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(54) Alarm system

(57) A fire alarm system comprises control panel 13, first and second two-wire alarm circuits 17,18 extending from the control panel 13 into respective zones, each alarm circuit comprising a plurality of combined detector and sounder devices 10 connected in parallel across the wires 11,12 of the circuit. Upon detection of smoke or heat in one of the zones, the activated device 10 is arranged to draw a pulsed current from the control panel 13, which can be detected to trigger an alarm condition in the control panel 13, whereupon the control panel 13 applies an alarm signal circuit to the alarm circuits 17,18 of both zones, so as to energise the sounders of all devices 10. The pulsed current that is drawn by the devices 10 when they are activated by heat or smoke means that any further change in current that is caused when more devices 10 are activated as the fire spreads will be detected by the control panel 13, despite the heavy current being drawn by the energised sounders.

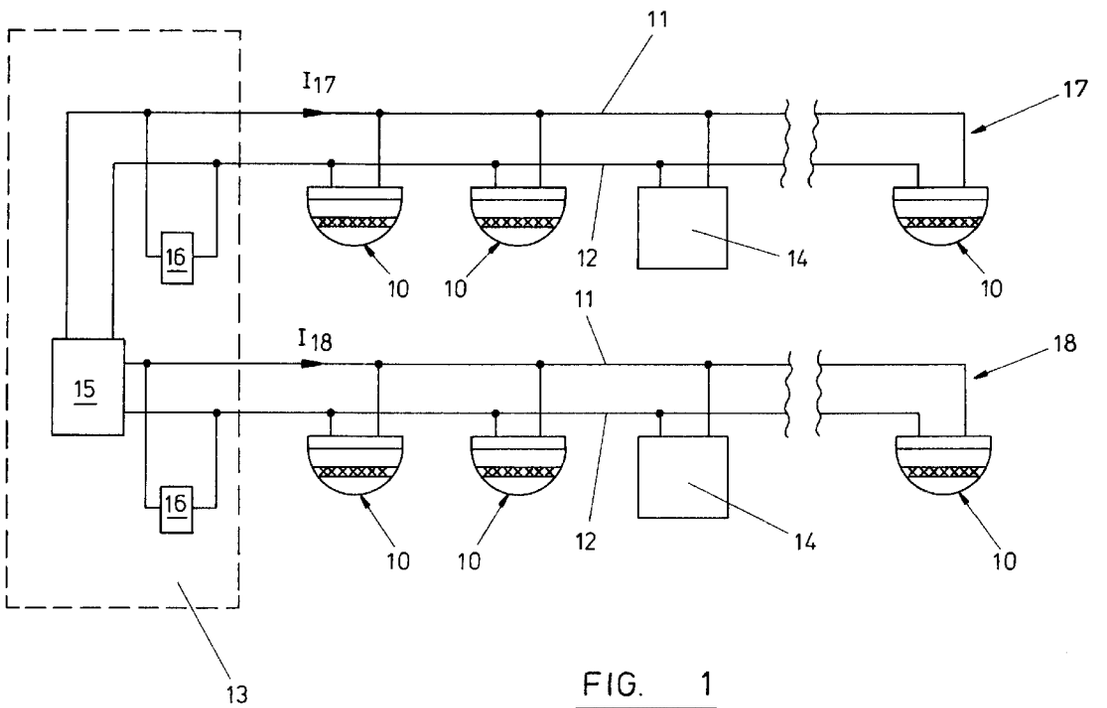

FIG. 1

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Description

This invention relates to an alarm system, and more particularly but not solely to a fire alarm system.

Fire alarm systems generally comprise a plurality of input transducers, such as heat/smoke detectors and manual call points connected across at least one two-wire detector circuit, which extends from a control panel. In the event of a fire, there is a change in the current flowing along the wires and this change in current is sensed by the control panel, which then triggers an alarm condition.

A plurality of audible and/or visible output transducers are connected across at least one two-wire sounder circuit, which also extends from the control panel. When the alarm condition is triggered the control panel is arranged to apply a voltage across the two wires of the sounder circuit, so that the output transducers are energised.

