

Feb. 25, 1969

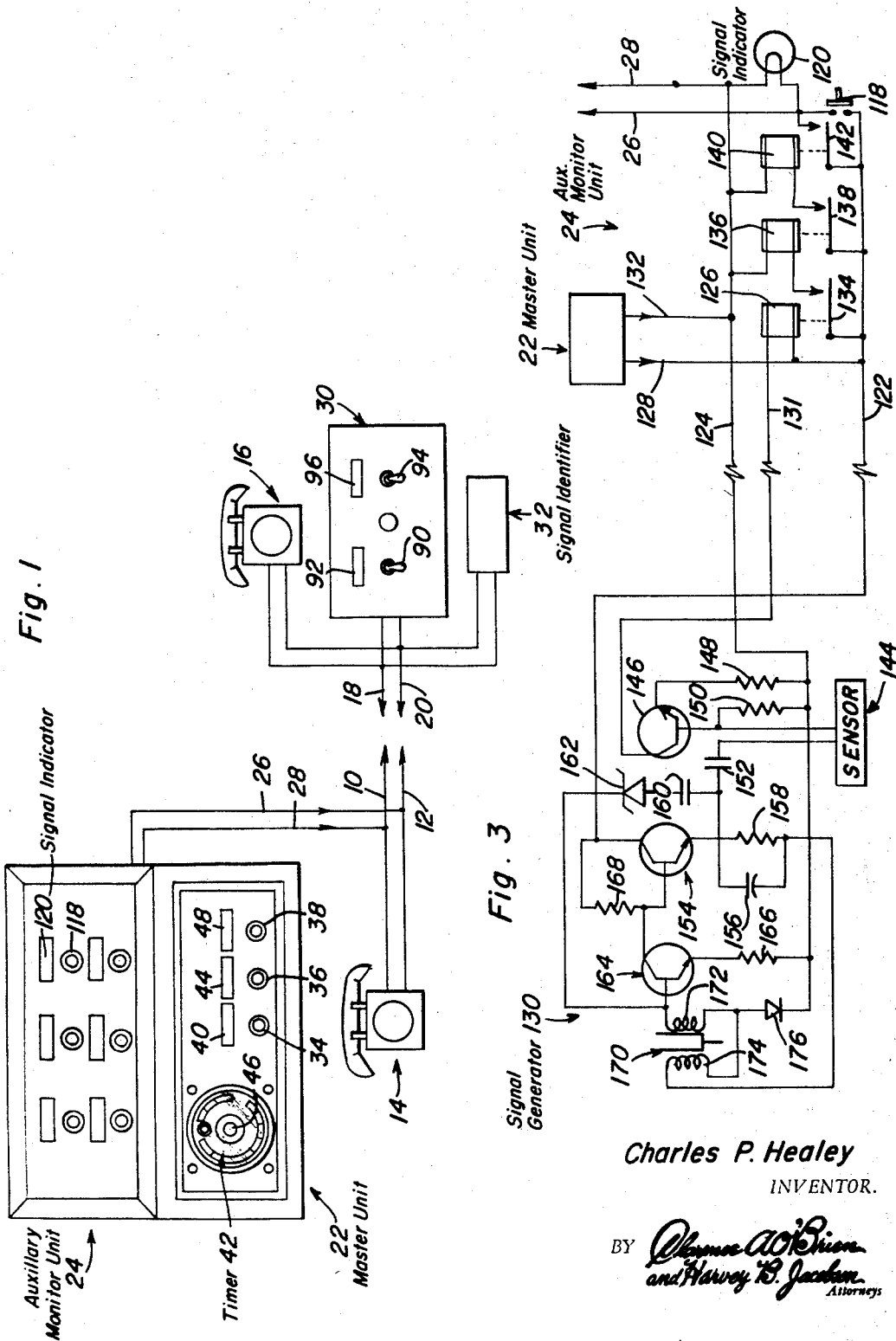
C. P. HEALEY

3,430,218

ALARM REPORTING SYSTEM

Filed Sept. 13, 1965

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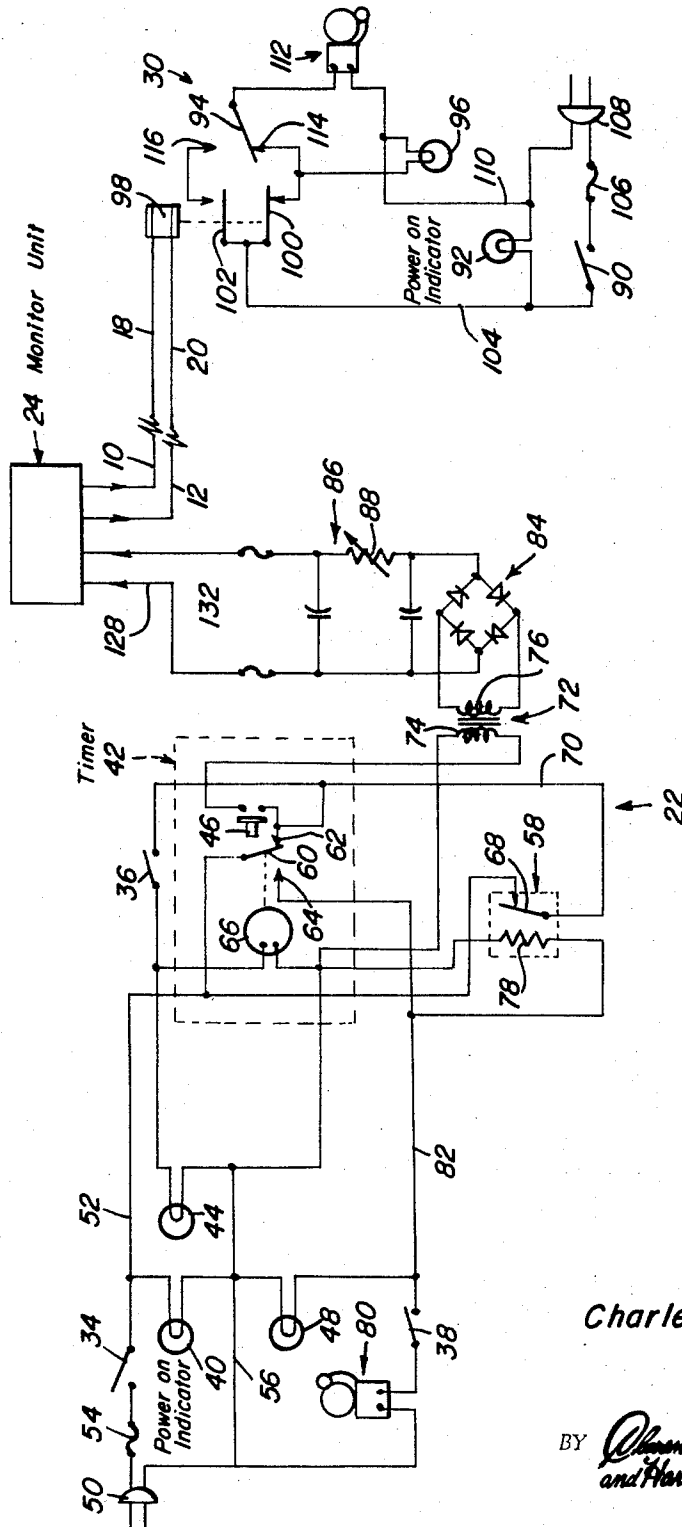
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Fig. 2



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3,430,218

ALARM REPORTING SYSTEM

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11 Claims

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ABSTRACT OF THE DISCLOSURE

Continuous monitoring of various conditions by a plurality of sensors which respond to malfunction by interrupting modulating signals identifying each of the conditions being monitored. The identifying signals modulate, under supervisory control, a continuous security signal which is interrupted if monitoring and security procedures are not followed at a modulating station from which the security signal is dispatched to a remote receiving station. Interruption of signal reception at the remote receiving station triggers an alarm.

This invention relates to an electrically operated surveillance system.

A primary object of the present invention is to provide a monitoring system utilizing commercial or private signal transmitting lines or radio links to transmit information regarding the condition of equipment being monitored as well as to establish surveillance over a manned security patrol at a particular locale.

In accordance with the foregoing object, it is a further object of the present invention to monitor conditions that may be a hazard to property including for example the condition of a boiler, the existence of power failure, building closures, leakage, electrical characteristics, and the operation of such equipment as pumps, elevators, freezers, etc.

