engagement with the contact 90d, whereby a positive voltage is supplied to the service channel output 130 and to the service light 83 in the master control 15.

The coil 91a of the fire channel relay 91 is constructed so that the small amount of current passing therethrough to energize the coil 90a is not sufficient to energize the coil 91a. However, upon the activation of any of the fire sensors 67, the current through the coil 91a is increased sufficiently to cause energization thereof. When the coil 91a is energized the arm 91b moves into engagement with the stationary contact 91c. Stationary contact 91c is connected to a fire channel output 131, terminal 27 of the terminal board 20 through a diode 132, and terminal 36 on the terminal board 20. Thus, since the arm 91b has a positive voltage thereon from the arm 95b and stationary contact 95d of the burglary channel relay 95, when the coil 91a is energized a positive voltage is supplied through the arm 91b and stationary contact 91c to the fire channel output 131, which is connected to the communicator 11 as will be described presently. Further, a positive voltage is supplied through the diode 132 to the positive side of the outside bell 123 and through the diodes 132 and 125 to the positive side of the inside bell 124 as well as to the fire light 80 on the master control 15 by way of the terminal 36 on the terminal board 20.

The relay 96 is a service or trouble relay, in addition to relay 90 which operates to provide an indication of trouble or a failure in the system. One side of the coil 96a of the service relay 96 is connected to a line 135 forming a portion of the supervisory loop, which line 135 is connected to the communicator 11, as will be described in detail presently. The opposite side of the coil 96a is connected to a stationary contact 136 of a two-position test switch having a second stationary contact 137 attached to the terminal 105, or the positive battery terminal, and a moveable arm 138 attached to terminal 30 on the terminal board 20. The communicator 11 normally operates to provide a short between the line 102 and the line 135, as will be described presently, when the circuitry is operating correctly and none of the sensors have been activated. Thus, a circuit is completed from the plus side of the power supply (line 102), through the short between lines 102 and 135, through the coil 96a, stationary contact 136 and moveable arm 138 of the test switch, and the inside bell 124

back to the line 104 of the negative side of the power supply. The coil 96a is of the high resistance type so that current traveling in the above-described circuit is sufficient to energize the relay 96 and maintain the moveable arm 96b engaged with the stationary contact 96c but the current is not sufficient to cause the inside bell 124 to ring. When the test switch moveable arm 138 is moved into engagement with the stationary contact 137, positive voltage from the battery is applied directly to the inside bell 124 causing it to operate. Simultaneously, the coil 96a is deenergized and the arm 96b moves into engagement with the stationary contact 96b. The stationary contact 96b is attached to the stationary contact 92d of the emergency relay 92 and has a plus voltage thereon when the emergency relay 92 is in the normal or deenergized position. The moveable arm 96b is connected to the service channel output 130, which is also connected to the stationary contact 90d of the relay 90, shown separately for convenience in drawing. Thus, when the moveable contact 96b moves into engagement with the stationary contact 96d a plus voltage or trouble signal is supplied to the service channel output 130.

It should be noted that each of the various channels, burglary, fire, emergency and service, supply a positive output signal to the communicator 11 with the actuation of certain condition responsive means and the signals supplied to the communicator 11 are preferentially supplied. That is, each of the various signals has a preferential order and when one signal is being supplied to the communicator only a signal of higher order can be supplied to the communicator at which time all lower order signals are removed. Thus, only one signal at a time is supplied to the communicator 11. This is accomplished, in this preferred embodiment, by connecting all of the contacts of the relays which provide the outputs in series with the positive side of the power supply. The moveable arm 90b of the service relay 90 and the stationary contact 96b of the service relay 96 are connected to the stationary contact 92d of the emergency relay 92. The movable contact of the emergency relay 92b is connected to the stationary contact 91d of the fire relay 90. The moveable contact 91b of the fire relay 91 is connected to the stationary contact 95d of the burglary relay 95. The moveable contact 95b of the burglary relay is connected through the line 101 to the positive side of the power supply. Thus, actuation of either of the relays 90 or 96 supplies a positive output voltage to the service channel output 130. Actuation of the emergency relay 92 removes positive voltage from the contacts of the service relays 90 and 96 and supplies a positive signal to the emergency channel output 121. Energization of the fire relay 91 removes positive voltage from the contacts of the emergency relay 92 and the service relays 90 and 96, and supplies a positive signal to the fire channel output 131. Energization of the burglary relay 95 removes positive voltage from the contacts of the fire relay 91, the emergency relay 92 and the service relays 90 and 96 and supplies a positive signal to the burglary channel output 112. It should be understood that additional channels for additional conditions which it is desired to sense might be added to the present system and each of the channels can be assigned a specific priority. It should further be understood that some modifications and improvements to the priority system might be desired by those skilled in the art.