It has been proposed to combine the detector and sounder circuits of alarm systems into a single or so-called two-wire circuit, in order to simplify the wiring and to reduce the cost of cabling. One such alarm system operates by applying a d.c. voltage to the circuit, which powers the input transducers. When a fire is detected the current drawn by the circuit changes, and this change in current is sensed by the control panel, which triggers an alarm condition. The control panel then energises the sounders in the circuit by reversing the polarity of the d.c. voltage.

U.K. Patent application No. 2 293 257 discloses another known system, in which the control panel energises the sounders by raising the voltage levels across the wires.

It is common to divide the circuits of alarm systems into discrete zones. Typically, all of the sounders in each of the zones are energised when an input transducer in one zone in activated. However, there is a requirement that the input transducers of the unactivated zones must remain functional when this happens, so that the spread of the fire can be detected. Furthermore, it may be desirable to detect when more than one input transducer in one zone has been activated.

A disadvantage of known two-wire alarm systems is that it is very difficult to reliably monitor for a change in the current being drawn by the input transducers of the unactivated zones whilst the sounders in those zones are energised, since the heavy current drawn by the sounders can mask the small change in current that is caused when an input transducer is activated. In some instances, it may be necessary to temporarily de-energise the sounders, in order to be able to monitor the current being drawn by the input transducers

We have now devised an alarm system which alleviates the above-mentioned problem.

In accordance with this invention, there is provided an alarm system comprising a control device, a two-wire alarm circuit extending from the control device, a plurality of input transducers connected in parallel across the wires with at least one warning transducer, the control device comprising means for applying electrical power to the transducers via the alarm circuit, wherein each input transducer is arranged to draw a periodically-varying current from the wires when an alarm condition is activated, the control device comprising current sensing means which detects when a periodically varying current is sensed on the alarm circuit.

In use, if an input transducer is activated when the or each warning transducer is energised, the control device will be able to detect the periodically-varying current even if the current being drawn by the circuit is heavy.

Preferably the activated input transducers are arranged to draw a current which is pulsed between a high value and a low value.

Preferably the difference between said high and low values is small compared with the maximum current which can be drawn by the circuit.

Preferably the activated input transducers are arranged to draw a pulsed current, which remains at said low value for longer than it remains at said high value, so that the simultaneous activation of two or more input transducers can be detected more readily.

If the system comprises two or more different types of input transducer, these are preferably arranged to draw different periodically-varying currents, so that the control device is able to recognise what type of transducer is activated.

Another disadvantage with the above-mentioned known types of two-wire alarm systems is that the way in which they energise their respective sounders is complicated and unreliable. Furthermore, it is not possible to provide additional control functions to the sounders. Thus, preferably the control device is arranged to energise the warning transducers by applying control pulses to the alarm circuit.

Preferably the control device is also arranged to apply control pulses to the alarm circuit in order to test, inhibit or re-synchronise the warning devices. The control pulses may also be used to reset or inhibit the input transducers.

Preferably the control pulses are global, so that more than one warning device and/or input transducer on the circuit may act simultaneously upon receipt of the pulse.

An embodiment of this invention will now be described by way of example only and with reference to the accompanying drawings, in which:

FIGURE 1 is a block diagram of a fire alarm system in accordance with this invention;

FIGURE 2 are graphs showing the current drawn by respective zones of the alarm system of Figure 1 during different operating conditions; and

FIGURE 3 is a graph of voltage across the two wires of a zone of the alarm circuit of the system of Figure 1.

Referring to Figure 1 of the drawings, there is shown a fire alarm system comprising a control panel 13 which is connected to an alarm circuit consisting of two-zones 17,18.

Each zone e.g. 17 comprises a plurality of combined detector and sounder devices 10 connected in parallel across a pair of wires 11,12 extending from the control panel 13. A plurality of manual call points 14 are also connected in parallel across the wires 11,12.

The control panel 13 includes a power supply 15 which applies a potential of +24vdc across the wires of each zone 17,18, such that a current I flows around each zone to power the devices 10. The control panel 13 also comprises current monitoring circuits 16 for monitoring the current I flowing around each zone.

