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Damon

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[54] **ALARM SYSTEM WITH AUTOMATIC RINGBACK**

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[58] **Field of Search**..... 340/213.2, 213.1, 226, 340/264, 276, 313, 314, 163, 413

[56] **References Cited**

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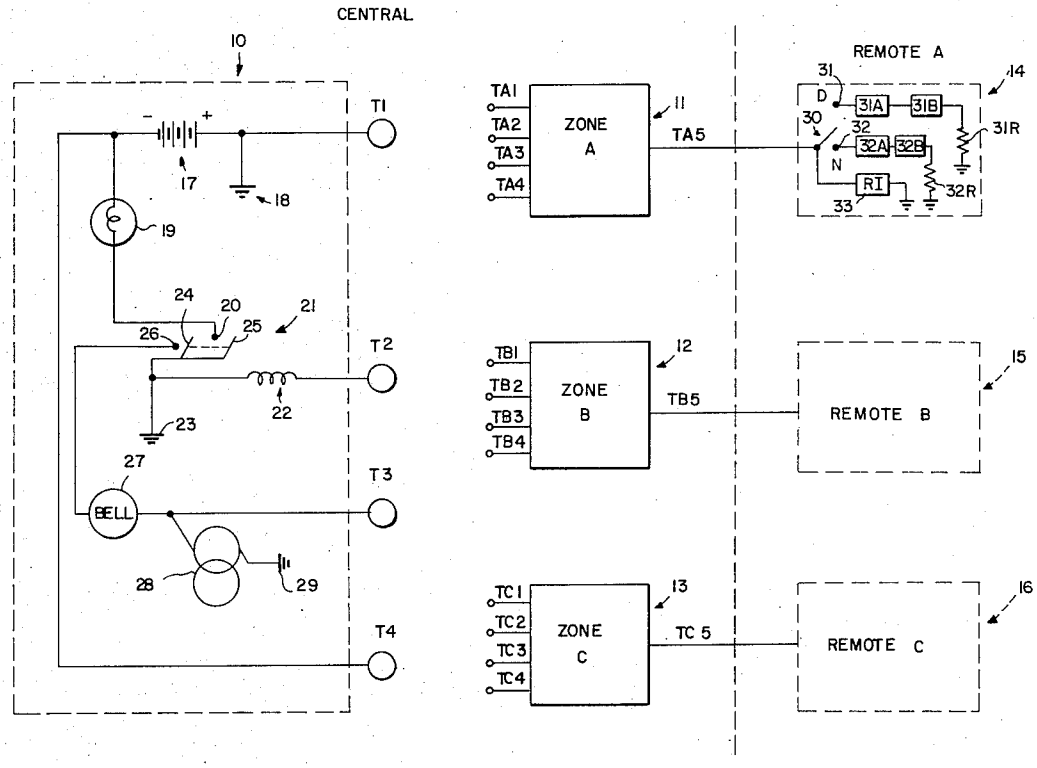
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Attorney, Agent, or Firm—Fidelman, Wolffe, Leitner & Hiney

[57] **ABSTRACT**

An alarm system which senses, at a central location, change from day monitoring to night monitoring at the remote location and automatically sends a ringback signal to the remote location to indicate that the change has been received and noted. The ringback signal is a repetitive signal for a given number of repetitions. The central location includes an indication of the change which remains activated until the central monitor is reset and switched to night monitoring.