While the local alarm system 10, described in conjunction with FIG. 4, can be utilized by itself with all alarms and signals being contained within the structure being protected, in this embodiment the communicator 11 is supplied to illustrate the connection of the local alarm 10 to a telephone line for providing signals at remote stations, such as police stations, fire stations, etc. The communicator 11 is illustrated in block form in FIG. 2 and in schematic form in FIGS. 5 and 6. For simplicity of description and understanding, the various portions of the communicator 11 illustrated schematically are outlined with dotted blocks and will be identified by the same numeral identifying the similar block in FIG. 2. Further, standard circuitry will not be described in detail since the operation thereof will be obvious to those skilled in the art.

The fire channel output 131, burglary channel output 112, emergency channel output 121 and service channel output 130, illustrated in FIG. 4, are connected to similarly marked leads in FIGS. 2 and 5. Further, two leads connected to either side of the transformer 97 in FIG. 4 are connected to the primary of a transformer 140 in FIGS. 2 and 5 and supply AC power thereto. The AC power supplied to the transformer 140 is stepped down to the correct voltage and rectified in a rectifying and filtering unit 141. The DC power from the rectifying and filtering unit 141 is supplied through a regulator/switch 142 to a low voltage regulator 143. The regulator/switch 142 includes a rechargeable battery 145 having the positive terminal connected to the positive output of the unit 141 and the negative terminal connected to the base of a P-N-P type transistor 146. The emitter of the transistor 146 is grounded and the collector is attached to the anode of a diode 147. The cathode of the diode 147 is connected to the negative terminal of the unit 141. A resistor 148 is connected between the collector and the base of the transistor 146. In this connection the transistor 146 operates as a switch and the battery 145 operates as a regulator. When the voltage at the output of the unit 141 is above the voltage of the battery, current flows into the battery for the recharging thereof. When the voltage at the output of the unit 141 drops below that of the battery 145, the battery 145 operates as a source to sustain or support the output voltage at the desired level.

A positive line 150 extends from the positive side of the rectifying unit 141 and the positive side of the battery 145 and connects to one side of a motor 151, one side of a resistor 152 and one side of a coil 153a associated with a relay 153. The opposite side of the motor 151 is connected, by means of a line 154 to the opposite side of the coil 153a and to the positive terminal of a latching circuit 155. A negative line 156 extends from the negative terminal of the rectifying unit 141 to one side of a resistor 157. The resistors 152 and 157 form a portion of the low voltage regulator 143 and have a Zener diode connected between the ends thereof opposite the ends connected to the lines 150 and 156. Positive and negative leads 158 and 159, respectively, extend from opposite sides of the Zener in the low voltage regulator 143 and supply power to the various transistors and other active circuits in the electronic circuitry.

The three outputs 131, 112 and 121, from the local alarm 10 are connected to three optical or photosensitive relays 165-167, respectively, so as to supply energy to the lights therein. In addition, the three outputs 131, 112 and 121 are connected to an input of the latching circuit 155. The line 154, in addition to being connected to the positive terminal of the latching circuit 155 is connected through a diode to the positive terminal of a second latching circuit 169 and to one side of the light source in a fourth optical or photosensitive relay 168. The opposite side of the light source in the photosensitive relay 168 is connected to the line 150. The fourth output 130 from the local alarm 10 is connected directly to the input of the latching circuit 169. Both of the latching circuits 155 and 169 have a grounded terminal therein. The latching circuits 155 and 169 are a standard silicon controlled rectifier-type circuit wherein a positive pulse at the input triggers the silicon-controlled rectifier causing the positive terminal to drop to approximately ground potential. It can be seen that a positive signal on any one of the fire channel output 131, the burglary channel output 112 or the emergency channel output 121 will cause the latching circuit 155 to operate whereby a circuit to ground is completed through the coil 153a and the motor 151 and energization thereof occurs. If a positive signal appears on the service channel output 130, the latching circuit 169 operates whereby, in addition to energization of the relay 153 and motor 151, the photosensitive relay 168 is energized.

The motor 151 powers a cartridge-type tape deck with a four-channel output each channel of which contains several sequences of recorded data corresponding to a telephone number to be dialed and a verbal message. The dialing infor-

mation is recorded in the form of a carrier, having a frequency of approximately 5 KC. in this embodiment, which carrier is interrupted to produce pulses and removed to produce a "hand up" condition and modulated by the verbal message. Each of the channels corresponds with one of the channels in the local alarm, fire, burglary, emergency, and service, and has a playback magnetic head 170 through 173, respectively, associated therewith. When a positive signal is prevalent at one of the outputs 131, 112, 121 or 130, the associated photosensitive relay 165-168, respectively, is activated and the motor 151 is energized so that the signal produced by the associated magnetic head 170-173 is free to pass through the photosensitive relay 165-168, respectively, and onto a line 175 connected to the input of a preamplifier 176, (see FIG. 6).