A still further object in accordance with the foregoing objects, is to provide a signal reporting system through which a person at a remote station may check a security system for a particular locale at which a monitoring station is located. A master unit located at the monitoring station may therefore be operated by an individual to signal the remote station from which surveillance over the security system is maintained. The remote station may be located for example at guard headquarters or a police station at which an alarm is established should there be an abnormal condition at the monitoring station from which the reports originate whether or not the abnormal condition arises from any breakdown in the security system or any equipment which could create a hazardous situation.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is a simplified diagrammatic view showing the various components of one typical system in accordance with the present invention.

FIGURE 2 is an electrical circuit diagram showing the basic system of the present invention.

FIGURE 3 is an electrical circuit diagram showing a typical automatic condition monitoring network associated with the system of the present invention.

Referring now to the drawings in detail, and initially to FIGURE 1, it will be observed that the system of the present invention may be associated with a commercial or private telephone communication system including the telephone lines 10 and 12 connected to a telephone instrument 14 located at a monitoring station whereby voice

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communication may be established with a remote station by means of another telephone instrument 16 to which the lines 18 and 20 are connected. It will of course be appreciated that the communication system could also include radio links and other signalling media such as light rays.

The monitoring station at which the telephone instrument 14 is located, may be located at an industrial complex, a building, etc. A master unit generally referred to by reference numeral 22 is located at the monitoring station through which a guard security procedure may be checked by personnel at the remote station. An auxiliary monitor unit 24 may also be located at the monitoring station and interconnected with the master unit 22 so as to dispatch signal energy through the lines 26 and 28 to the remote station through the telephone transmitting lines as aforementioned. In addition to reporting to the remote station through the master unit 22, a guard or watchman at the monitoring station may observe any abnormal condition of various pieces of equipment being monitored by the auxiliary unit 24. The existence of any abnormal condition as monitored by the auxiliary unit 24 or any breakdown in the security system will therefore be reported to the remote station through a remote receiving unit generally referred to by reference numeral 30. Also, a signal source identifying device 32 at the remote station may indicate the nature of the abnormal condition being reported as will be hereafter explained. Therefore, if there is any report of abnormal conditions, an attempt may be made to establish voice communications between the monitoring and remote stations through the telephone instruments 14 and 16.

As shown in FIGURE 1, the master unit 22 includes a plurality of key operated switches including a power switch 34, a timer switch 36 and an alert disabling switch 38. When the power switch 34 is closed, the master unit is connected to a source of electrical energy at the monitoring station illuminating a "power on" indicator lamp 40 signifying that the unit is in operating condition. The timer switch 36 may then be turned on to initiate a timing cycle after a timer device 42 has been manually set for a predetermined timing interval. When the timer switch is turned on, a "timer on" indicator lamp 44 is illuminated above the key operated switch 36. Once the timer device has been set, actuation of a push button reset switch 46 in the center of the timer will establish an output signal for the duration of the timing cycle, this signal being fed through the telephone lines to the receiving unit 30 at the remote station. Upon completion of the timing cycle, energization of the timer device and the indicator lamp 44 is prolonged for a predetermined time delay interval or warning period before the signal energy dispatched through the telephone lines to the receiving unit 30 is interrupted. During this warning period, an alerting device is sounded and a warning indicator lamp illuminated so as to alert the guard of the impending report to the remote station of a breakdown in the security system. During the warning period, the audible alerting device may be turned off by the key operated disabling switch 38. The timer device 42 may be reset during the warning period in order to initiate a new cycle before the signal output from the monitoring station is interrupted.

As shown in FIGURE 2, the master unit 22 may be connected by a power plug 50 to a source of electrical energy such as a 120 volt, 60 cycle alternating current source. The power plug 50 is therefore connected to the power line 52 through series connected fuse 54 and power switch 34. Power line 56 on the other hand is directly connected to the power plug so that upon closing of the power switch 34, the indicator lamp connected across the power lines 52 and 56 will be illuminated. The power line 52 is connected to the timer device 42 and to a time

delay relay 58. The timer device includes a timer setting switch 60 displaced from a timing position engaging contact 62 toward a start or zero position engaging contact 64 upon energization of the timer motor 66 to which the switch 60 is operatively connected. One terminal of the timer motor 66 is connected to the power line 56 while the other terminal thereof is connected by conductor 70 in series with the time delay relay switch 68 to the power line 52. Accordingly, in the normally closed position of the relay switch 68 as shown in FIGURE 2, an energizing circuit is established for the timer motor 66 in order to initiate a timing cycle upon closing of the timer switch 36. At the same time, a parallel energizing circuit is completed through the indicator lamp 44 connected between the timer switch 36 and the power line 56 to signify that the timer is operating.