18 Claims, 2 Drawing Figures



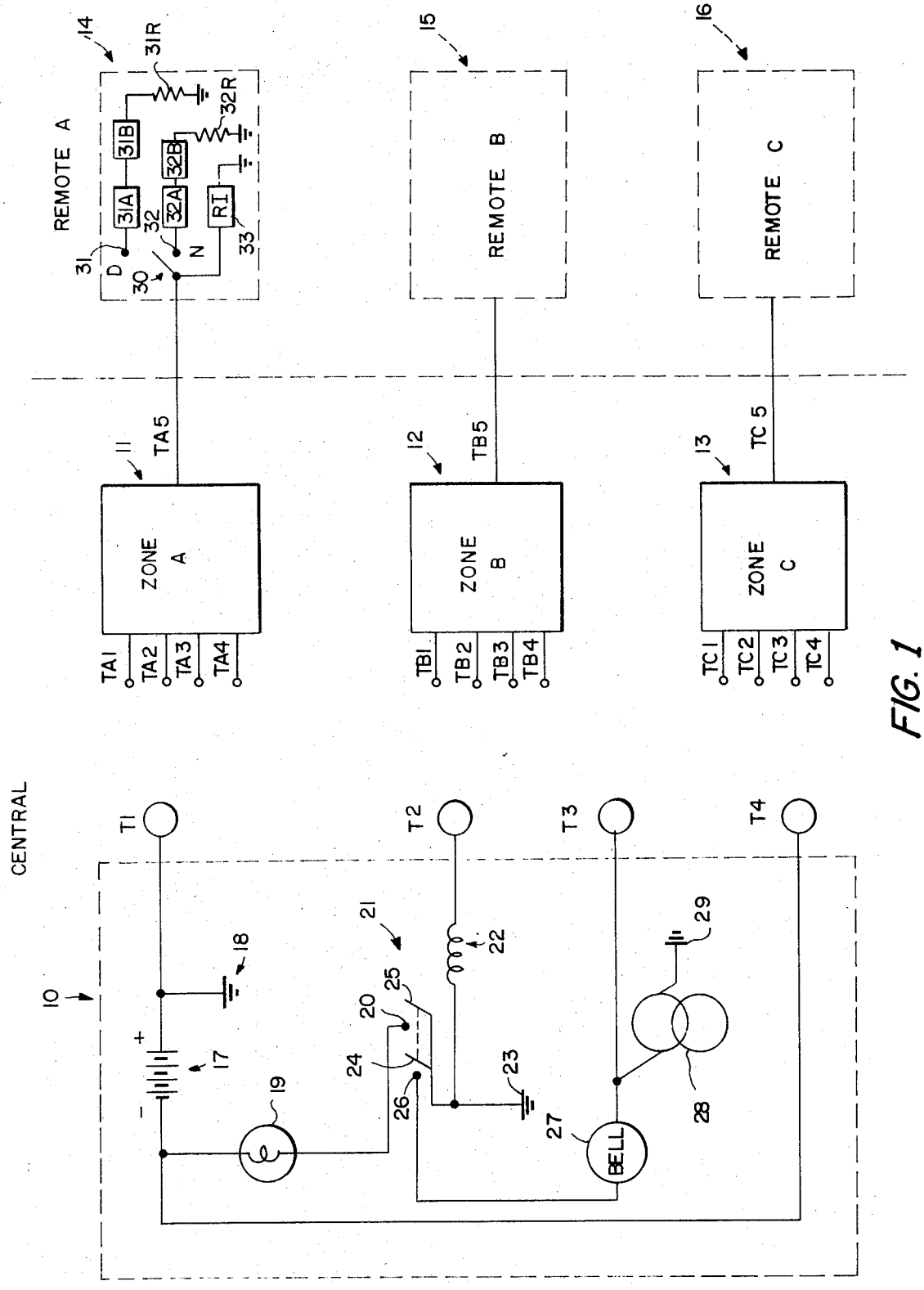

CENTRAL
10
T1
T2
T3
T4
18
17
19
21
22
20
25
24
26
23
27
BELL
29
28
REMOTE A
14
31R
32R
31B
32B
31A
32A
RI
31
32
33
D
N
30
REMOTE B
15
REMOTE C
16
11
TA5
ZONE A
TA1
TA2
TA3
TA4
12
TB5
ZONE B
TB1
TB2
TB3
TB4
13
TC 5
ZONE C
TC1
TC2
TC3
TC4