The end of the tape (subsequent to the several sequences of recorded data) has a small piece of conducting foil or the like attached thereto which is utilized to stop the operation of the system. A stop sensor 180, consisting of a pair of adjacent conducting terminals one of which is connected to ground and the other of which is connected to the line 154, is positioned so that the tape passes thereover after it passes across the heads 170-173. When the conducting foil contacts both of the terminals on the stop sensor 180, the line 154 is shorted directly to ground which stops conduction of the silicon-conducting rectifier in the latching circuits 155 or 169 and once the foil passes the stop sensor 180, the line 154 is no longer at or near ground potential. Thus, once the foil passes the stop sensor 180 the motor 151 and the relay 153 are deenergized until another positive signal at one of the outputs 131, 112, 121 or 130 reactivate a latching circuit 155 or 169.

A supervisory oscillator 185 is grounded on the negative side thereof and has a positive terminal attached to the line 154. The output of the supervisory oscillator 185 is applied to the input of the preamplifier 176 on the line 175. Since the line 154 is normally at some positive potential above ground and drops to near ground when one of the latching circuits 155 or 169 operate, the supervisory oscillator 185 is normally oscillating and stops when the motor 151 and relay 153 are energized. The supervisory oscillator 185 provides an oscillatory signal having a frequency approximately equal to the aforementioned carrier (approximately 5 kc.) and is utilized to supervise the operation of the circuitry as will become apparent presently.

The output signal from either one of the heads 170-173 or the supervisory oscillator 185 is amplified in the preamplifier 176 and applied to the inputs of a notch filter 190 and a pulse amplifier 191. The notch filter 190 allows the verbal message to pass to an audio amplifier 192 where it is applied through an isolation network 193 to the telephone line, as will be explained presently. The dialing information in the form of an interrupted 5 kc. carrier and the verbal message superimposed on the carrier is amplified in the amplifier 191 and applied to a detector 194. The detector 194 filters the 5 kc. carrier signal to provide a DC signal at the output approximating the envelope of the 5 kc. carrier. This DC signal is applied to a Schmitt trigger 195 to square the leading and trailing edges of the dialing pulses and the verbal portion of the message. The DC square pulses from the Schmitt trigger 195 are applied to the input of a first gate circuit 200 and, through the first gate circuit 200 to a second gate circuit 201. The first gate circuit 200 has a unijunction oscillator or a pulse generator 202 attached thereto which produces pulses 30 milliseconds apart when a negative or low potential signal from the output of the Schmitt trigger 195 is applied to the input of the first gate circuit 200. The second gate circuit 201 has a unijunction oscillator or pulse generator 203 attached thereto which produces pulses 30 milliseconds apart when the signal supplied to the input of the first gate circuit 200, and consequently, the input of the second gate circuit 201, is a positive or high potential signal. The 30 millisecond pulses supplied by the first and second pulse generators 202 and 203 are applied to two opposed inputs of a bistable multivibrator circuit 204. The bista-

ble multivibrator 204 includes a pair of transistors 205 and 206, only one of which is conducting. When the pulse generator 202 is producing 30 millisecond pulses, these pulses are applied to the base of the transistor 206, causing the conduction thereof. When the pulse generator 203 is producing 30 millisecond pulses, these pulses are applied to the base of the transistor 205 causing the conduction thereof. A transistor 207 having a relay coil 208a of a relay 208 in circuit therewith is attached to the collector of the transistor 206 so as to cause conduction of the transistor 207 and the energization of the coil 208a when the transistor 206 is conducting. Conversely when the transistor 206 is nonconducting and the transistor 205 is conducting, the transistor 207 is nonconducting and the coil 208a is deenergized. Thus, the energization of the coil 208a of the relay 208 follows the dialing pulses applied to the input of the preamplifier 176, except that the energization of the relay coil 208a is delayed approximately 30 milliseconds because of the 30 millisecond pulses supplied by the pulse generators 202 and 203. Since the pulses from either of the pulse generators 202 or 203 are all in the same direction, no change of state occurs in the bistable multivibrator 204 once the first pulse causes the initial change of state. However, the pulse generators 202 and 203 cannot be switched on or off until the completion of a pulse and, therefore, a delay of approximately 30 milliseconds will be incorporated into the signal applied to the bistable multivibrator 204.

