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[54] **CONDITION DETECTION AND ALARM SYSTEM**
1 Claim, 1 Drawing Fig.

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[50] **Field of Search** 340/409, 412, 251; 317/148.5

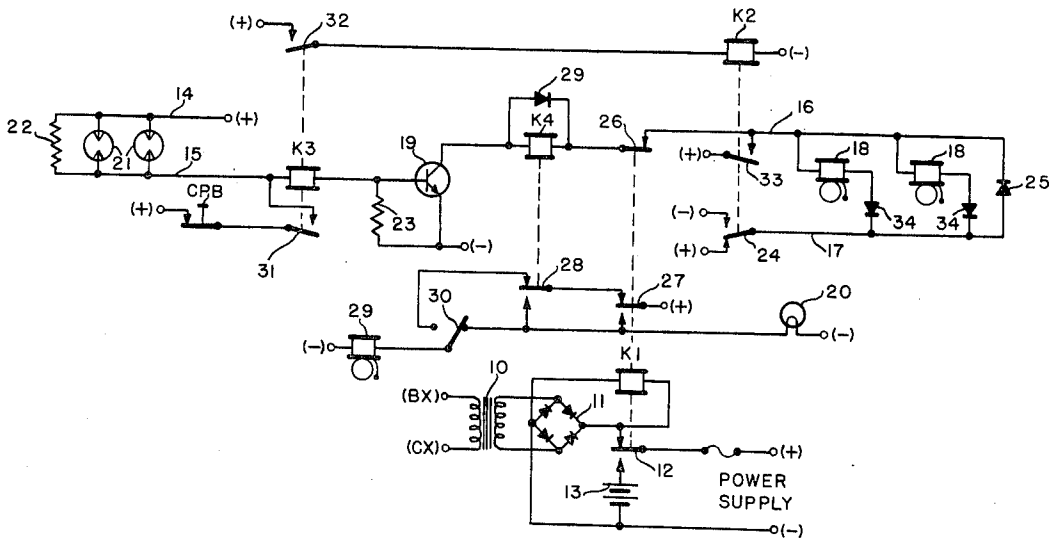
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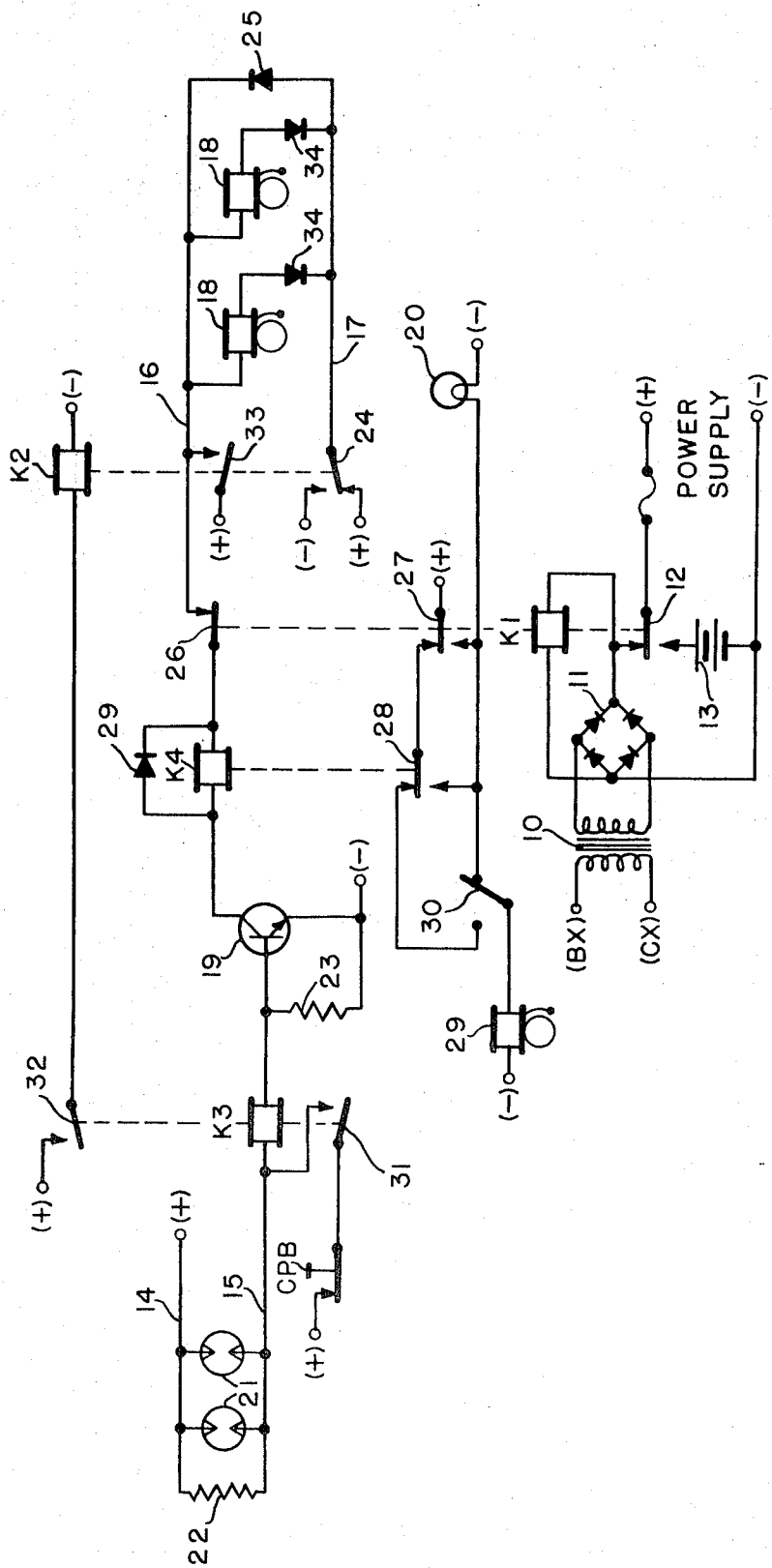
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ABSTRACT: A condition detection and alarm system is disclosed having a normally inactive detector relay in series in a detection circuit with a normally open-circuited alarm sensing device that is connected in multiple with a resistor to permit supervising of the circuit. In response to actuation of the detector relay, an alarm circuit becomes energized for actuation of at least one alarm device. A single transistor switch is provided for supervising both the detection circuit and the alarm circuit, the detection circuit being supervised in a biasing circuit for the transistor, and the alarm circuit being supervised in the output circuit of the transistor. Failure of the transistor to provide an output is manifested as a trouble condition.




