

Feb. 25, 1969

F. E. WELD
ANNUNCIATOR SYSTEM

3,430,231

Filed June 1, 1965

Sheet 1 of 2

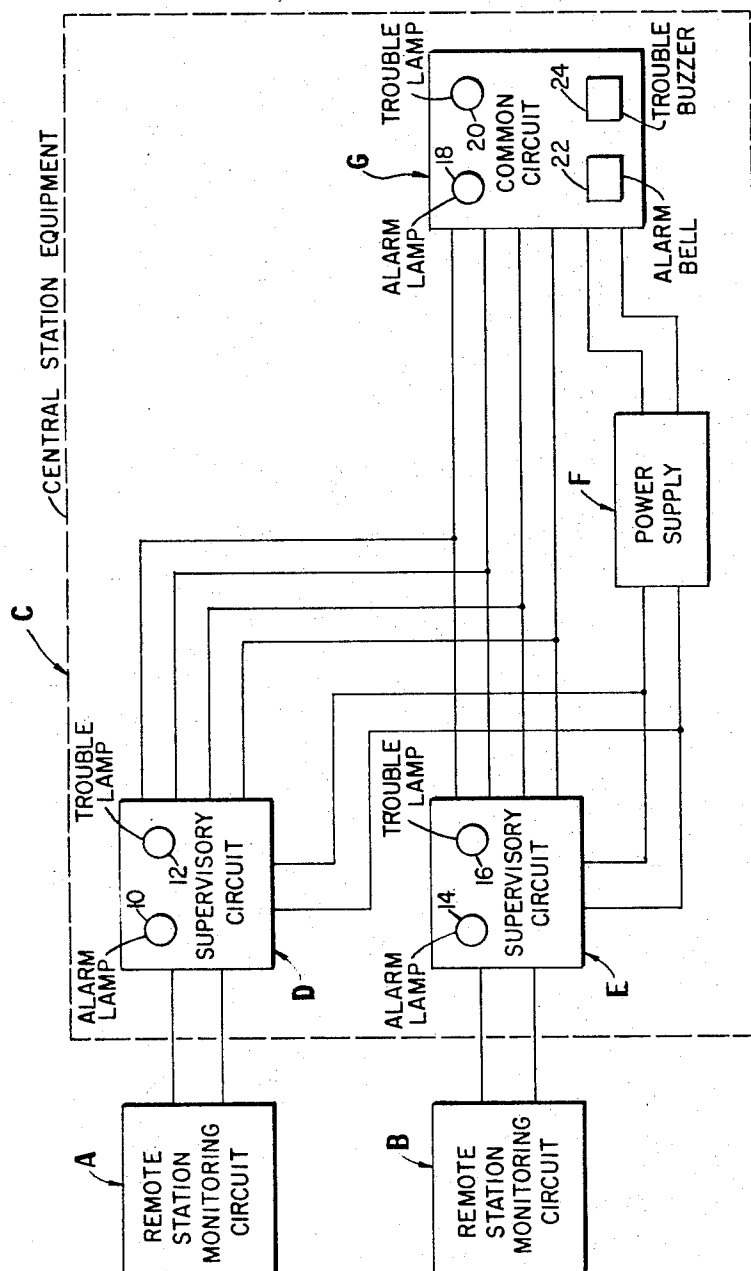


FIG. 1.