When the timer device has been set as aforementioned, with the switch 60 engaging the contact 62, closing of the reset switch 46 will complete an energizing circuit for the signal output transformer 72 associated with the master unit 22. Accordingly, the reset switch 46 is connected in series with one terminal 74 of the primary, the other terminal of which is connected to the power line 56. Thus, an electrical connection is established between the primary of the transformer and the power line 52 so as to induce a signal output in the secondary 76 of the transformer until the reset switch 46 is opened upon deenergization of the timer motor 66 to thereby open the primary circuit of the transformer. However, at the end of the timing cycle when the switch 60 engages contact 64, the timer motor 66 remains energized as long as the relay switch 68 remains closed. The switch 60 will then connect the power line 52 to one terminal of the relay heater element 78, the other terminal of which is connected to the power line 56 so as to complete an energizing circuit therethrough establishing a time delay warning period. Upon completion of the warning period, the heater element 78 will be effective to open the relay switch 68 in order to deenergize the timer motor 66 by opening the energizing circuit thereof, as well as to open the primary circuit of the transformer 72 and the energizing circuit for the indicator lamp 44. The output of the master unit will then be interrupted. At the beginning of the warning period, when the timer operated switch 60 is displaced into engagement with the switch contact 64, parallel energizing circuits are completed for the warning indicator lamp 48 and the alerting buzzer device 80 through the normally closed disabling switch 38. Accordingly, the warning indicator lamp 48 is connected between the power line 56 and the switch contact 64 while the alerting buzzer device 80 is connected between the power line 56 and the disabling switch 38, the disabling switch being also connected to the switch contact 64 by the conductor 82. It will therefore be apparent, that upon completion of the timing cycle of the timer device 42, the buzzer device 80 will provide an audible alert which may be terminated at anytime by opening of the disabling switch 38. The warning indicator lamp 48 will however remain illuminated until the timer device is reset displacing the switch 60 into engagement with the contact 62. If the timer has not been reset during the warning period, a signal is dispatched to the remote station by interruption of the output from the master unit. The output from the master unit is in the form of a D.C. voltage capable of being applied to the telephone lines. Toward this end, the secondary 76 of the output transformer is connected to the input terminals of a full wave rectifier 84, the output terminals of which are connected to a filter network 86 having a voltage regulating potentiometer 88 for controlling the D.C. output voltage level. The D.C. output may be supplied to the receiving unit 30 at the remote station either directly through the telephone lines or through the auxiliary unit 24.

The receiving unit 30 at the remote station may be selectively rendered operative by turning on a power switch 90. A "power on" indicator lamp 92 will then be

illuminated to signify that the receiving unit is in operating condition. The indicator lamp 92 is therefore located above the power switch 90 as shown in FIGURE 1. Also mounted on the receiving unit, is a silencing switch 94 having a normal position and a stand-by position. In the normal position of the silencing switch 94, an alerting buzzer device and an indicator lamp 96 will be illuminated whenever there is an interruption in the output from the monitoring station so as to inform the personnel at the remote station of some trouble or abnormal condition. The silencing switch 94 may then be actuated to its stand-by position to disable only the audible alerting device while the warning lamp 96 remains illuminated. Once the abnormal condition is corrected and the output from the monitoring station resumed, the warning lamp 96 will become extinguished and the audible alerting device re-energized. The personnel at the remote station may then displace the silencing switch 94 to its normal position in order to await receipt of another report of any abnormal condition.