FIG. 1

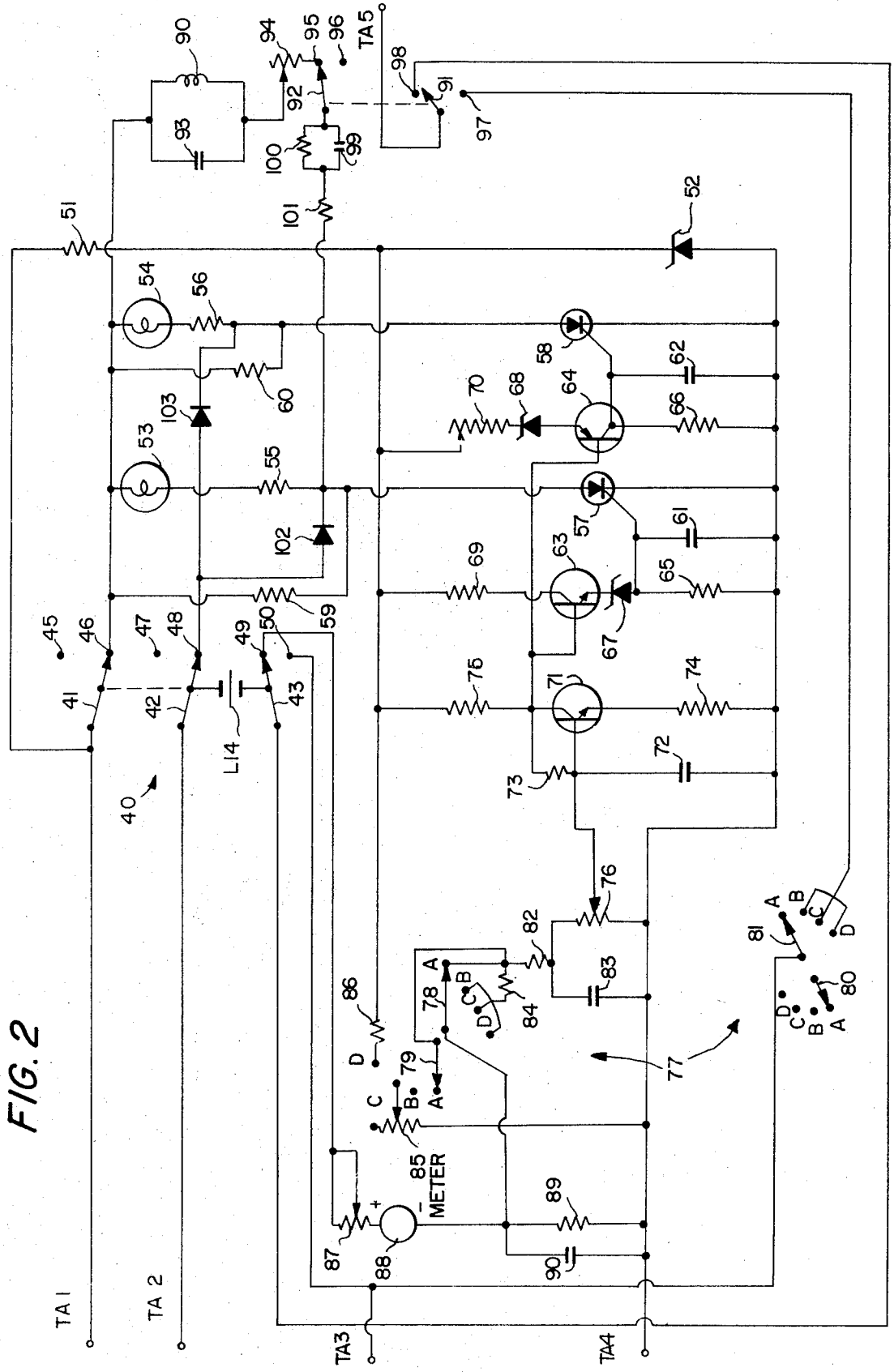


FIG. 2

ALARM SYSTEM WITH AUTOMATIC RINGBACK

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to a centrally monitored remote alarm system and more particularly to an automatic ringback system for centrally monitored remote alarm systems.

2. Description of Prior Art

In the field of centrally monitored alarm systems, a plurality of remote locations are monitored at a central location. At the remote location, there usually are a plurality of switches connected to various devices to be protected including a first group for day-time monitoring and a second group (including part of the first group) for night-time monitoring. A selection switch is included at the remote location to connect the central office with either the group of day-time or the group of night-time switches at the remote location.

In the evening, a large number of stores in a given area close at approximately the same time; i.e., 6:00 or 9:00 in the evening. At this time, the remote systems are switched from day-time monitoring to night-timing monitoring and the central office must indicate by a ringback signal that the central office has received the change from day to night monitoring and that the system appears in order and consequently the client may leave the premises.

In the prior art devices, the operator at the central location must ring back each received signal manually. Consequently, the client must sometimes wait 2–3 minutes or sometimes as long as 10 minutes for the busy operator to ring back the received signal. To alleviate this inconvenience to the client, some companies have provided additional personnel at these peak hours. The additional personnel required is unnecessary expense which is passed on to the client.