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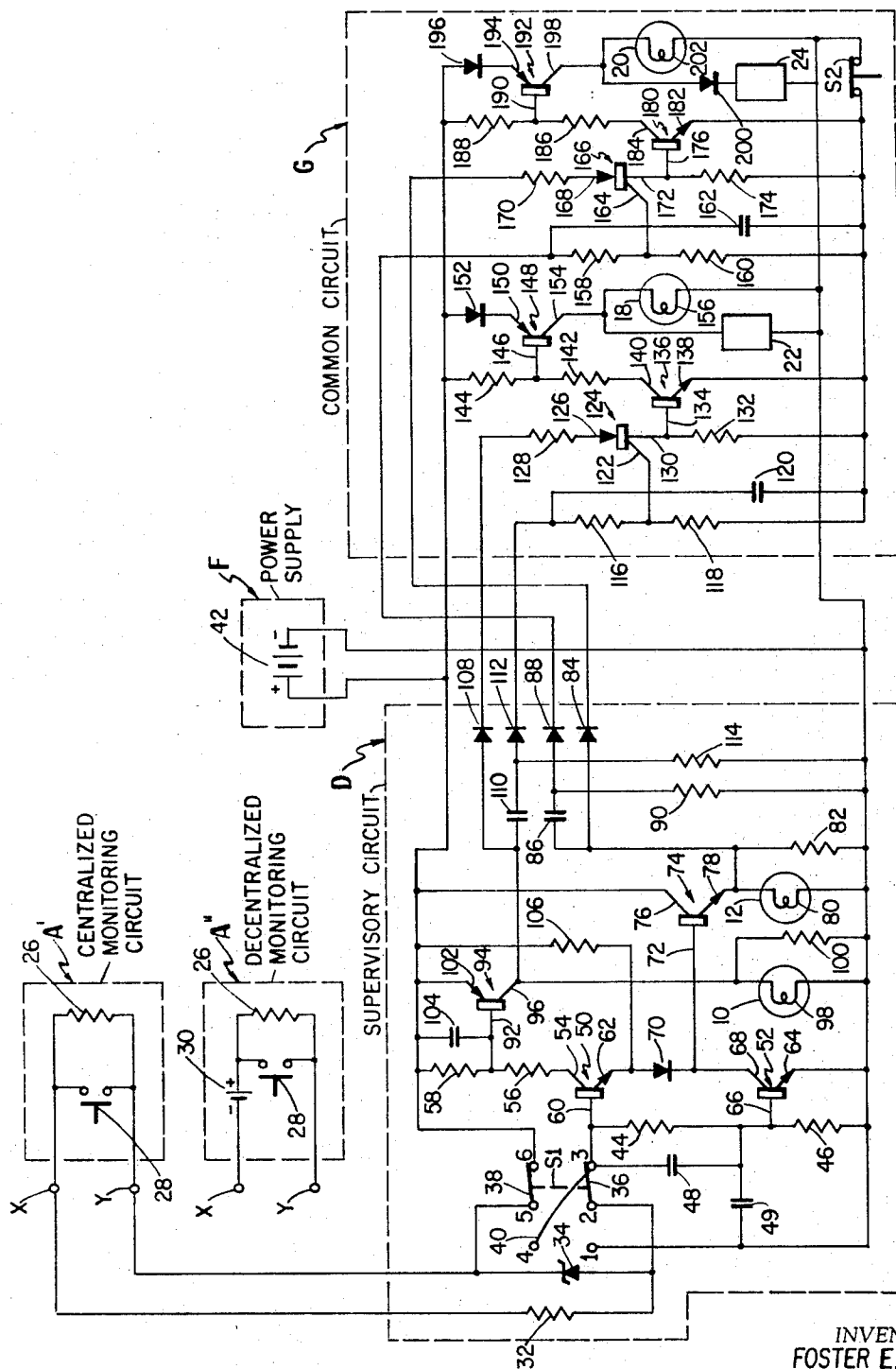


FIG. 2.

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3,430,231

ANNUNCIATOR SYSTEM

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10 Claims

ABSTRACT OF THE DISCLOSURE

A solid state system for indicating that an alarm condition exists at any of a plurality of remote station monitoring circuits having a like plurality of central station supervisory circuits, each electrically connected with an associated one of the monitoring circuits, and a central station common circuit which is connected to each of the central station supervisory circuits. An alarm signal indicative of an alarm condition at the remote station is transmitted to the associated supervisory circuit which energizes an alarm indicator in the central station supervisory circuit and causes common alarm indicators in the central station common circuit to be energized. Each of the central station supervisory circuits also has a trouble indicator which is energized by a disruption in the electrical connection between the supervisory circuit and the associated monitoring circuit, and energizes common trouble indicators in the central station common circuit. A self-restoring reset switch common to both the common alarm indicators and the common trouble indicators at the central station common circuit deenergizes the common alarm indicators and common trouble indicators while the supervisory alarm indicator or supervisory trouble indicator of any of the supervisory circuits remain energized, so that the central station common circuit may indicate an alarm or trouble condition associated with another remote station monitoring circuit.

This invention is directed toward an annunciator system and, more particularly, to an improved annunciator system which provides indications in response to either an alarm condition at a monitored station or a trouble condition of the annunciator system itself.

Generally, annunciator systems are utilized to monitor the condition of a device or environment at a remotely located station and provide visual and/or audible indications in accordance therewith at a centrally located station. An operator at the central station will take note of the visual and/or audible indications to, for example, initiate corrective measures.

