

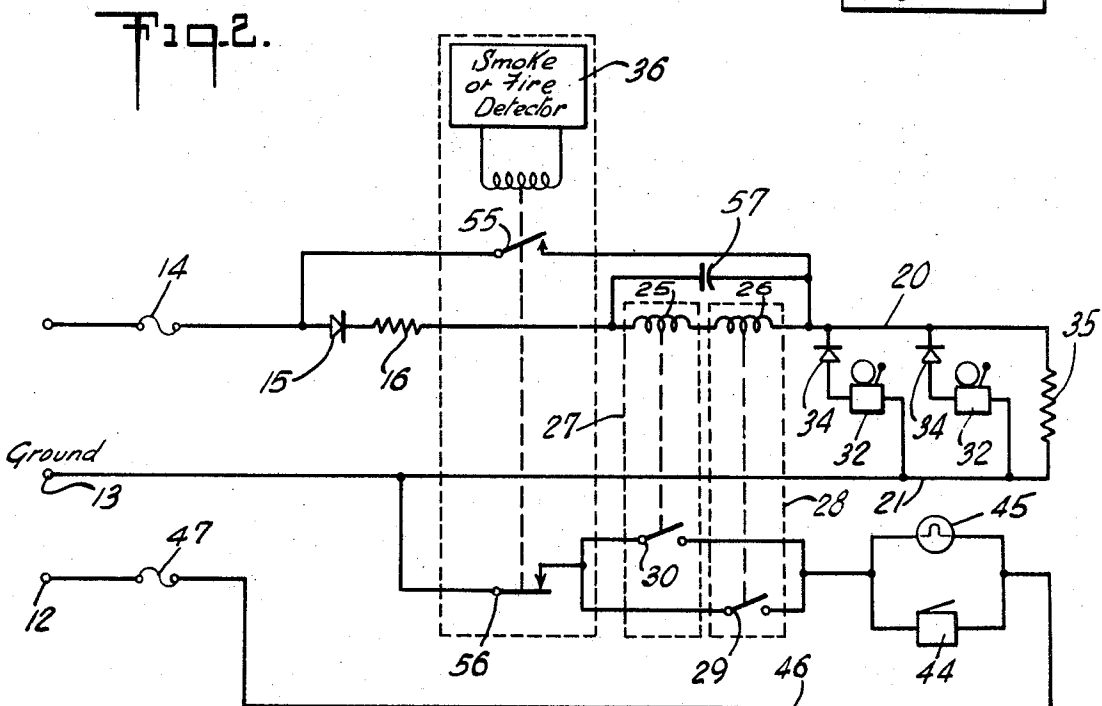
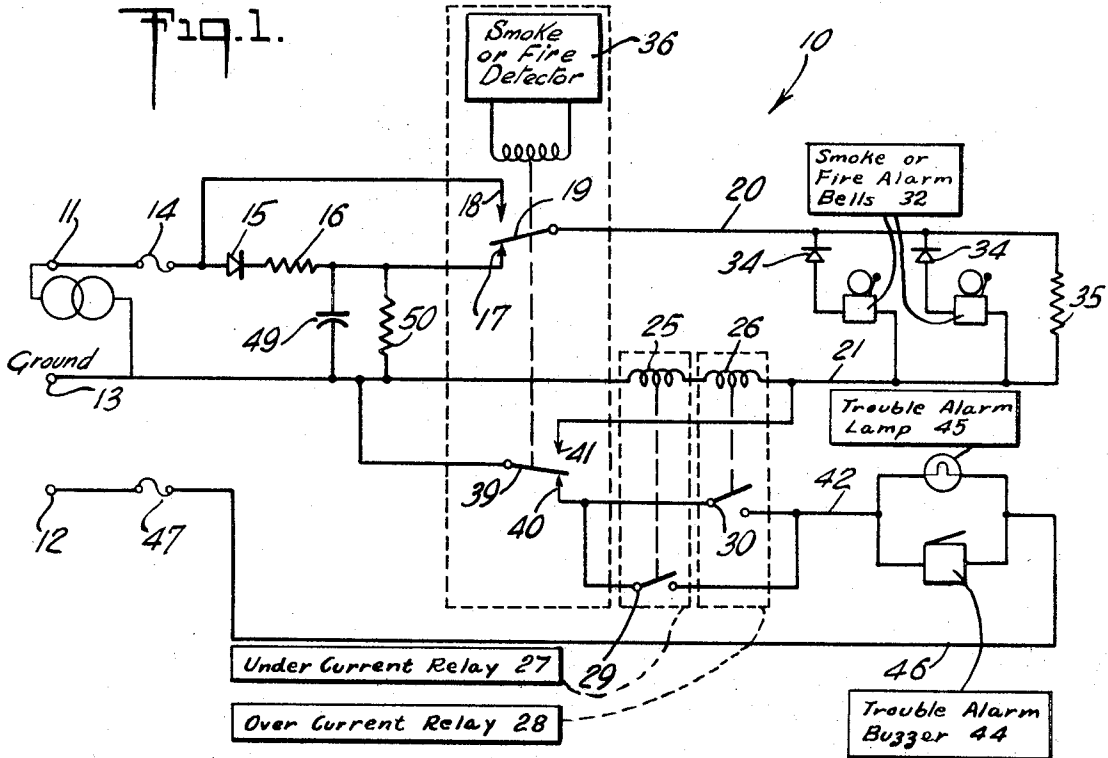
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SUPERVISED ALARM CIRCUIT