Referring to Figure 2 of the drawings, in the event that one of the devices in zone 17 detects smoke or fire it periodically places a load across the wires 11,12 so that the current I_{17} flowing around the zone 17 correspondingly increases by 30-40mA for 350MS every 1050MS. The current sensing circuit 16 of zone 17 senses this periodic current, whereupon the control panel 13 applies an alarm signal to both zones 17,18, in order to energise the sounders of the devices 10.

A heavy current flows around each circuit when the sounders are energised, and in conventional alarm systems this current could mask the fact that the fire has spread to another zone. However, in accordance with this invention, if a device in zone 18 detects a fire it also periodically places a load across the wires 11,12, so that the current I_{18} flowing around the zone 18 correspondingly increases. The current sensing circuit 16 on zone 18 is able to recognise this periodic change in current despite the fact that the current I_{18} is heavy and possibly fluctuating. Accordingly, the control panel is able to sense that the fire has spread. The control panel is also able to recognise when more than two detectors in the same zone have been activated, owing to the asymmetric current pattern.

Preferably the control panel comprises a pulse counting circuit, which waits for say 8 pulses before it recognises a detector as being activated by smoke or fire. The current pattern generated when a manual call point is activated is preferably different, so that the control panel can distinguish between the two current signals.

Referring to Figure 3 of the drawings, the alarm signal which energises the sounders in the devices 10, comprises a binary word which is serially encoded onto the supply voltage across the wires. Each binary word preferably comprises 1 start bit, 8 data bits and 1 stop bit.

The data bits can be varied to provide other global commands to the devices, such as to reset, test and inhibit the sounders.

Claims

1. An alarm system comprising a control device, a two-wire alarm circuit extending from the control device, a plurality of input transducers connected in parallel across the wires with at least one warning transducer, the control device comprising means for applying electrical power to the transducers via the alarm circuit, wherein each input transducer is arranged to draw a periodically-varying current from the wires when an alarm condition is activated, the control device comprising current sensing means which detects when a periodically varying current is sensed on the alarm circuit.

2. An alarm system as claimed in claim 1, in which the periodically-varying current is pulsed between a high value and a low value.

3. An alarm system as claimed in claim 2, in which the difference between said high and said low value is small compared with the maximum current which can be drawn by the alarm circuit.

4. An alarm system as claimed in claims 2 or 3, in which the periodically-varying current remains at said low value for longer than it remains at said high value.

5. An alarm system as claimed in any preceding claim, comprising first and second types of input transducer, respectively arranged to draw different periodically-varying currents when activated, said control device being arranged to monitor the current drawn by said alarm circuit and to determine whether said first or said second type of input transducer is activated.

6. An alarm system as claimed in any preceding claim, in which the control device is arranged to energise the warning transducer by applying control pulses to the alarm circuit.

7. An alarm system as claimed in claim 6, in which the control device is arranged to inhibit or re-synchronise the warning transducer by applying control pulses to the alarm circuit.

8. An alarm system as claimed in any preceding claim, in which the control device is arranged to reset or inhibit the input transducers applying control pulses to the alarm circuit.