A known annunciator system is described and illustrated in the patent to G. E. Foster 3,124,793 and includes generally a plurality of pairs of normally open contacts, each pair associated with one monitored device at a remotely located station; an equal plurality of supervisory circuits, each including an alarm indicating lamp and circuitry for energizing the lamp when an associated monitored device exhibits an alarm condition; and, a common alert device and circuitry for energizing the alert device when any monitored device exhibits an alarm condition. The above system does not provide indications so that the operator may distinguish between an alarm condition at the monitored device and a trouble condition, such as an open circuit, of the system itself.

The present invention is directed toward an annunciator system which provides indications to an operator at a central station as to both an alarm condition of a monitored device or environment and a trouble condition of the annunciator system itself, thereby overcoming the

noted disadvantages, and others, of previous annunciator systems.

In accordance with the present invention, the annunciator system includes a plurality of remote station monitoring circuits, each including means to transmit an alarm signal when an alarm condition has occurred at the remote station; a like plurality of central station supervisory circuits, each associated with one of the remote station monitoring circuits and including first circuit means responsive to an alarm signal for energizing supervisory alarm indicating means, and second circuit means responsive to a trouble condition of the associated monitoring circuit for energizing supervisory trouble indicating means; and, a common central station circuit including common alarm indicating means which becomes energized when the alarm indicating means of any supervisory circuit is energized, and a common trouble indicating means which becomes energized when the trouble indicating means of any supervisory circuit is energized.

In accordance with a further aspect of the present invention, the common alarm and trouble indicating means each include both visual and audible indicating means.

In accordance with a further aspect of the present invention, each supervisory circuit and its associated monitoring circuit have supervisory current of a given value normally flowing therethrough, which current is increased in value when the monitoring circuit transmits an alarm signal and the first circuit means in the supervisory circuit is responsive to the increased value of the supervisory current to cause energization of the supervisory indicating means.

In accordance with a still further aspect of the present invention, the second circuit means in each supervisory circuit is responsive to a decrease or extinction in the value of the supervisory current to cause energization of the supervisory trouble indicating means.

In accordance with a still further and preferred aspect of the present invention, each supervisory circuit and the common circuit include static element switching circuits.

The principal object of the present invention is to provide an annunciator system which has the capability of presenting indications to an operator of both alarm conditions at remote stations and trouble conditions of the annunciator system itself.

Another object of the present invention is to provide an annunciator system having supervisory current flowing therethrough, the increase in value of which is representative of an alarm condition at a remote station, and the decrease or loss in value of which is a trouble condition of the annunciator system itself.

A still further object of the present invention is to provide an annunciator system utilizing static switching circuits, such as transistors, whereby current requirements and, hence, power requirements are maintained low for economically efficient operation.

The invention may take physical form in certain parts and arrangement of parts, a preferred embodiment of which will be described in detail in the specification and illustrated in the accompanying drawings which are a part hereof, and wherein:

FIGURE 1 is a block diagram of the preferred embodiment of the invention; and,

FIGURE 2 is a schematic circuit diagram of the preferred embodiment of the invention.

Referring now to the drawings wherein the showings are for the purpose of illustrating a preferred embodiment of the invention only and not for the purpose of limiting same, FIGURE 1 illustrates an annunciator system including generally a pair of remote station monitoring circuits A and B; and, central station equipment C including a pair of supervisory circuits D and E, a power supply circuit F, and a common circuit G. The

monitoring circuits A and B may be located, as desired, at different remote stations within the annunciator system. Each monitoring circuit serves the purpose of monitoring the condition of a device or an environment, such as temperature within a particular area and the like, to develop an alarm signal when a particular condition has occurred. The output circuits of the monitoring circuits A and B are connected to supervisory circuits D and E, located at the central station equipment C. Supervisory circuit D includes an alarm lamp 10 and a trouble lamp 12 and, similarly, supervisory circuit E includes an alarm lamp 14 and a trouble lamp 16. The supervisory circuits D and E are connected to the common circuit G which has an alarm lamp 18, a trouble lamp 20, an alarm bell 22 and a trouble buzzer 24. The power supply circuit F serves to provide power for operating supervisory circuits D and E, as well as the common circuit G.

The monitoring circuits A and B are substantially identical and the supervisory circuits D and E are substantially identical and, accordingly, the following description with reference to the schematic circuit diagram, illustrated in FIGURE 2, is directed only toward monitoring circuit A and supervisory circuit D, along with the power supply circuit F and the common circuit G.