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SUPERVISED ALARM CIRCUIT

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ABSTRACT OF THE DISCLOSURE

An alternating current alarm circuit is supervised for continuity, grounds, and short circuits with direct current provided through a rectifier. In FIG. 1 a double pole, double throw switch normally controls direct current to the alarm circuit for the supervision. Alarm bells are connected across the circuit in series with diodes poled so that the bells are not operative on the direct current. Upon actuation of the alarm relay, in the circuit of FIG. 1, the double throw switch is actuated so that the supervisory current is disconnected and alternating current is supplied which actuates the alarm bells. In FIG. 2 direct current is supplied to the alarm circuit through a series connected rectifier. Upon actuation of the alarm relay a single pole switch bypasses the rectifier to supply alternating current to the circuit.

The present invention relates to a supervised alarm circuit such as is particularly suitable for use in a fire or smoke detection system.

Heretofore supervised alarm circuits have been provided. Generally such systems utilize bells connected in series with a series connected voltage dropping resistor. In such systems the number of bells is limited to the summation of the voltage drops of the bells. For example, if eight 12 volt bells are connected in series, the voltage drop of the bells would be 96 volts and a voltage dropping resistor of 19 volts must be connected in series with the bells for connection to a 115 volt alternating current system. In the event it is desired to add additional bells to the system it is necessary to readjust the voltage dropping resistor or to provide additional "loops of bells" with each loop having an associated voltage dropping resistor. One of the disadvantages of such a system is the rather appreciable power dissipation in the resistor requiring additional capacity for the system and, of course, causing a problem in providing means to dissipate the heat that is generated. A further disadvantage is the need for field adjustment of the voltage dropping resistor if the number of bells is changed.

The present invention overcomes the difficulties and disadvantages of prior systems by providing a two wire supervised alarm circuit which uses direct current as the supervising current and alternating current for the alarm operation. Alarm devices such as lamps or bells are connected in series with associated diodes and the combinations connected in parallel across the two wires, which are continuously supervised and provide a trouble signal for either an open or a grounded wire in addition to shorted wires. The alarm device may be visual, audible, or both, that is, it may be an alarm light or an alarm bell. The system is accordance with the invention is advantageous in that, while a resistor is connected across the ends of the circuit, the resistor may be of low wattage, inasmuch as it acts solely to provide a controlled current path for the coils of the supervisory relays. A further advantage of this system is that the number of connected alarm devices may be changed without the necessity of adjustment of a voltage dropping resistor.

Other objects and advantages of the invention will be apparent from the following description and from the

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accompanying drawings which show, by way of example, two embodiments of the invention.

In the drawing:

FIG. 1 is a schematic diagram of a supervised alarm circuit utilizing a double throw switch to connect the direct current to the circuit for supervision and thereafter to switch from direct current to alternating current in the event an alarm is received.