9. An alarm system as claimed in any of claims 6 to 8, in which the control pulses are global to said transducers.

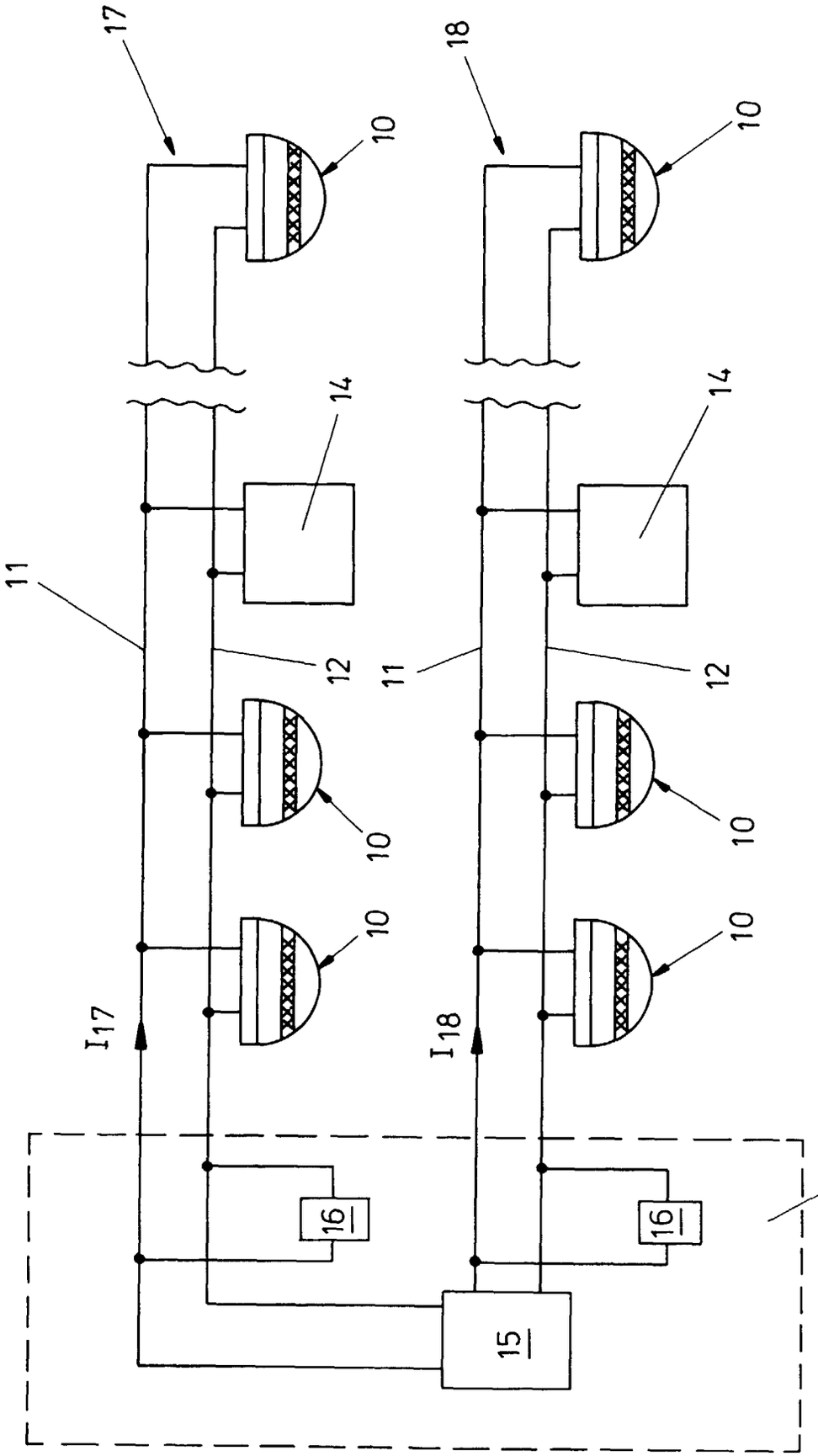

FIG. 1