Monitoring circuit

The monitoring circuit A may take the form, as illustrated in FIGURE 2, of either a centralized monitoring circuit A' or a decentralized monitoring circuit A''. The monitoring circuits A' and A'' are similar and each includes an end of line resistor 26 and a normally open switch 28 connected in parallel with resistor 26 across monitoring circuit terminals X and Y. Switch 28 may be a manually operated switch, as shown, or any well known switching means, such as a bimetallic element switch, so that in response to a particular condition the switch may serve to short circuit the end of line resistor 26. The distinction between the centralized monitoring circuit A' and a decentralized monitoring circuit A'' is that the latter circuit further includes its own source of power taking the form, for example, of battery 30 having its negative to positive sides connected in series from terminal X to the parallel circuit of resistor 26 and switch 28. For purposes of discussion, monitoring circuit A' is shown in FIGURE 2 with its output terminals X and Y connected to the input circuit of supervisory circuit D through a current limiting resistor 32.

Supervisory circuit

The input circuit of the supervisory circuit D is taken across a Zener diode 34, poled as shown in FIGURE 2, and which is in turn connected across terminals 2 and 5 of a double throw, double pole switch S1 having a pair of movable contacts 36 and 38 connected to terminals 2 and 5, respectively. The movable contacts 36 and 38 respectively serve to engage stationary contacts 1 and 4 when the input circuit of supervisory circuit D is connected across the decentralized monitoring circuit A'' or, as shown in FIGURE 2, to respectively engage stationary contacts 3 and 6 when the input circuit of supervisory circuit D is connected across the centralized monitoring circuit A'. A jumper wire, or conductor, 40 connects contacts 3 and 4 together.

Operating power for supervisory circuit D is obtained from the power supply circuit F, which, for purposes of illustration, takes the form of a battery 42 having its positive side connected to contact 6 of switch S1 and its negative side connected to contact 1 of switch S1. A voltage divider taking the form of series connected resistors 44 and 46 is connected between switch contact 3 and the negative side of battery 42, i.e., switch contact 1. A pair of series connected capacitors 48 and 49 are connected in parallel with resistors 44 and 46, which in turn are connected to a pair of NPN transistors 50 and 52. Transistor 50 has a collector 54 connected to the positive side of battery 42 through a pair of series connected resistors

56 and 58, a base 60 connected to one side of resistor 44 at switch contact 3 and an emitter 62. Transistor 52 includes an emitter 64 connected to the negative side of battery 42, a base 66 connected to the junction of resistors 44 and 46 and a collector 68 connected to the emitter 62 of transistor 50 through the cathode to anode circuit of a diode 70.

The collector 68 of transistor 52 is connected to the base 72 of a NPN transistor 74 which serves as an emitter follower circuit and includes a collector 76 connected to the positive side of battery 42 and an emitter 78 connected to the negative side of battery 42 through a filament coil 80 of supervisory trouble lamp 12. A load resistor 82 is connected in parallel with filament coil 80 and is connected from the negative side of battery 42 to two supervisory output circuits, one including the anode to cathode circuit of a diode 84 and the other including a capacitor 86 connected in series with the anode to cathode circuit of another diode 88. The junction of capacitor 86 and the anode side of diode 88 is connected to the negative side of battery 42 through a resistor 90.

The junction of resistors 56 and 58 in the collector circuit of transistor 50 is connected to the base 92 of a PNP transistor 94, having a collector 96 connected to the negative side of battery 42 through a parallel circuit comprising a filament coil 98 of supervisory alarm lamp 10 and a load resistor 100, and an emitter 102 connected to the positive side of battery 42. A capacitor 104 is connected between the base 92 and emitter 102 of transistor 94. Transistor 52 together with diode 70 and a resistor 106, connected from the anode side of diode 70 to the positive side of battery 42, serve as a reverse biasing circuit for transistor 94. A pair of output circuits are taken from the junction of load resistor 100 and collector 96 of transistor 94, one including the anode to cathode circuit of a diode 108 and the other including a capacitor 110 in series with the anode to cathode circuit of a diode 112. The junction of capacitor 110 and the anode side of diode 112 is connected to the negative side of battery 42 through a resistor 114.

Common circuit

The common circuit G, schematically illustrated in FIGURE 2, includes a pair of series connected resistors 116 and 118, defining a voltage divider, connected across load resistor 100 in the collector circuit of transistor 94, through capacitor 110 and the anode to cathode circuit of diode 112. A capacitor 120 is connected in parallel across resistors 116 and 118 and the junction of the resistors is connected to the gate 122 of a silicon controlled rectifier 124. Rectifier 124 has an anode 126 connected to the junction of collector 96 of transistor 94 and load resistor 100 through the anode to cathode circuit of diode 108 and a resistor 128. Rectifier 124 also has a cathode 130 connected to the negative side of battery 42 through a resistor 132 and a normally closed, manually operable switch S2. The junction of resistor 132 and the cathode 130 of rectifier 124 is connected to the base 134 of a NPN transistor 136, having an emitter 138 connected to the negative side of battery 42 through switch S2 and a collector 140 connected to the positive side of battery 42 through a pair of series connected resistors 142 and 144. The junction of resistors 142 and 144 is connected to the base 146 of a NPN transistor 148, having an emitter 150 connected to the positive side of battery 42 through the anode to cathode circuit of a diode 152. The transistor 148 also includes a collector 154 connected to the negative side of battery 42 through a parallel circuit including the common alarm bell 22 and a filament coil 156 of alarm lamp 18.