As shown in FIGURE 2, the receiving unit 30 includes a signal receiving relay coil 98 adapted to be energized by the D.C. voltage output of the master unit 22 as aforementioned. Associated with the signal receiving relay coil 98, is a normally closed relay switch 100 and a normally opened relay switch 102, both of which are connected to power line 104. The power line 104 is connected to a source of electrical energy at the remote station through the power switch 90, the fuse 106 and the power plug 108. The power plug is therefore also connected to the power line 110 while the indicator lamp 92 is connected across the power lines 104 and 110 so that it may be energized upon closing of the power switch 90. Also connected to the power line 110, is one terminal of the warning lamp 96 and one terminal of the audible alerting device 112. The warning lamp 96 is also connected to the relay contact associated with the normally closed relay switch 100 and the switch contact 114 associated with the silencing switch 94. The switch contact 116 associated with the silencing switch on the other hand, is connected to the relay contact associated with the normally opened relay switch 102. It will therefore be apparent, that when the signal receiving relay 98 is energized, no energizing circuit for the buzzer device 112 and warning lamp 96 will be established when the silencing switch 94 is in its normal position as illustrated in FIGURE 2, since the power line 104 will then be disconnected from both the buzzer device 112 and lamp 96. In response to any abnormal condition at the monitoring station, the relay 98 will be deenergized so that the relay switches 100 and 102 will assume the positions illustrated in FIGURE 2 thereby completing an energizing circuit for both the buzzer device 112 and the warning lamp 96. When the personnel at the remote station are so alerted, the silencing switch 94 may then be displaced to its stand-by position interrupting only the energizing circuit for the buzzer device 112. When the abnormal condition at the monitoring station is thereafter corrected, the signal receiving relay coil 98 will be energized once again in order to interrupt the energizing circuit for the warning lamp 96 and complete an energizing circuit for the buzzer device 112 through the silencing switch 94 in its stand-by position. The personnel at the remote station will thereby be advised of the corrected condition and may then restore the silencing switch to its normal position to reset the receiving unit 30.

As shown in FIGURE 1, the auxiliary unit 24 includes a plurality of key operated switches 118 and associated indicator lamps 120 through which various signal sources may be identified. Accordingly, the key operated switch devices 118 may be actuated to monitor the equipment at the monitoring station through one or more condition sensing circuits. The condition sensing circuits may therefore include sensors of various types such as water level sensors, pressure sensors, fire detectors, etc., each of which

generates a signal having a different characteristic such as a pattern of pulses or a tone of a particular frequency or phase. Thus, each signal source will illuminate a different one of the indicator lamps 120 so that it may be identified by appropriate labeling of the indicator lamps when the D.C. output voltage of the master unit 22 is available. The signal outputs of the various signal sources may therefore impose a modulating signal component on the D.C. output voltage supplied to the signal receiving unit 30 so that interruption of a modulating signal from any one of the monitored signal sources may not only be observed by extinction of an indicator lamp 120 at the monitoring station, but may also be observed at the remote station through the signal identifying device 32 aforementioned.

Referring now to FIGURE 3, it will be observed that the D.C. output of the master unit 22 is connected across the signal line 122 and the reference voltage line 124 associated with one of the condition sensing circuits of the auxiliary unit by means of the output lines 128 and 132. Thus, when the D.C. output is available from the master unit, a relay coil 126 to which D.C. voltage line 128 is connected, is energized as long as signal generating device 130 is in operating condition monitoring some remotely located equipment. The relay coil 126 is connected by the conductor 131 to the signal generating device to control energization thereof. Energization of the relay coil 126 closes the normally opened relay switch 134 associated therewith so as to complete an energizing circuit through a frequency responsive relay coil 136. The relay switch 134 therefore connects the frequency responsive relay coil 136 across the signal line 122 and voltage line 124 so that a signal having a predetermined frequency tone will energize the relay coil 136 in order to close its normally opened relay switch 138. Closing of the relay switch 138 will in turn complete an energizing circuit for the frequency responsive relay coil 140 by connecting it across the lines 122 and 124. The relay coil 140 will therefore also respond to the predetermined frequency tone in order to close a normally opened relay switch 142 completing an energizing circuit for the indicator lamp 120 and connecting the signal line 122 to the output line 26 in order to superimpose the frequency tone on the D.C. voltage output supplied to the telephone lines by the lines 26 and 28. It will therefore be apparent that in the illustrated embodiment, frequency tones are utilized to identify the equipment being monitored by each of the signal generating devices 130 such as illustrated in FIGURE 3 by way of example.

