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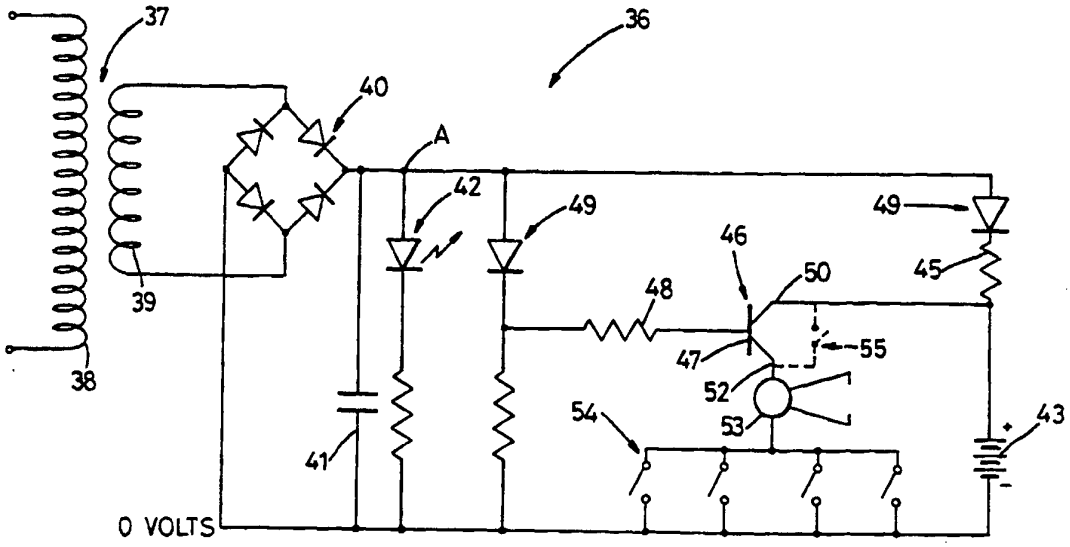

(57) Abstract

An electric device includes a circuit (36) including a transformer (37) having its secondary coil (39) connected to a bridge rectifier (40). The resultant DC output at (A) charges a battery (43). The base (47) of a p-n-p transistor (46) is held at the voltage (A). If the power fails the transistor (46) conducts current from the battery (43) through an alarm (53) unless code switches (54) have all previously been opened to disable the alarm.

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ALARMS INCORPORATING PLUG FOR ELECTRIC APPLIANCES

This invention relates to alarms and in particular to electric appliances and plugs incorporating such alarms.

Instances of burglary are ever on the increase and the most popular targets are electrical items such as computers, videos, televisions etc. Many people either cannot afford to, or are reluctant to have, their houses fully burglar alarmed and there is a need for a relatively cheap and simple device for sounding an alarm if an attempt is made to steal a piece of electrical equipment. Certain proposals along these lines have been made, but they almost all require some specialised form of electrical socket.

The present invention consists in an electric device including an alarm, a code-, key- or card- operated means for disabling the alarm, means for detecting the presence of a source of electricity connected to the device and means for activating the alarm when no source is detected.

The device may be incorporated either in an appliance or in an electric plug connected to it.

In the case were the alarm system forms part of the electrical device or appliance, the means for detecting the presence of electricity may comprise a transformer, means for rectifying the output of the transformer, switch means responsive to the output of the rectifying means to connect the alarm in circuit with a further power source whenever the output of the transformer falls below a predetermined level. Preferably the further power source is a

rechargeable battery connected across the rectifying means for charging thereby during normal operation of the device.

The switch means may be a transistor and is preferably a p-n-p transistor, in which case the alarm may be connected in series with its collector.

The code-operated means may comprise a plurality of switches connected mutually in parallel and respectively in series with the switch means and the alarm e.g. they may be connected between the collector and the alarm.