The common circuit G also includes a pair of series connected resistors 158 and 160, defining a voltage divider, connected across load resistor 82 in the emitter circuit of transistor 74 through capacitor 86 and the anode to cathode circuit of diode 88. A capacitor 162 is connected in parallel across resistors 158 and 160 and the junction

of the resistors is connected to the gate 164 of a silicon controlled rectifier 166. The rectifier 166 has an anode 168 connected to the junction of load resistor 82 and emitter 78 of transistor 74, through the anode to cathode circuit of diode 84 and a resistor 170, and a cathode 172 connected to the negative side of battery 42 through a resistor 174 and switch S2. The junction of resistor 174 and cathode 172 of rectifier 166 is connected to the base 176 of a NPN transistor 180, having an emitter 182 connected to the negative side of battery 42 through switch S2 and a collector 184 connected to the positive side of battery 42 through a pair of series connected resistors 186 and 188. The junction of resistors 186 and 188 is connected to the base 190 of a PNP transistor 192 having an emitter 194 connected to the positive side of battery 42 through the anode to cathode circuit of a diode 196. Transistor 192 also has a collector 198 connected to the negative side of battery 42 through a parallel circuit including a diode 200 connected in series with trouble buzzer 24, and a filament coil 202 of trouble lamp 20.

Operation

During the operation of the annunciator system, as illustrated in FIGURE 2, supervisory current normally flows from the positive side of battery 42 through a current path including switch contacts 6 and 38, the end of line resistor 26, resistor 32, resistor 44 and resistor 46 to the negative side of battery 42. Preferably, the supervisory current is of a given value, such as 1 milliamperes direct current, and is of sufficient value that a positive potential will be present on base 66 of transistor 52 with respect to emitter 64, whereby transistor 52 will be forward biased and conductive. With transistor 52 conductive, current will also flow from the positive side of battery 42 through resistor 106, the anode to cathode circuit of diode 70, and from the collector to emitter of transistor 52 to the negative side of battery 42. The forward resistance of diode 70, however, is sufficiently large with respect to the series resistance of resistors 44 and 46 that the potential appearing on the emitter 62 will be more positive than that appearing on the base 60 of transistor 50, whereby transistor 50 will be maintained reversed biased and nonconductive. So long as the supervisory current is maintained at substantially the given value, i.e., at 1 milliamperes, transistor 50 will be maintained reversed biased and nonconductive and transistor 52 will be maintained forward biased and conductive and both the alarm lamp 10 and trouble lamp 12 of the supervisory circuit D will remain de-energized. Also, so long as alarm lamp 10 is maintained de-energized the common circuit lamp 18, as well as the common circuit alarm bell 22, will not become energized, and that so long as supervisory circuit trouble lamp 12 is maintained de-energized the common circuit trouble lamp 20 and the common circuit trouble buzzer 24 will not become energized. This is the normal operating condition of the annunciator system.

In a manner similar to that as described above, a normal operating condition of the annunciator system may be obtained by substituting the decentralized monitoring circuit A' for the centralized monitoring circuit A', shown connected to the input circuit of supervisory circuit D in FIGURE 2. When monitoring circuit A' is connected to the input circuit of supervisory circuit D, and with switch S1 in its decentralized position, i.e., with movable contact 36 in engagement with switch contact 1 and movable contact 38 in engagement with switch contact 4, supervisory current of the given value, preferably on the order of 1 milliamperes, will normally flow from the positive side of battery 30 through the end of line resistor 26, switch contacts 38, 4 and 3, resistors 44 and 46, and through switch contacts 1 and 36 to the negative side of battery 30 through resistor 32. As described with respect to the centralized monitoring circuit A', the supervisory current is of sufficient magnitude that transistor 52 will be forward biased and conductive, and current will flow from the positive side of battery 42 through diode 70

and the collector to emitter of transistor 52 to the negative side of battery 42, whereby transistor 50 will become reversed biased and nonconductive. Other than the foregoing manner in which supervisory current is obtained, the operation of the annunciator system is the same whether the centralized monitoring circuit A' or the decentralized monitoring circuit A'' is connected to the input circuit of supervisory circuit D.