25
18
34
34
18
17
20
(-)
16
(-)
K2
33
24
(+)
(-)
(+)
27
(+)
POWER
SUPPLY
(+)
(-)
26
K1
12
29
K4
28
11
13
10
30
(BX)
(CX)
19
(-)
23
29
(-)
32
K3
31
(+)
(+)
14
15
CPB
(+)
21
22

CONDITION DETECTION AND ALARM SYSTEM

While the invention is subject to a wide range of applications, it is especially suited for use in a condition detection and alarm system wherein both a condition-sensing detection circuit and an alarm circuit are supervised, and the invention will be particularly described in that connection.

It is a requisite in a fire alarm system for use in a public building, such as a school, for example, that fire-sensing detection circuits and alarm circuits be supervised by checking their continuity. Such a system may have a detection circuit for one or more normally open-circuited, condition-sensing devices, and may have an alarm circuit having one or more normally inactive alarm devices, such as bells, connected thereto for use in automatically sounding a general alarm in response to an abnormal condition sensed by the detection circuit. A sensitive supervisory relay is normally included in series in each of these circuits and is maintained energized by a relatively low level of energization of the associated circuit for supervisory purposes, while a detector relay requires a higher level of energization. The use of marginal relays in this manner produces operating problems due to voltage fluctuation.

An object of the present invention is to provide a condition-sensing and alarm system having improved supervisory control.

SUMMARY OF INVENTION

The present invention provides a condition-sensing and alarm system having a normally inactive detector device in a detection circuit and having a normally inactive alarm circuit controlled by the detection device. A single solid-state switching device is controlled partly by the detection circuit and partly by the alarm circuit to deliver an output for manifesting trouble in the continuity of these circuits.

For a better understanding of the present invention, together with other further objects thereof, reference is had to the following description, taken in connection with the single FIGURE of the accompanying drawing.

With reference to the accompanying drawing, terminals (BX) and (CX) are connected to an alternating current commercial source of power, thus these terminals are energized except under commercial power failure conditions. This alternating current energy is applied through a transformer **10**, full-wave rectifier **11** and front contact **12** of a power failure relay K1 to direct current power supply terminals (+) and (−) to provide a power supply for the condition-sensing and alarm system. A standby battery **13** can be provided as illustrated to be connected by back contact **12** of relay K1 to the direct current power supply terminals in case of failure of the commercial source of power.

The detection circuit that is supervised comprises wires **14** and **15** and includes a normally inactive detector relay K3 in series in the circuit. The alarm circuit that is supervised includes wires **16** and **17** having a plurality of alarm devices **18** connected thereto.

A single transistor switch **19** is used for supervising both the detection circuit and the alarm circuit. It has its bias determined by the detection circuit and has a supervisory device in the form of relay K4 connected in its output circuit.