Each of the signal generating devices is therefore associated with a condition sensing switch device 144 one terminal of which is connected to the base of a transistor 146. A predetermined bias is maintained on the emitter of transistor 146 by the resistor 148 connecting it to the D.C. voltage line 124 so that when the transistor 146 is rendered conductive, energizing current will be established for the relay coil 126. A predetermined bias voltage is also maintained on the base of transistor 146 by the bias resistor 150 so that upon closing of the sensor switch device 144, the transistor 146 will be rendered conductive in order to establish energizing current for the relay coil 126. Emitter bias for transistor 154 is established upon closing of the sensor switch 144 through coupling capacitor 152 and series connected capacitor 156 and resistor 158. The capacitor 152 also is connected by the capacitor 160 and Zener diode 162 to the base of transistor 164 to hold a predetermined bias voltage thereon. A predetermined bias is also maintained on the emitter of transistor 164 through the bias resistor 166 connecting the emitter to the voltage line 124. The output collector of the transistor 164 is connected to the base of transistor 154 and to the load resistor 168 in order to turn the transistor 154 off when the transistor 164 is conducting. The output collector of the transistor 154 on the other hand is connected to the signal voltage line 122 so as to impose thereon an

oscillating signal at a frequency characteristic of the equipment being monitored by the signal generating device 130. The frequency of the output signal is controlled by a tuning fork 170 adapted to be vibrated at a natural frequency in order to induce signal currents in the coils 172 and 174. Both of the coils are connected through the diode 176 to the voltage line 124 in order to limit the induced current in the coils to D.C. pulses. The coil 172 is also connected to the base of the transistor 164 in order to regulate the conducting periods thereof. The coil 174 on the other hand is connected to the emitter of transistor 154 through the resistor 158 in order to synchronize operation of the transistors 154 and 164 at an output oscillating frequency controlled by the natural vibrating frequency of the tuning fork 170. It will therefore be apparent, that each of the signal generating devices will employ a tuning fork having a different natural frequency in order to identify the equipment with which it is associated. The tone frequency imposed on the D.C. output voltage will not only illuminate a corresponding indicator lamp 120 by operating the frequency responsive relays associated therewith but may also illuminate indicator lamps within the signal identifying component 32 in a similar manner. Accordingly, the personnel at the remote station will also be in a position to monitor the equipment and may notify the guard through the telephone communication system at any time should there be any abnormal condition.

Should there be any malfunction with the equipment being monitored by one of the signal generating devices, the sensor device 144 will open in order to interrupt the generation of the characteristic frequency tone associated with the signal generating device. The D.C. output to the receiving unit 30 will also be interrupted in order to alert the personnel at the remote station. By closing of the switches 118 by-passing the relays at the monitoring station, the source of trouble may be identified at the remote station and if malfunction of any of the equipment being monitored is indicated by the signal identifying component 32, communication may be established with the guard through the telephone communication system at anytime. The guard at the monitoring station may then verify the existence of any malfunction by opening the appropriate switches 118 of the auxiliary unit 24. Thus, not only may the security procedure be monitored at the remote station, but also the condition of the equipment being monitored utilizing the same D.C. voltage interrupting signal.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention.

What is claimed as new is as follows:

1. A surveillance system for reporting abnormal conditions from a monitoring station to a remote station comprising, a source of electrical energy at the monitoring station, manually resettable means connected to said source of energy for establishing signal energy during predetermined intervals, signal transmitting means connected to the resettable means for transmitting the signal energy to the remote station, signal receiving means at the remote station, and alarm means operatively connected to the signal receiving means for indicating any interruption in transmission of said signal energy to the signal receiving means.

2. The combination of claim 1 wherein said signal receiving means comprises, relay means energized by said signal energy, silencing switch means operatively connected to said relay means and the alarm means for disabling operation of the alarm means in response to deenergization of the relay means, and condition indicating means operatively connected to the alarm means and the relay means for indicating the operative condition of the alarm means in response to energization of the relay means

upon restoration of the signal energy from the monitoring station.

3. The combination of claim 1 including condition sensing means connected to said resettable means for selectively modulating the signal energy with identifying signals.