The description of operation of the annunciator system illustrated in FIGURE 2 is hereinafter continued with reference to the centralized monitoring circuit A' being connected, as shown, to input circuit of supervisory circuit D. When the switch 28 is monitoring circuit A' becomes closed in response to a predetermined condition of a monitored device or environment, such as temperature, the end of line resistor 26 will be short circuited whereby the supervisory current will be increased in value from, for example, 1 milliamperes to 3 milliamperes, so that the potential across resistors 44 and 46 will sufficiently increase in value that the potential appearing on base 60 of transistor 50 will become positive with respect to that appearing on emitter 62. Thus, the transistor 50 will become forward biased and conductive. When transistor 50 is conductive, current will flow from the positive side of battery 42 through resistors 58, 56, the collector to emitter circuit of transistor 50, the anode to cathode circuit of diode 70, and from the collector to emitter circuit of transistor 52 to the negative side of battery 42. Thus, a voltage will appear across resistor 58, whereby the potential appearing on base 92 of transistor 94 will become less positive with respect to that appearing on emitter 102. Thus, transistor 94 will become forward biased and conductive, and current will flow from the positive side of battery 42 through the emitter to collector circuit of transistor 94 and thence through the parallel path including load resistor 100 and filament 98 of lamp 10, whereby lamp 10 will glow brightly indicative of an alarm condition at monitoring circuit A'.

When current flows through load resistor 100, a positive potential will appear across resistor 100, which potential will be applied to the anode 126 of silicon controlled rectifier 124 in the common circuit G through the anode to cathode circuit of diode 108 and resistor 128. Capacitor 110 in supervisory circuit D will be charged by current flow therethrough from the positive side of battery 42 through the emitter to collector circuit of transistor 94, the capacitor 110, the anode to cathode circuit of diode 112, and the series connected resistors 116 and 118 to the negative side of battery 42 through switch S2. The capacitor charging current will exist for a period in accordance with the RC time constant as determined by the values of capacitor 110, the forward resistance of diode 112 and the resistors 116 and 118. When this capacitor charging current is flowing a voltage pulse will be developed across resistor 118 in the common circuit G, which pulse will be of positive polarity and of sufficient magnitude that the voltage existing on gate 122 of silicon controlled rectifier 124 will be positive with respect to that appearing on cathode 130, whereby the rectifier 124 will become forward biased and conductive. Thus, current will flow from the positive side of battery 42 through the emitter to collector circuit of transistor 94, through the anode to cathode circuit of diode 108, the resistor 128, the anode to cathode circuit of rectifier 124, and thence through resistor 132 through switch S2 to the negative side of battery 42. A voltage will be developed across resistor 132 so that a positive voltage will appear on base 134 of transistor 136 with respect to that on emitter 138, whereby transistor 136 will become forward biased and conductive. Current will then flow from the positive side of battery 42 through resistors 144 and 142, the collector to emitter circuit of transistor 136 to the negative side of battery 42 through the switch S2. A voltage will be developed across resistor 144 so that

the voltage on emitter 150 on transistor 148 will be positive with respect to that on base 146, whereby the transistor 148 will become forward biased and conductive. Thus, current will flow from the positive side of battery 42, through the anode to cathode circuit of diode 152, the emitter to collector circuit of transistor 148, energizing both the common circuit alarm bell 22 and the filament 156 of the common circuit alarm lamp 18. The operator after noting the alarm indications may press switch S2 to momentarily provide an open circuit to the negative side of battery 42, de-energizing silicon controlled rectifier 124. Thus, transistors 136 and 150 will become de-energized, causing bell 22 and lamp 18 to become de-energized. The momentary opening of switch S2, however, will not result in de-energization of alarm lamp 10 in the supervisory circuit D since with switch 28 closed the increased value of supervisory current flowing through resistors 44 and 46 will continue to maintain transistor 94 forward biased and conductive. Lamp 10 will remain energized until corrective action is taken to decrease the supervisory current to its normal value, i.e., 1 milliamperes, by, for example, opening switch 28 in the monitoring circuit A'.