The device may further include a movement detector, which can conveniently be connected across the switch means for sounding the alarm if the device is moved and the alarm is not disabled. The movement detector may be arranged to detect lifting or lowering movement only and could be constituted by a mercury switch.

In the case of the plug the detecting means are looking for a source of electricity across the pins.

In one preferred embodiment the detecting means additionally or alternatively detects the flow of current in a cable electrically connected to the plug or appliance. Thus the detecting means may comprise a coil mounted in or on the plug or appliance to surround, in use, a cable electrically connected to the plug or appliance. Thus particularly conveniently the coil may be formed in an outlet or inlet tube or grommet which is typically mounted into a modern plug or appliance. The detector means may include means for monitoring the e.m.f. generated in the coil by current flowing through the cable, in use, and for

producing an alarm activation signal when that current falls below a predetermined level.

In an alternative or additional construction the detector means may include a reed switch in circuit with the alarm, the coil of the reed switch being connected across the live pins of the plug or live contacts of the appliance so that the switch is held open when there is a source of electricity connected across the pins or contacts. Preferably the reed switch is arranged to close if the cable connected to the plug or appliance is short-circuited, e.g. if it is cut.

The disabling means may most conveniently be a key-pad operated switch which will only disable the alarm when an appropriate combination is keyed in. Alternatively it could be a key-operated switch or it could be operated by a magnetic card or other identification device.

Although the invention has been described above it is to be understood it includes any inventive combination of the features set out above or in the following description.

The invention may be performed in various ways and a specific embodiment will now be described by way of example with reference to the accompanying drawings in which:

Figure 1 is a schematic view of a piece of electrical equipment;

Figure 2 is a part-sectional view of an electric plug;

Figure 3 is a diagrammatic circuit for use in the plug of Figure 2;

Figure 4 is a diagrammatic circuit of an alternative

arrangement for the plug of Figure 2; and

Figure 5 is a circuit diagram of an alarm control circuit suitable for use in an electrical appliance or device.

Referring to Figure 1 a computer 11 has a power cable 12 and a plug 13 which can be inserted into a power socket 14 to power the computer 11.

The basis of this invention is that the plug 13, or an electrical appliance connected to it, should contain means for detecting either the removal of the plug 13 from the socket 14 or any break in the connection provided by the power cable 12 and an alarm which is responsive to the detection of either event. The plug or appliance is also provided with some means for disabling the alarm so that the owner can avoid setting off the alarm.

One example of such a construction is shown in Figures 2 and 3. Thus in Figure 2 a plug 13 has a casing 15 which includes a grill 16 for the horn of an alarm and a key-pad 17, which operates a disabling switch. The casing 15 has an outlet grommet or tube 18 in which is embedded an electrical coil 19. This electrical coil 19 surrounds one of the wires 12 of the cable 12a, when it is connected into the plug 13.

As can be seen in Figure 3 the coil 19 is electrically connected to a full wave rectifier and averager 20 which in turn feeds one input 21 of a comparator 22. The other input 23 is held at a predetermined voltage above earth by resistor 24. The output 25 of the comparator 22 is connected to the base 26 of the transistor 27. The transistor

27 is connected in circuit with an alarm 28 and a switch 29 which is operated by the key pad 17. The alarm 28 has a loud speaker or horn 30.

When the plug 13 is located in its power socket 14 and the socket is switched on, alternating current will flow along in the cable 12 and this will set up an e.m.f. in the coil 19. The full wave rectifier and averager 20 will convert this to a steady DC voltage on input 21 which is compared with the voltage on input 23 by the comparator 22 and will normally result in an output at 25 which holds the transistor 27 "off". If however the plug 13 is removed or the cable 12 is cut or disconnected, then there will be no e.m.f. created in the coil 19 and as a result the comparator 22 will switch the transistor 27 on. This brings the alarm 28 into circuit and it will sound, unless switch 29 has been previously turned off by the correct combination being punched in on the key pad 17.