4. The combination of claim 3 including indicator means located at the monitoring and remote stations and connected respectively to the condition sensing means and the transmitting means for signifying the source of said signifying signals.

5. The combination of claim 4 wherein said resettable means comprises, a timer device having a switch displaced from a start position to a timing position, signal establishing means operatively connecting said timer device to the source of energy for simultaneously energizing the timer device and establishing said signal energy when said switch is in the timing position, alerting means connected to the timer device and rendered operative thereby only in response to displacement of the switch to the start position at the end of a timing cycle and time delay means connected to the timer device and the signal establishing means for prolonging the energization of the timer device and the duration of the signal energy beyond said timing cycle, whereby the timer device may be selectively reset while the alerting means is operative to prevent interruption of the signal energy transmitted to the receiving means at the remote station.

6. The combination of claim 5 wherein said signal receiving means comprises, relay means energized by said signal energy, silencing switch means operatively connected to said relay means and the alarm means for disabling operation of the alarm means in response to deenergization of the relay means, and condition indicating means operatively connected to the alarm means and the relay means for indicating the operative condition of the alarm means in response to energization of the relay means.

7. The combination of claim 1 wherein said resettable means comprises, a timer device having a switch displaced from a start position to a timing position, signal establishing means operatively connecting said timer device to the source of energy for simultaneously energizing the timer device and establishing said signal energy when said switch is in the timing position, alerting means connected to the timer device and rendered operative thereby only in response to displacement of the switch to the start position at the end of a timing cycle and time delay means connected to the timer device and the signal establishing means for prolonging the energization of the timer device and the duration of the signal energy beyond said timing cycle, whereby the timer device may be manually reset while the alerting means is operative to prevent interruption of the signal energy transmitted to the receiving means at the remote station.

8. A surveillance system for reporting abnormal conditions from a monitoring station to a remote station comprising, a source of electrical energy at the monitoring station, a timer device having a switch displaced from start position to a timing position, signal establishing means operatively connecting said timer device to the source of energy for simultaneously energizing the timer device and establishing said signal energy when said switch is in the timing position, alerting means connected to the timer device and rendered operative thereby only in response to displacement of the switch to the start position at the end of a timing cycle, time delay means connected to the timer device and the signal establishing means for prolonging the energization of the timer device and the duration of the signal energy beyond said

timing cycle, whereby the timer device may be manually reset while the alerting means is operative to prevent interruption of the signal energy transmitted to the remote station, signal receiving means at the remote station to which said signal energy is transmitted, and alarm means operatively connected to the signal receiving means for indicating interruption in transmission of said signal energy to the signal receiving means.

9. The combination of claim 8 wherein said signal receiving means comprises, relay means energized by said signal energy, silencing switch means operatively connected to said relay means and the alarm means for disabling operation of the alarm means in response to deenergization of the relay means, and condition indicating means operatively connected to the alarm means and the relay means for indicating the operative condition of the alarm means in response to energization of the relay means.

10. A surveillance system for reporting, abnormal conditions monitored at a monitoring station, to a receiving station and alerting personnel at the receiving station of any breakdown in security at the monitoring station, including a timer at the monitoring station having a source of electrical energy, a signal control switch, a timing motor, a timer switch movable by the motor between two operative positions and circuit means connecting the source to the motor for energizing the same when the timer switch is in one of said operative positions to initiate a timing cycle, signal emitting means connected to the circuit means for generating a continuous security signal upon actuation of the signal control switch while the timing motor is energized, means for interrupting generation of said security signal in response to movement of the timer switch to the other of said operative positions, delay means connected to the circuit means and responsive to movement of the timer switch to said other operative position for prolonging generation of the security signal for a warning period of predetermined duration, warning means connected to the circuit means for energization from said source only during said warning period established by the delay means, receiving means at the receiving station responsive to the security signal, alarm means operatively connected to the receiving means for producing visible and audible alarms in response to interruption of the security signal at the receiving station, and silencing switch means connected to the receiving means for disabling the audible alarm only until the security signal is restored.

11. The combination of claim 10 including signal generator means connected to the signal emitting means for continuous modulation of the security signal by an identifying signal, condition sensing means connected to the signal generator means for interruption of said identifying signal, and signal indicator means connected to the signal emitting means and the receiving means for indicating the presence and absence of the identifying signal.

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