During the operation of the annunciator system, illustrated in FIGURE 2, it is possible that the supervisory current will decrease in value to less than that of the given value, i.e., 1 milliamperes, or even be extinguished, such as upon an open circuit in the interconnection between monitoring circuit A' or A'' and supervisory circuit D, or upon loss of power resulting from failure of battery 30 if the decentralized monitoring circuit A'' is connected to the supervisory circuit D, etc. When the supervisory current has decreased in value below 1 milliamperes transistor 52 will become reverse biased and non-conductive so that the voltage appearing on base 72 of transistor 74 will be positive with respect to that on emitter 78. Thus, transistor 74 will become forward biased and current will flow from the positive side of battery 42 through the collector to emitter circuit of transistor 74 and thence through filament 80 of lamp 12 and through the load resistor 82. The trouble lamp 12 will, therefore, become energized providing a visual indication of a trouble condition. The contact developed across resistor 82, due to current flow therethrough, will be coupled to the anode of silicon controlled rectifier 166 through the anode to cathode circuit of diode 84 and resistor 170 so that the voltage appearing on anode 168 is positive with respect to that on cathode 172. Capacitor 86 will become charged by current flowing therethrough from the positive side of battery 42 through the collector to emitter circuit of transistor 74, the capacitor 86, the anode to cathode circuit of diode 88, the series connected resistors 158 and 160 of common circuit G and, thence, through switch S2 to the negative side of battery 42. The charging current will exist for a period in accordance with the RC time constant, determined by the values of capacitor 86, the forward resistance of diode 88 and resistors 158 and 160. During the period that capacitor charging current is flowing, a voltage pulse will be developed across resistor 160 so that, in turn, a positive voltage pulse will appear on gate 164 of silicon controlled rectifier 166 with respect to cathode 172 so that the rectifier becomes forward biased and conductive. Thus, current will flow from the positive side of battery 42 through the collector to emitter circuit of transistor 74, the anode to cathode circuit of diode 84, resistor 170, the anode to cathode circuit of rectifier 166, the resistor 174 and thence through the switch S2 to the negative side of battery 42. A voltage will be developed across resistor 174 so that a positive voltage will be applied to the base 176 of transistor 180 with respect to emitter 182, whereby transistor 180 becomes forward biased and conductive. Current will flow from the positive side of battery 42 through resistors 188, 186, the collector to emitter circuit of transistor 180, and thence to the

negative side of battery 42 through the switch S2. A voltage will be developed across resistor 188 so that the voltage appearing on emitter 194 of transistor 192 will be positive with respect to that on base 190, whereby transistor 192 will become forward biased and conductive. Accordingly, current will flow from the positive side of battery 42 through the anode to cathode circuit of diode 196, the emitter to collector circuit of transistor 192, the anode to cathode circuit of diode 200, the trouble buzzer 24, and also through the parallel circuit including the filament 202 of trouble lamp 20 and to the negative side of battery 42. The common circuit trouble buzzer 24, as well as the common circuit trouble lamp 20, will become energized presenting an operator with both audible and visual trouble indications. The operator, after noting the trouble indications by buzzer 24 and lamp 20 at the common circuit G, may momentarily depress switch S2 thereby placing an open circuit in the cathode circuit of silicon controlled rectifier 166 to the negative side of battery 42. Thus, rectifier 166 will cease to conduct, de-energizing transistors 180 and 192, lamp 20 and bell 24. The trouble lamp 12 in the supervisory circuit D will, however, be maintained energized until the supervisory current is restored to its normal value at which time transistor 52 will become forward biased and conductive, thereby causing transistor 74 to become nonconductive, de-energizing lamp 12.

In accordance with a preferred embodiment of the invention, the values and types of various components illustrated in FIGURE 2 are found in Table I.

Table I

Component:	Component value or type
Battery 30	volts-- 20
End of line resistor 26	kilohms-- 11
Zener diode 34	IN3031
Resistor 32	ohms-- 600
Capacitor 48	microfarad-- 0.05
Capacitor 49	do-- 2.0
Resistor 44	ohms-- 200
Resistor 46	do-- 600
Resistor 58	do-- 270
Resistor 56	kilohms-- 1.8
Transistor 50	2N1302
Transistor 52	2N1302
Diode 70	ED3002
Capacitor 104	microfarads-- 2.0
Resistor 106	kilohms-- 1.8
Transistor 94	2N1415
Resistor 100	kilohms-- 5.1
Resistor 82	do-- 5.1
Transistor 74	2N1302
Capacitor 110	microfarads-- 2.0
Capacitor 86	do-- 2.0
Resistor 90	kilohms-- 100
Resistor 114	do-- 100
Diode 84	ED3002
Diode 88	ED3002
Diode 108	ED3002
Diode 112	ED3002
Resistor 116	kilohm-- 1
Resistor 118	ohms-- 150
Capacitor 120	microfarad-- 0.05
Silicon controlled rectifier 124	2N2323
Resistor 128	kilohm-- 1
Resistor 132	ohms-- 270
Transistor 136	2N1302
Resistor 142	kilohms-- 1
Resistor 144	ohms-- 270
Diode 152	microfarads-- ED3002
Transistor 148	2N1501
Resistor 158	kilohm-- 1
Resistor 160	ohms-- 150
Capacitor 162	microfarad-- 0.05
Silicon controlled rectifier 166	2N2323