SUMMARY OF THE INVENTION

The present invention overcomes the shortcomings of the prior art previously discussed by providing an automatic ringback system wherein the central office senses the changing from day to night monitoring at the remote location and automatically transmits a ringback signal to indicate that the change has been received and noted and that the alarm system is in operating order. A ringback signal is transmitted repeatedly for a given number of times. Upon the termination of the ringback signal, the client may leave the premises knowing that the central location has received the day to night change. At the central location, an indicator is activated for each client to which a ringback signal has been transmitted and is extinguished only by resetting of the central monitoring unit and switching the central monitoring unit from day to night monitoring. The central unit contains a single DC power source for use with a plurality of monitoring circuits and a single AC generator for transmitting the ringback signal to the plurality of remote units.

OBJECTS OF THE INVENTION

An object of the present invention is to provide an automatic ringback system.

Another object is to provide a simple and inexpensive ringback system for alarms.

A further object of the invention is the provision of a single power source and a single ringback signal generator for use with a plurality of zone monitoring remote site alarm systems.

Another object is to provide an automatic ringback which is easily incorporated into a present alarm system without major modification.

Other objects, advantages and novel features of the present invention will become apparent from the following detailed description of the invention when considered in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram of the overall system including schematics of the central power system and the remote site switches;

FIG. 2 is a detailed schematic of the individual zone monitoring units with automatic ringback capability.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 shows, in block diagram form, a central office having a central power supply unit **10** and individual zone monitoring units **11, 12** and **13** and remote locations **14, 15** and **16** connected respectively to zone monitoring units. The central power supply **10** has a DC source **17** having one side connected to ground **18** which is connected to output terminal **T1.** Connected to the other side of DC source **17** is lamp **19** which is also connected to terminal **20** of relay **21.** Relay **21** includes a solenoid **22** having one side thereof connected to the terminal **22** and the other side connected to ground **23.** Also connected to ground **23** are the two ganged switch elements **24** and **25** of relay **21.** Switch element **25** connects terminal **20** to ground **23** and switch element **24** connects terminal **26** to ground **23.** Connected to terminal **26** is a bell **27** which is connected to a 20-cycle motor generator set **28** which is also connected to ground **29.** The ungrounded side of motor and generator set **28** is connected to terminal **T3.** The negative side of the DC power source **17** is connected to terminal **T4.**

Upon activation of relay **21,** solenoid **22** closes the switch elements **24** and **25** to contacts **26** and **20,** respectively, connecting light **19** with the DC source **17** and bell **27** with the AC signal from motor generator set **28.**

Connected to the terminals **T1-T4** of central power supply are terminals **TA1-TA4,** terminals **TB1-TB4,** and **TC1-TC4,** respectively of zone monitoring units **11, 12** and **13,** respectively. Though showing only three units, the number of units may be increased and is limited only by the capacity of the central power supply system. The lamp **19,** bell **27** and the 20-cycle motor generator **28** are examples of devices which may be used. Consequently any equivalent indicating and AC signal generating device may be used.

Connected to terminals **TA5, TB5** and **TC6** are remote site units **14, 15** and **16,** respectively. A simplified schematic of the remote site unit is shown at remote site **14.** Generally, the remote site has a day-night switch **30** having a day terminal **31** with day switches **31A, 31B** and day resistor **31R** connected in series to ground. A second terminal **32** is a night terminal having night switches **32A, 32B** and night resistor **32R** connected in series to ground. Also in the remote unit is a

ringback indicator 33 connected between the input line and ground. Devices 31A, 31B, 32A and 32B may be either normally open or normally closed switches which may be foil on windows, switches on doors, windows, safes and any device which is to be monitored during the day or night position of switch 30. If they are normally open switches, they are usually in parallel with the resistor so that the system can be monitored, whereas if they are normally closed switches, no resistors are needed. The individual resistors 31 and 32 are of different values such that the control monitoring system 11 can sense which mode switch 30 is in.

As will be discussed more fully in the explanation of FIG. 2, upon moving switch 30 from the day position 31 to the night position 32, central zone monitoring unit 11 will sense the change and automatically transmit back a signal from AC ringback signal generator 28 to activate ringback indicator 33 in the remote location. Also, upon sensing the changing of the position of switch 31, relay 21 is activated which in turn activates lamp 19 and bell 27 until reset by a central operator.