Referring to FIG. 6, the relay 208 has a movable arm 208b, a first stationary contact 208c and a second stationary contact 208d. The stationary contact 208c has no connection thereto and the movable arm 208b is biased so as to be in engagement with the stationary contact 208c when the coil 208a is deenergized. As previously mentioned, the output of the isolation network 193, which consists of a pair of leads 210 and 211, are attached to the telephone line and this is accomplished in the following manner. Output lead 211 from the isolation network 193 is attached to stationary contact 208d of the relay 208. Relay 153 (FIG. 5) has four sets of stationary contacts 153b-153c, 153d-153e, 153f-153g, and 153h-153j with four moveable contacts 153k, 153m, 153n and 153p associated therewith, respectively. The moveable arms of the relay 153 are biased so that arm 153k engages contact 153b, arm 153m engages contact 153d, arm 153n engages contact 153f, and arm 153p engages contact 153h when the coil 153a is deenergized. Conversely, the opposite contact of the sets of contacts is engaged by the associated arm when the coil 153a is energized. The output lead 210 from the isolation network 193 is connected to the stationary contact 153c. The moveable arm 208b of the pulsing relay 208 is connected by means of a lead 212 to the stationary contacts 153e and 153f of the relay 153. The moveable arms 153k and 153m are connected directly to an external telephone circuit by means of a pair of leads 213 and 214. The moveable arms 153n and 153p are connected to the lines 102 and 135 (see FIG. 4) forming a portion of the supervisory loop. Stationary contacts 153b and 153d are connected to any telephone instruments located throughout the structure. Stationary contact 153g is connected to a stationary contact 153j. Thus, with the coil 153a deenergized, all telephone instruments in the structure are connected directly to the telephone line by means of lines 213 and 214, in the normal operating manner. Also, the supervisory oscillator 185 is providing a continuous signal to the electronic circuitry causing the bistable multivibrator 204 to remain in the state which energizes relay 208. With relay 208 energized the isolation network 193 is connected between the lines 102 and 135. If any of the components in the electronic circuitry fail, the relay 208 will open breaking the circuit between the line 102 and 135 and deenergizing the relay 96 (see FIG. 4). Thus, a positive trouble signal will be applied to the service channel output 130 as well as to the alarm bell 85 in the master control 15.

When any one of the outputs 131, 112, 121 or 130 have a positive signal thereon, the supervisory oscillator 185 is deenergized and the motor 151 and relay 153 are energized.

Energizing the relay **153** disconnects the phone instruments from the telephone line throughout the structure and connects the isolation network **193** and relay contact **208d** and arm **208b** across the telephone line. Pulsing of the relay **208** causing dialing of a remote telephone instrument and the subsequent verbal message is applied by way of the isolation network **193**. After several sequences of dialing and verbal messages the system is automatically interrupted by the stop sensor **180**. If the positive signal on the output from the local alarm is still prevalent, when the system is interrupted, the entire procedure will start again, providing the signal is in the fire channel, burglary channel or emergency channel. However, since the positive signal from the service channel is applied directly to the latching circuit **169**, once a complete sequence of dialing pulses and verbal messages is over and the system is interrupted by the stop sensor **180**, the positive pulse at the input of the latching circuit **169** will have no further effect and the remaining channels may operate in a normal manner (providing the trouble prevalent in the system does not cause an adverse effect therein).

Thus, a security system has been described which is capable of incorporating a plurality of channels each sensitive to a different condition and each assigned a predetermined priority, so that only the most important condition will produce a particular alarm or signal at a predetermined remote telephone. Further, substantial portions of the electronics, sensors and alarm circuitry are supervised so that any trouble or failure therein will provide a signal within the structure or at some remote station. While a preferred embodiment of the present invention has been illustrated and described, it should be understood that many alterations and modifications might be made by those skilled in the art, such as varying numbers of

channels or conditions sensed, different types and numbers of sensors, different types of electronic circuits and different components in the various circuits.

I claim:

1. A security system comprising:

a. condition responsive means;

b. relay means;

c. electrical circuitry connecting said condition responsive means to said relay means for operating said relay means and supplying an output signal upon the occurrence of a condition;

d. memory means including electronic circuitry for supplying predetermined signals at an output upon the occurrence of a signal at an input, said predetermined signals including telephone dialing pulses and voice messages;

e. means connecting the output signals of said relay means to the input of said memory means; and

f. circuitry for continually monitoring the correct operation of substantial portions of the system and for providing an indication of a failure therein said monitoring circuitry including an oscillator connected to the electronic circuitry for monitoring said electronic circuitry and providing a predetermined indication when a failure occurs therein.

2. A security system as set forth in claim 1 wherein the relay means includes at least two electrical relays and the connecting electrical circuitry includes a two-wire loop connecting at least some of the condition responsive means to said two relays for operating one of said relays when at least one of said condition responsive means produces a short circuit between the two wires and operating the other of said relays upon the occurrence of a break in one of the two wires.

35

40

45

50

55

60

65

70

75