Table I—Continued

Component:	Component value or type	
Resistor 170	kilohm	1
Resistor 188	ohms	270
Resistor 186	kilohm	1
Transistor 180	2N1302	5
Resistor 186	kilohm	1
Resistor 188	ohms	270
Diode 196	microfarads	ED3002
Transistor 192	2N1501	10

Although the invention has been shown in connection with a preferred embodiment, it will be readily apparent to those skilled in the art that various changes in form and arrangement of parts may be made to suit requirements without departing from the spirit and scope of the invention.

I claim:

1. An annunciator system comprising:
 - a plurality of remote station monitoring circuits, each of said monitoring circuits having means for transmitting an alarm signal indicative of an alarm condition at the remote station;
 - a like plurality of central station supervisory circuits each electrically connected with an associated one of said monitoring circuits, means for indicating an alarm in each said supervisory circuit, first circuit means for energizing said alarm indicating means in response to said alarm signal, means for indicating trouble in each said supervisory circuit, second circuit means for energizing said trouble indicating means in response to a disruption in said electrical connection between said supervisory circuit and said associated monitoring circuit;
 - a central station common circuit having common alarm indicating means and common trouble indicating means and third and fourth circuit means for respectively energizing said common alarm and common trouble indicating means when said supervisory alarm and supervisory trouble indicating means of any of said supervisory circuits become energized; and,
 - said central station common circuit also having means for respectively deenergizing said common alarm and common trouble indicating means while said supervisory alarm or said supervisory trouble indicating means of any of said supervisory circuits remain energized.
2. An annunciator system as set forth in claim 1, wherein said deenergizing means is common to said third and fourth circuit energizing means.
3. An annunciator system as set forth in claim 2, wherein said deenergizing means is a normally closed self-restoring switch.
4. An annunciator system as set forth in claim 1, wherein said supervisory circuit and its associated monitoring circuit forms a supervisory current circuit, and a source of voltage is connected within said current circuit so that supervisory current of a given value normally flows in said current circuit.
5. An annunciator system as set forth in claim 4, wherein said voltage source is located at said associated monitoring circuit.
6. An annunciator system as set forth in claim 4, wherein said associated monitoring circuit includes means for

increasing the value of said supervisory current consisting of said alarm signal.

7. An annunciator system as set forth in claim 6, wherein said supervisory current circuit includes a resistor so that the voltage developed across said resistor will be increased in value when the value of said supervisory current is increased; and,

said first circuit means includes a normally nonconductive electronic control means having an input circuit connected to said resistor and an output circuit coupled to said supervisory alarm indicating means, said control means being conductive when the voltage across said resistor attains a predetermined value whereby current will flow through said control means to energize said supervisory alarm indicating means.

8. An annunciator system as set forth in claim 4, wherein said supervisory current circuit includes a resistor so that the voltage developed across said resistor will be decreased in value when the value of said supervisory current is decreased; and,

said second circuit means includes a normally conductive electronic control means having an input circuit connected to said resistor and an output circuit coupled to said supervisory trouble indicating means, said normally conductive control means being nonconductive when the voltage across said resistor is decreased in value from said given value, said supervisory trouble indicating means being energized when said normally conductive control means becomes nonconductive.

9. An annunciator system as set forth in claim 1, wherein said common circuit includes a resistor having current flow therethrough when said supervisory alarm indicating means is energized; and,

said third circuit means includes an electronic control means having an input circuit connected to said resistor and an output circuit coupled to said common alarm indicating means, said control means being conductive when current flows through said resistor and said common alarm indicating means being energized when said control means becomes conductive.

10. An annunciator system as set forth in claim 1, wherein said common circuit includes a resistor having current flow therethrough when said supervisory trouble indicating means is energized; and,

said fourth circuit means includes an electronic control means having an input circuit connected to said resistor and an output circuit coupled to said common trouble indicating means, said control means being conductive when current flows through said resistor and said common trouble indicating means being energized when said control means becomes conductive.

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THOMAS B. HABECKER, *Primary Examiner*.

U.S. Cl. X.R.

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