A detailed schematic of the zone monitoring unit 11 is shown in FIg. 2 and has terminals TA1-TA4 connected respectively to terminals T1-T4 of the central power supply 10 and terminal TA-5 connected to the remote site unit 14. TA1 and TA2 are connected to three position toggle switch 40 at switcharms 41 and 42, respectively. Switcharms 41, 42 and 43 are ganged by a restoring spring 44, and are shown in their neutral position resting on contacts 46, 48 and 49, respectively. In the reset position, the switcharms are moved up, arm 41 coming in contact with contact 45, 42 coming in contact with 47 and 43 breaking contact with contact 49. For the test position, the switch is moved down and switcharm 41 breaks contact with contact 46, 42 breaks contact with contact 48, and 43 comes into contact with contact 50, which iis connected to terminal TA-3. Terminal TA-1 is also connected through resistors 51 and Zener diode 52 to terminal TA-4 and provides current regulation for the zone monitoring network.

Connected in parallel between contact 46 and terminal TA4 are two series circuits having lights 53 and 54, resistors 55 and 56, and silicon control diodes (SCR) 57 and 58, respectively. Connected in parallel with lights 53 and 54 and series resistors 55 and 56 are resistors 59 and 60, respectively. Upon detection of a break in the alarm system, SCR 57 is activated which ignites break light 53 and when a ground is detected, SCR 58 is activated which ignites ground light 54. The SCR's 57 and 58 are activated depending upon the charge of capacitor 61 and 62 connected between their gate and cathode. Capacitors 61 and 62 are connected across the output transistors 63 and 64, respectively, which have resistors 65, 66, Zener diodes 66, 68 and resistors 69, 70 associated therewith, respectively. Transistors 63 and 64 are connected to the output of transistors 71 which has capacitor 72 at its base and biasing resistors 73, 74 and 75. Transistor 71 amplifies a signal obtained by a variable voltage divider formed by resistor 76 and a movable tap.

The voltage across voltage dividing resistor 76 is determined by the resistance between 76 and the remote site. The resistance between the remote location and the central office may change due to opening of one of the switches in the remote site, breaking of a line between the remote site and central location and a short between the remote site and central location. The resistance between 76 and remote site may be changed also by varying the position of switch 77 having contact arms 78, 79, 80 and 81 and positions A, B, C and D. When the four ganged contact arms 78, 79, 80 and 81 of switch 77 are in the A position, the alarm system is in the night monitoring position. When the contact arms are in the B position, the alarm system is in the day monitoring position. When the contact arms are in the C position, the alarm system will simulate an opening condition to test the zone monitoring electronics, including SCR 57 and indicator light 53. When the contact arms are in the D position, the alarm system will simulate a grounding condition to test the electronics, including SCR 58 and indicator light 54.

The resistance from the remote location is connected to contact arm 78. In the day-time position, 78 is connected directly to resistor 82 which is connected to parallel combination of voltage dividing resistors 76 and capacitor 83. In the B, C and D positions of contact arms 78, resistor 84 is connected in series with resistor 82. Contact arm 79 is open in the A and B position and in the C position, connects variable resistor 85 in parallel with a series combination of resistors 82, 84 and capacitor 83. Resistance 85 is chosen to be large enough so as to simulate a break or open circuit condition. In the D position, contact arm 79 connects resistor 86 between resistors 75 and 82 and is chosen so as to simulate a grounded condition. Connected in series between contact 49 and terminal TA4 of switch 44 are variable resistor 87, meter 88, resistor 89 and parallel capacitor 90. Connected between meter 88 and resistor 89 is contact arm 78 of switch 77. In the neutral position of switch 40, contact arm 43 connects the resistance of the remote site via terminal TA5 with meter 88 via contact 49. The condition of the remote site is not only monitored by meter 88 but by the electronics including SCR's 57 and 58 and indicators 53 and 54.

Connected to contact 46 of switch 40 is relay coil 90 having contact arms 91 and 92. In parallel with relay coil 90 is capacitor 93 which, as will be described later, provides a slow release of the relay. The parallel combination of capacitor 93 and relay coil 90 is connected to variable resistor 94 which is connected to switch contact 95. When relay coil 90 is activated, it will break its circuit with the power supply by moving contact 92 out of engagement with contact 95 and into engagement with open contact 96, but will retain contact arms 91 and 92 in their down position for a time to be determined by the values of the capacitor 93 and the relay coil 90. Contact 97 for contact arm 91 is connected to positions B, C and D of contact arm 81 of switch 77 and contact 98 is connected to switch arm 43 of switch 40. Contact arm 81 of switch 77 is connected to contact 50 of switch 40 and terminal TA3 and has its A position open and its B, C and D positions connected to contact 97. It should be noted that contact arm 80 of switch 77 has all four of its positions open and is not connected in the circuit.