Figure 4 shows an alternative arrangement in which a coil 31 of a reed switch 32 is connected across the live pins 33 of the plug 13 so that when the plug has current passing through it the reed switch 32 is held in its open position shown in Figure 4. When that current ceases then the reed switch will complete the alarm circuit 34 and the alarm 28 will again be set off unless switch 29 has previously been disabled. Equally a short circuit caused by cutting the cable will cause the reed switch 32 to switch on the alarm 28.

As has already been indicated, the means by which the

switch 29 is disabled can be altered to a key operated or card operated switch or indeed any other suitable arrangement. This disabling means may equally be placed in other circuit positions which are suitable to achieve disabling of the alarm. Other current detection means may be provided. A visual alarm may be added to or replace the alarm 28.

As has been indicated above the invention can be equally well configured in the electrical appliance, such as the computer 11. In this case the keypad 17 or its equivalent will conveniently be incorporated in the casing 35.

Figure 5 shows an alternative alarm control circuit suitable for use in an electrical appliance or device. The circuit, which is generally indicated at 36 includes a transformer 37 which has its primary coil 38 connected to the power circuit of the device and its secondary coil 39 connected to a bridge rectifier 40. The output of the rectifier is smoothed by a capacitor 41 and the presence of a DC voltage output at A is indicated by a light-emitting diode 42. The voltage is also placed across a nickel-cadmium battery 43, which is fed a small current by diode 44 through resistor 45. A p-n-p transistor 46 has its base 47 connected to point A by a resistor 48 and diode 49, whilst its emitter 50 is connected to the battery 43 and its collector 52 is connected to ground through an alarm 53 and "code" switches 54.

When there is power in the primary coil 38, the voltage at A keeps the base 47 of the transistor above the collector 52 and the transistor is switched off and the alarm silent.

If, however, the power fails, then no voltage is present at A and the transistor 46 will conduct current from the battery 43 through the alarm 53 and through the code switches 54, if any one of them is closed. Thus to disable the alarm 53 each of the four switches 54 has to be placed in its open or off position and it will not be immediately apparent to a thief how this arrangement is achieved. The on/off switch 50 is not normally accessible.

In some circumstances it may be desirable to detect movement of the unit and this can be done by adding a movement detector 55 in parallel with the transistor 46. The detector could be a mercury or other movement operated switch and may be arranged to detect vertical movement only, so that the device or appliance can be slid along a surface without sounding the alarm.

CLAIMS

1. An electric device including an alarm, a code-, key- or card- operated means for disabling the alarm, means for detecting the presence of a source of electricity connected to the device and means for activating the alarm, when no source is detected.

2. A device as claimed in claim 1 wherein the means for detecting the presence of electricity may comprise a transformer, means for rectifying the output of the transformer, switch means responsive to the output of the rectifying means to connect the alarm in circuit with a further power source whenever the output of the transformer fall below a predetermined level.

3. A device as claimed in claim 2 wherein the further power source is a rechargeable battery connected across the rectifying means for charging thereby during normal operation of the device.

4. A device as claimed in claim 2 or claim 3 wherein the switch means is a transistor.

5. A device as claimed in claim 4 wherein the transistor is a p-n-p transistor and the alarm is connected in series with the collector of the transistor.

6. A device as claimed in any one of claims 2 to 5 wherein the code-operated means comprises a plurality of switches connected mutually in parallel and respectively in series with the switch means and the alarm.

7. A device as claimed in any one of claims 2 to 6 further including a movement detector.

8. A device as claimed in claim 7 wherein the movement detector is connected across the switch means for sounding the alarm if the device is moved and the alarm is not disabled.

9. A device as claimed in claim 7 or claim 8 wherein the movement detector is arranged to detect lifting or lowering movement only.

10. A device as claimed in claim 1 wherein the device is incorporated in or is constituted by a plug.

11. A device as claimed in claim 10 where the detecting means detect the presence or absence of an electrical source across pins of the plug.