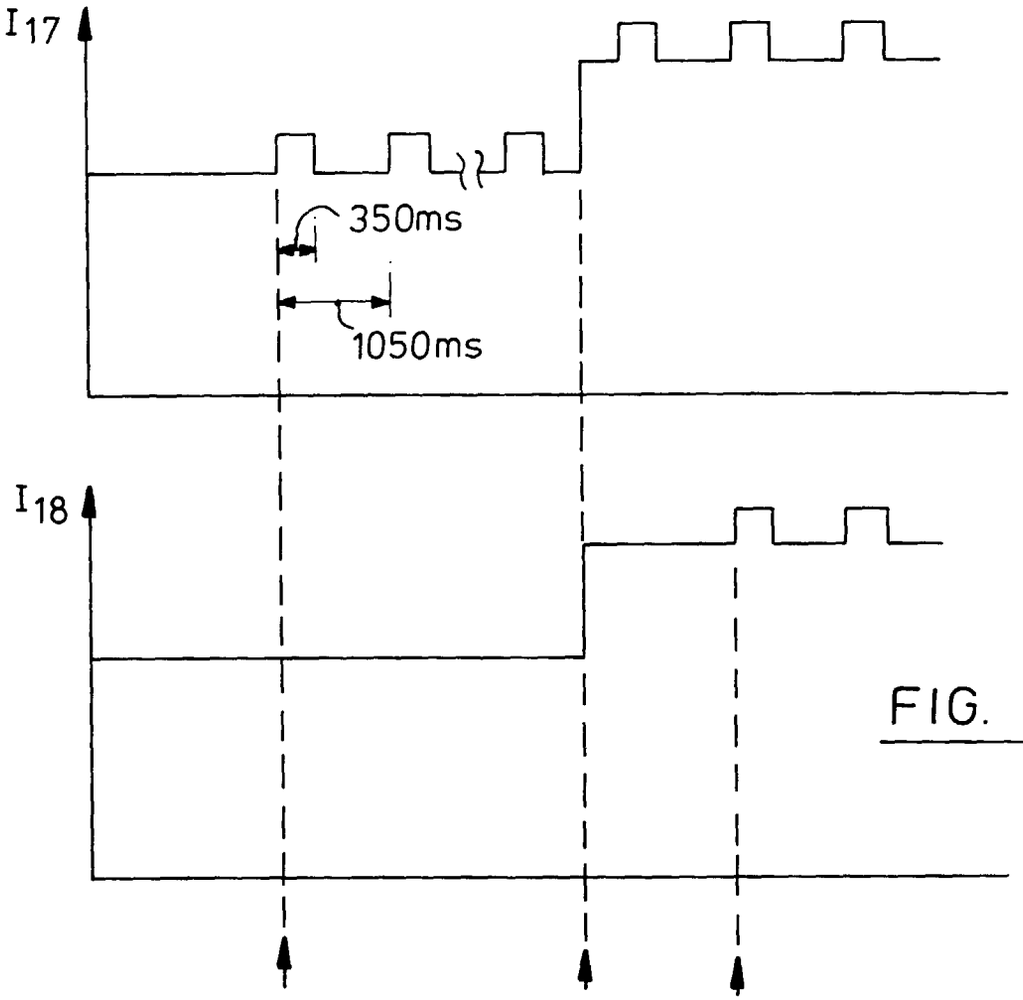
I17
350ms
1050ms
I18
FIRE DETECTED IN ZONE 17
ENERGISE SOUNDERS ALL ZONES
FIRE DETECTED IN ZONE 18

FIG. 2

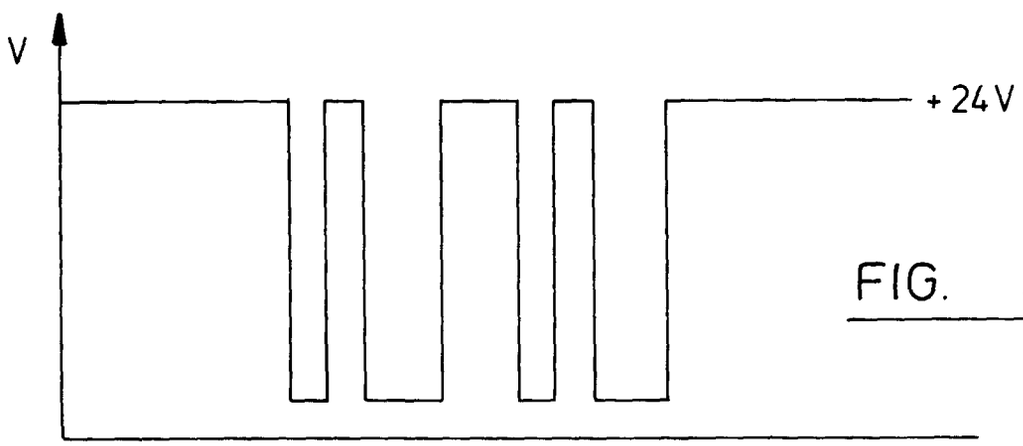
V
+24V

FIG. 3