FIG. 2 differs somewhat from FIG. 1 in that a single pole switch is used to bypass the rectified direct current supply and thus apply alternating current to the circuit.

Referring to the drawing there is shown in FIG. 1 an electric system 10 supplied by a pair of terminals 11 and 12 which may be connected to an alternating current supply with a voltage of the order of 230 volts. A neutral or ground terminal 13 provides 115 volts on each side. Terminal 11 is connected through a fuse 14, a rectifier or diode 15 and a resistor 16 to one contact 17 of a first double throw switch having another contact 18 and a moving terminal or swinger 19 which may be switched between the contacts 17 and 18. Contact 18 is connected ahead of the rectifier or diode 15 and thus acts as an alternating current source, while terminal 17 receives rectified direct current through the diode 15.

Dual conductor means 20 and 21 provide the alarm circuit, the dual conductor means 20 and 21 being led throughout an area to be protected. Conductor 20 is connected to the swinger 19 of the double throw switch while conductor 21 is connected through relay coils 25 and 26 of supervisory relays 27 and 28 to the ground terminal 13, which is the common terminal for the alternating and direct current sources. Supervisory relay 27 is deenergized for current below a predetermined value to close single pole switch 29 while supervisory relay 28 is energized by current above a predetermined value to close single pole switch 30.

Alarm means such as alarm bells 32 are connected in series with unidirectional current passage means such as diodes 34, the diodes being poled so as to block the flow of direct current from conductor 20 and 21. The alarm bells 32 may be of any suitable type adapted to operate on half wave alternating current which also may be termed pulsating direct current. It has been found that polarized bells work satisfactorily in this circuit. Alternately alarm lights might be substituted for the bells. At the outer end of the dual conductor circuit 20-21 is provided direct current conducting means such as a resistor 35.

An alarm relay 36 is provided such as is known in the art and which may be operated in any suitable manner. This relay may be responsive to a predetermined condition such as smoke or fire and moves the swinger 19 of the double throw switch from its normal position in contact with contact 17 to contact 18. Such a switching action disconnects direct current from the conductor 20 and applies alternating current thereto. The alarm relay 36 also controls a second double throw switch 39, 40, 41 actuated simultaneously with the actuation of the first double throw switch 17, 18, 19. The second double throw switch has its swinger 39 connected to the ground or neutral 13. Its normally closed contact 40 is connected in series with the switches 29 and 30. Normally open contact 41 is connected to the conductor 21 so that when the swinger 39 engages contact 41 the relay coils 25 and 26 are shorted.

The switches 29 and 30, which are connected in parallel, are connected by a lead 42 to trouble buzzer 44 and trouble lamp 45 supplied from the alternating current terminal 12 through lead 46 and fuse 47.

In order to filter the direct current supply a capacitor 49 may be connected between the load side of the resistor 16 and terminal 13 parallel-connected by a discharge resistor 50.

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The circuit shown in FIG. 1 is energized by an alternating current source, the alarm relay 36 being normally in a position so that the direct current contact 17 is connected to the conductor 20. Thereby direct current is supplied through the lead 20, the resistor 35, the lead 21 and the relay coils 25 and 26 to the ground terminal 13. The supervisory relay 27 is adapted to provide a trouble indication when the current therethrough falls below a predetermined value. Accordingly if the conductors 20 or 21 are opened the holding current of relay 27 drops thereby causing the switch 29 to be closed so that the supervisory trouble buzzer 44 and the trouble light 45 are energized. A similar condition exists for a ground on the conductor 21. In the event the conductor 20 is grounded a larger than usual direct current is drawn through the lead 20 causing the fuse 14 to blow. This results in the holding current of the relay 27 dropping and the closing of the switch 29 to sound the trouble indicator buzzer 44 and to light the trouble indicator lamp 45.

In the event the dual conductors 20 and 21 are shorted, the current flow becomes larger than usual and operates overcurrent relay 28 closing its switch 30 and operating the trouble buzzer 44 and the light 45.