Relay K4 is normally energized dependent jointly upon continuity being maintained in both the detection and the alarm circuits to deliver an output of the transistor **19**. If either of these circuits becomes open circuited, the relay K4 becomes deenergized to manifest a trouble condition and cause the energization of a trouble lamp **20**.

Considering the structure of the supervised circuits more specifically, the detection circuit has a plurality of fire-sensing devices **21** connected in multiple across the wires **14** and **15**. These devices **21** are normally open circuited but close their contacts upon sensing an abnormal condition such as a fire. Connected in multiple with the sensing devices **21**, is a resistor **22**, which normally limits the current flow in the detection circuit. This circuit extends from (+), including wire **14**, resistor **22**, wire **15**, winding of relay K3 and resistor **23**, to (−).

Because of the resistor **22** being in series in the circuit just described, the circuit is energized at a low level which does not actuate relay K3 to close its front contacts.

The detection circuit just described also serves as a bias circuit for transistor **19** in that a desired level of energization is applied from this circuit to the base of transistor **19** to maintain that transistor normally turned on, dependent upon continuity in the detection circuit just described. OUtput of the transistor **19** to energize the supervisory relay K4 is also dependent upon continuity in the alarm circuit extending from (+), including back contact **24** of relay K2, wire **17**, diode **25**, wire **16**, front contact **26** of relay K1, winding of relay K4 and collector-emitter circuit of transistor **19**, to (−).

Relay K4 is therefore maintained normally energized in accordance with continuity in both circuits, because it can be energized in the output circuit of the transistor **19** only provided the alarm circuit continuity is maintained, and the transistor **19** can be turned on only provided there is continuity in the detection circuit. If either of these circuits should become open circuited, the relay K4 would become dropped away, and the dropping away of that relay would close a circuit for energizing the trouble lamp **20** through front contact **27** of relay K1 and back contact **28** of relay K4. A diode **29** is connected across the winding of relay K4 to provide that this relay will not be dropped away due to a momentary line circuit interruption, and also to protect the transistor **19** from an inductive surge generated by the winding of relay K4.

It will be noted that trouble lamp **20** is subject to energization either upon the dropping away of the supervisory relay K4 as described, or upon the dropping away of the power failure relay K1 to close back contact **27**. A trouble buzzer **29** is connected in multiple with the trouble lamp **20** through a trouble switch **30** so as to provide an audible manifestation of detection of trouble. The buzzer **29** can be silenced by actuation of the switch **30** to its left-hand position.

If a sensor **21** becomes actuated to close its contacts, the resistor **22** is shunted out of the detection circuit, and thus sufficient current flows in the winding of relay K3 to cause that relay to become picked up. Upon picking up, relay K3 closes a stick circuit including its front contact **31** and cancels button CPB to maintain relay K3 in its picked-up position. The picking up of relay K3 causes the picking up of a repeater relay K2 upon the closure of front contact **32** of relay K3, and the picking up of relay K2 pole changes the alarm circuit so as to render the alarm devices **18** active. Each alarm device **18** (such as a bell or horn) thus becomes energized through front contact **33** of relay K2, wire **16**, winding of device **18**, a diode **34**, wire **17** and front contact **24** of relay K2. The shifting of contacts **33** and **24** of relay K2 thus pole changes the alarm circuit and removes the shunt of the alarm devices **18** by the diode **25**.

After the sensors **21** have been restored to their normal conditions, the actuation of cancel push button CPB can become effective to cause relay K3 to be restored to its normally dropped-away position. This causes the dropping away of relay K2 to restore the alarm circuit to its normal polarity of energization.

While there has been described what is at present considered to be the preferred embodiment of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention.

What is claimed is:

1. A condition detection and alarm system having at least one normally inactive detection relay serially coupled in a detector circuit including a plurality of normally open sensing devices coupled in parallel with a supervisory resistor, and a plurality of normally inactive alarm-sensing devices coupled in parallel in an alarm circuit subject to activation by the detector devices wherein the improvement comprises:

a. means including a normally conducting transistor for supervising both the detector circuit and the alarm circuit wherein the detector circuit is normally checked for con-

tinuity in the base circuit for the transistor and the alarm circuit is checked for continuity in the collector-emitter circuit of the transistor,

b. means including a normally energized relay having its winding connected in the collector-emitter circuit of the transistor deenergized for manifesting failure of continuity in both the detector circuit and the alarm circuit by a cutoff of the conductance of the transistor,

c. a normally energized power failure relay, having a front contact serially coupled in the collector-emitter circuit of the transistor, deenergized upon failure of a commercial source of power to remove the continuity of the transistor circuit; and

d. a standby source of energy coupled to the system upon deenergization of the power failure relay.

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