Connecting contact arm 92 to the anode of SCR 57 is the parallel combination of capacitor 99 and resistor 100 and series resistor 101. Though capacitor 99 and resistors 100, 101 are shown between SCR 57 and contact arm 92, 92 and 57 may be directly connected and the capacitor 99 and resistors 100 and 101 may be connected in series with the parallel combination of

relay coil **90** and capacitor **93.** As will be described more fully hereafter, capacitor **99** and resistors **100, 101** provide a cycle limiting function to limit the number of cycles relay coil **90** opens and closes gang contact arms **91** and **92.**

The anodes of SCR's **57** and **58** are connected to terminal TA2 through switch arm **42** and contact **48** by diodes **102** and **103,** respectively. Diode **103** prevents the ignition of light **54** upon the activation of SCR **57** and diode **102** prevents the ignition of light **53** upon the activation of SCR **58.**

Since the alarm circuitry alone is not part of the present invention, only the operation of the automatic ringback system will be described in detail. Initially, the system is in the day monitoring condition wherein said switch **77** has contact arms **78, 79, 80** and **81** in their B position. Switch **40** which has switch arms **41, 42** and **43** in their neutral position contacting contact **46, 48** and **49,** respectively. Relay coil **90** is deactivated with contact arm **91** contacting contact **98** and contact arm **92** contacting contact **95.** With the switches in the position just described, the remote site is being monitored via terminal TA5, contact arm **91,** contact **98,** switch arm **43,** contact **49,** meter **88,** contact arm **78** to the monitoring electronics. When the client at the remote site desires to leave his premises and switches his day-night switch to the night-time position, the monitoring electronics sense a break in the system and activates SCR **57.** Upon activation of SCR **57,** a series circuit is created from the DC source **17** through terminals T4 and TA4, SCR **57,** diode **102,** contact **48,** switch arm **42,** terminal TA2, terminal T2 to relay coil **22** to activate indicator light **19** and bell **27.** Also connected to the DC power source **17** through SCR **57** is break indicator **53** via contact **46,** switch arm **41,** terminal TA1, and terminal T1, and relay coil **90** via resistors **101, 100,** capacitor **99,** contact arm **92,** contact **95,** resistor **94,** contact **46,** switch arm **41,** terminal TA1 and terminal TA2. Thus, on switching the remote site switch from the day to night position, SCR **57** is activated and activates relay coil **22** and its indicators **19** and **27;** indicating light **53,** and relay coil **90.**

Upon the activation of relay coil **90,** contact arms **91** and **92** are moved to their down position. With contact arm **91** in contact with contact **97,** and AC signal from motor generator set **28** is transmitted to the remote location to ring remote indicator buzzer **33** through terminals T3 and TA3, the switch contact arm **81,** position B, contact **97,** contact arm **91,** and terminal TA5. When contact arm **92** moves out of engagement with contact **95,** the DC power supply is removed from relay coil **90** and it starts to discharge through capacitor **93.** Capacitor **93** prevents relay coil **90** from immediately discharging and consequently holds contact arms **91** and **92** in the down position for a preset amount of time, thus producing more than momentary buzzing of remote indicator **33.** Also, upon the breaking of contact between contact arm **92** and contact **9,** the charging circuit for capacitor **99** was broken and a small amount of charge is bled off during this break by resistor **100.** With the energy in relay coil **90** being dissipated, contact arms **91** and **92** resume their upward position, cutting off the AC signal through terminal TA5 and reactivating the charging circuit of the capacitor **99** and relay coil **90.** The cycle is then repeated as just described.

The number of times the cycle will be repeated so as to allow the contact arms **91** and **92** to move up and down is determined by the resistors **101, 100, 94** and capacitor **99.** At some point in time, capacitor **99** will be charged to a voltage sufficient to prevent the activation of coil **90.** At this point, a majority of the DC voltage will be across capacitor **99,** relay coil **90** will be deactivated, and the contact arm **91** and **92** will be in their up position, disconnecting the AC signal from terminal TA5.

Since the remote condition sensing device is an SCR, SCR **57** will remain conducting once gated until reset. Thus, break-light **53** will be ignited and the operator will know which remote sites have been changed from night to day monitoring. When the operator has time, he will move switch **40** into its reset position, breaking the series circuit of SCR **57** with the DC power source **17** and thus deactivate the SCR **57.** At the same time, the operator moves switch **77** into position A for night monitoring.