In the event the alarm relay 36 is actuated due to a predetermined condition such as fire or smoke, then the center point 19 of the double throw switch is connected to contact 18 thereby removing direct current from the dual conductor system 20-21 and applying alternating current thereto. The diodes 34 are poled so as to block the flow of direct current through the bells 32. However, when alternating current is applied to the conductors 20 and 21, a half wave of the alternating current passes through the diodes 34 and their associated bells 32 thereby providing an alarm. Simultaneously with the actuation of the first double throw 17, 18, 19, the second double throw switch 39, 40, 41 is actuated, its swinger 39 engaging the contact 41, thereby bypassing the supervisory relay coils 25 and 26.

In FIG. 2 there is shown a somewhat modified form of the alarm circuit in which the two double throw switches 17, 18, 19 and 39, 40, 41 of FIG. 1 are replaced by single pole switches 55 and 56, a capacitor 57 being connected in parallel with the relay coils 25 and 26.

The operation of the circuit shown in FIG. 2 is similar to that shown in FIG. 1 expecting that the operation of the alarm relay 36 causes switch 55 to close, thereby bypassing alternating current from the line side of the rectifier 15 to the load side of the relay coil 26, and simultaneously opens the switch 56 deenergizing the circuit for the trouble buzzer 44 and light 45.

While the invention has been described and illustrated with reference to specific embodiments thereof, it will be understood that other embodiments may be resorted to without departing from the invention. For example, solid state devices may be used in place of the electro-mechanical devices specifically described herein. Therefore, the form of the invention set out above should be considered as illustrative and not as limiting the scope of the following claims.

I claim:

1. A supervised alarm circuit comprising a source of alternating current means providing direct current, common terminal means for said direct and alternating currents, dual conductor means having one conductor connected to said common terminal, alarm means and unidirectional current passage means connected in series across said dual conductor means, direct current conducting means connected across said dual conductor means, means normally connecting the other of said dual conductor means to said direct current, switching means adapted to render said last-mentioned means ineffective and to connect said alternating current source to said

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other of said dual conductors, alarm relay means responsive to a predetermined condition and effective to control said switching means, supervisory relay means responsive to direct current flow in said dual conductor means below a predetermined value, and trouble indicator means responsive to said supervisory relay means, whereby direct current is used for supervising the condition of the system and alternating current is used for operating the alarm means.

2. A supervised alarm circuit according to claim 1 in which said unidirectional current passing means is a diode.

3. A supervised alarm circuit according to claim 1 in which said direct current conducting means is a resistor.

4. A supervised alarm circuit according to claim 1 in which the alternating current source is outwardly of the electric circuit and the direct current source is provided within the electric circuit by a rectifier connected between the alternating current source and said switching means in series with said supervisory relay means thereby providing the direct current from said alternating current.

5. A supervised alarm circuit according to claim 1 in which a plurality of alarm means are series connected to associated unidirectional current passage means and the combination connected in parallel across said dual conductor means.

6. A supervised alarm circuit according to claim 1 in which said switching means is a double throw switch with its center point connected to said other of said dual conductors.

7. A supervised alarm circuit according to claim 1 in which second switching means is provided connected in the trouble indicator circuit, said second switching means being also controlled by said alarm relay means so that said trouble indicator is rendered ineffective when said alarm relay means is operated.

8. A supervised alarm circuit according to claim 1 in which said supervisory relay means is provided with bypass means connected thereacross, said bypass means effective to pass alternating current upon actuation of said alarm relay means.

9. A supervised alarm circuit according to claim 1 in which second supervisory relay means responsive to direct current above a predetermined value is connected in series with said supervisory relay means responsive to direct current below a predetermined value, said trouble indicator means responsive to both supervisory relay means.

10. A supervised alarm circuit according to claim 1 in which said unidirectional current passing means is a diode, a plurality of alarm means are series connected to associated unidirectional current passing means and the combination connected in parallel across said dual conductor means, said direct current conducting means is a resistor, second switching means is provided and connected in said trouble indicator circuit, said second switching means being also controlled by said alarm control means so that the trouble indicator is rendered ineffective when said alarm relay means is operated, and bypass means is connected across said supervisory means, said bypass means effective to pass alternating current.

References Cited

UNITED STATES PATENTS

2,646,556	7/1953	Allen	340—409
3,309,685	3/1967	Manning	340—410

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