Thus, the circuits as just described automatically transmit a ringback signal to the remote site to indicate that the central office has sensed the change of position of the remote site switch from night to day monitoring and automatically transmits an AC signal for a given number of cycles. When the operator has time, he resets the central office and turns the central office from day to night monitoring of the remote site. Thus the present invention has provided an automatic ringback system which will allow the client to leave his premises knowing that his system is in operation without the necessity of manual manipulation by an operator in the central location.

Though the various indicators have been shown as lights, bells or buzzers, the power sources have been shown as a DC battery and a 20-cycle motor generator set, any substitution of equivalent elements can be made without deviating from the spirit or scope of the invention. The present automatic ringback system has been described in combination with a specific alarm system but may be used with any other type of alarm system. Although the invention has been described and illustrated in detail, it is to be clearly understood that the same is by way of illustration and example only and is not to be taken by way of limitation, the spirit and scope of the invention being limited only by the terms of the appended claims.

What is claimed is:

1. An alarm system with automatic ringback from a central location to a remote site comprising:

a manually operated remote switch at said remote site connected to said central location;

a remote indicator at said remote site connected to said central location;

a switching means at said central location having a first terminal connected to said remote indicator and a second terminal connected to a signal source;

a sensing means at said central location connected to said remote switch for sensing the condition of said remote switch; and

a switch control means at said central location connected to said sensing means for interconnecting said switching means first and second terminals for a limited time in response to a first sensed condition;

whereby said remote indicator is activated by said signal source for said limited time.

2. An alarm system as in claim **1** including a first central indicator connected to said sensing means and activated in response to said first sensed condition until manually reset.

3. An alarm system as in claim **1** wherein said switch control means includes a cycling means for causing said switching means to repeatedly interconnect and disconnect said switching means first and second terminals for the duration of said limited time.

4. An alarm system as in claim **3** wherein said cycling means comprises a relay means connected to said sensing means by a relay switch for simultaneously opening said relay switch and interconnecting said switch means first and second terminals.

5. An alarm system as in claim **4** including a time delay means connected to said relay means for delaying the activation of said relay means upon opening of said relay switch.

6. An alarm system as in claim **3** including a cycle limiting means connected to said cycling means for disabling said cycling means at the expiration of said limited time.

7. An alarm system as in claim **6** wherein said cycle limiting means comprises a resistor-capacitor circuit whose rate of change determines said limited time.

8. An alarm system as in claim **1** wherein said manually operable remote switch has a day and night condition and said first sensed condition being said night condition.

9. An alarm system with automatic ringback comprising:

a remote switch having a day position and a night position;

a remote ringback indicator;

a sensing means for sensing said night position of said remote switch;

a ringback signal source; and

a switching means having a first terminal connected to said remote switch and said remote ringback indicator, a second terminal connected to said sensing means, and a third terminal connected to said ringback signal source for automatically interconnecting said first and third terminals for a fixed duration in response to a sensed night position.

10. An alarm system as in claim **9** wherein said switching means includes a relay means connected to said sensing means for interconnecting said first terminal and said second terminal or interconnecting said first terminal and said third terminal.

11. An alarm system as in claim **10** wherein said sensing means is a bistable means which remains activated upon sensing said night position until manually reset.

12. An alarm system as in claim **11** wherein said relay means includes a switch connected in series with said relay means, said relay upon activation simultaneously opening said series switch and interconnecting said switch means' first and third terminals.

13. An alarm system as in claim **12** including a capacitor in parallel with said relay to delay deactivation of said relay upon opening of said series switch.

14. An alarm system as in claim **12** including an RC circuit in series with said relay whose rate of charge determines the fixed duration.

15. An alarm system as in claim **11** including a first indicator connected to said sensing means; and manual reset means for resetting said sensing means, and said first indicator, and for discharging said RC circuit.

16. An alarm system as in claim **15** including a manual switch connected between said ringback signal source and said third terminal.

17. An alarm system as in claim **2** wherein there is a corresponding plurality of remote switches, remote indicators, switching means, sensing means, switch control means, and first central indicator; a single signal source connected to said second terminal of each switching means, and a single second central indicator connected to each of said sensing means.

18. An alarm system as in claim **17** wherein said single signal source is an alternating current and includes a single direct current source connected to each of said sensing means.

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