12. A device as claimed in any one of the preceding claims wherein the detecting means additionally or alternatively detects the flow of current in a cable electrically connected to the device.

13. A device as claimed in any one of claims 10 to 12 wherein the detecting means comprises a coil mounted to surround a cable electrically connected to the device.

14. A device as claimed in claim 13 wherein the detector means included means for monitoring the emf generated in the coil by current flowing through the cable and for producing an alarm activation signal when it falls below a predetermined level.

15. A device as claimed in claim 10 wherein the detector means included a reed switch in circuit with the alarm, the coil of the switch being connected across the live pins of the plug so that the switch is held open when

there is a source of electricity connected across the pins.

16. A device as claimed in claim 15 wherein the reed switch is arranged to close if a cable connected to the plug is short-circuited.

17. An electric device substantially as hereinbefore described with reference to the accompanying drawings.

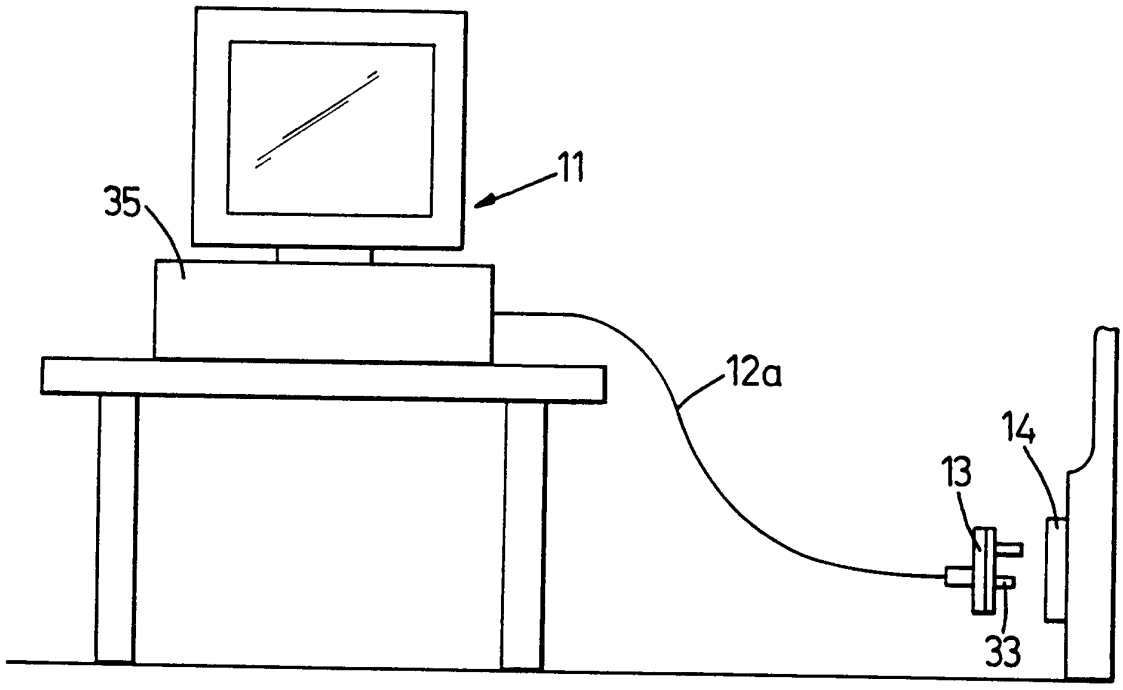

Fig. 1

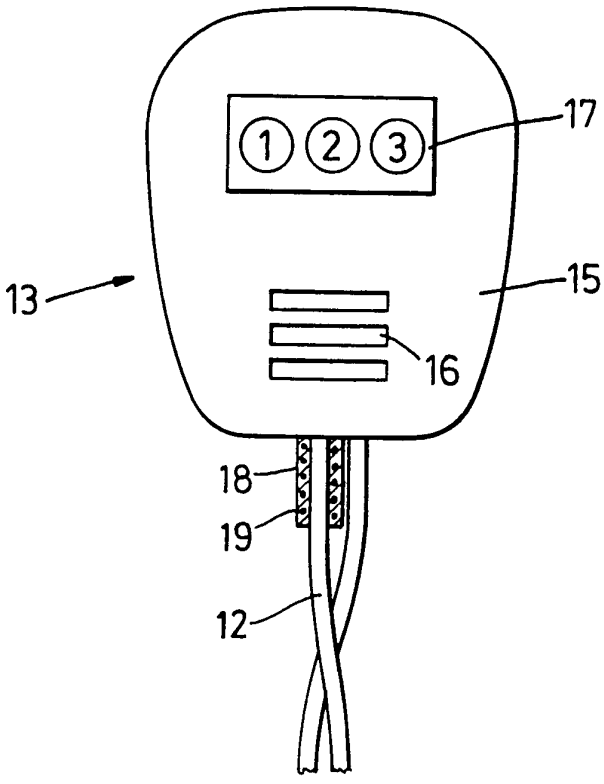

Fig. 2

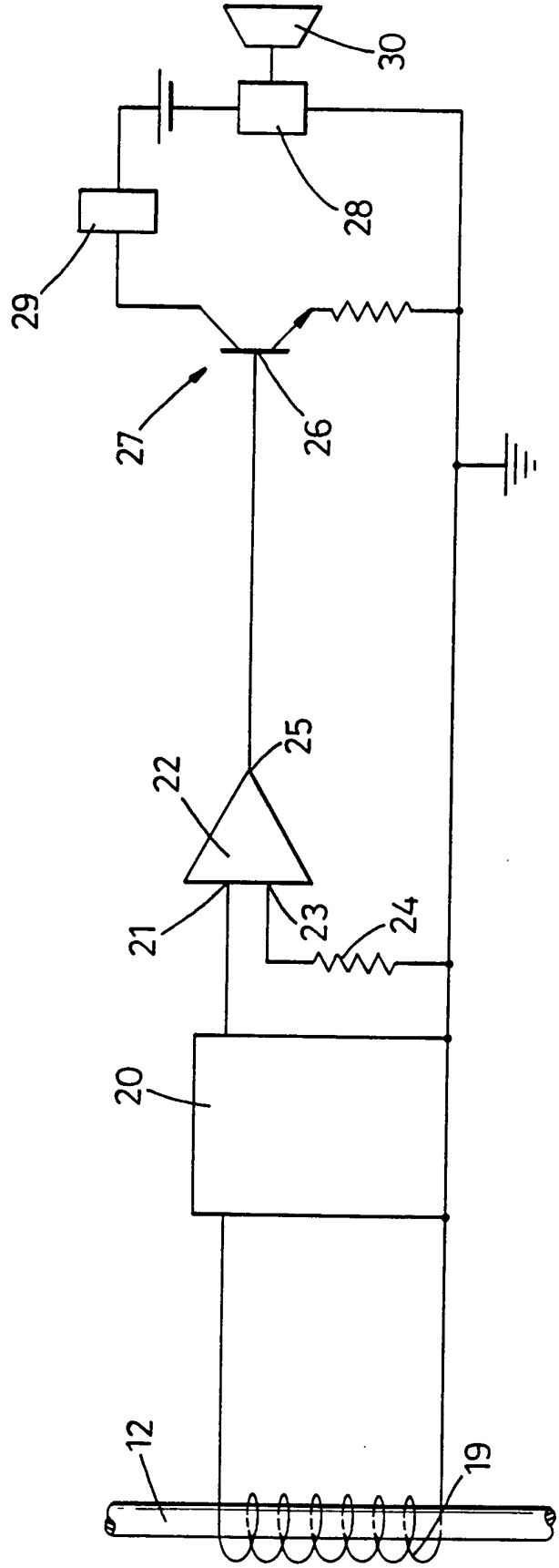

Fig. 3

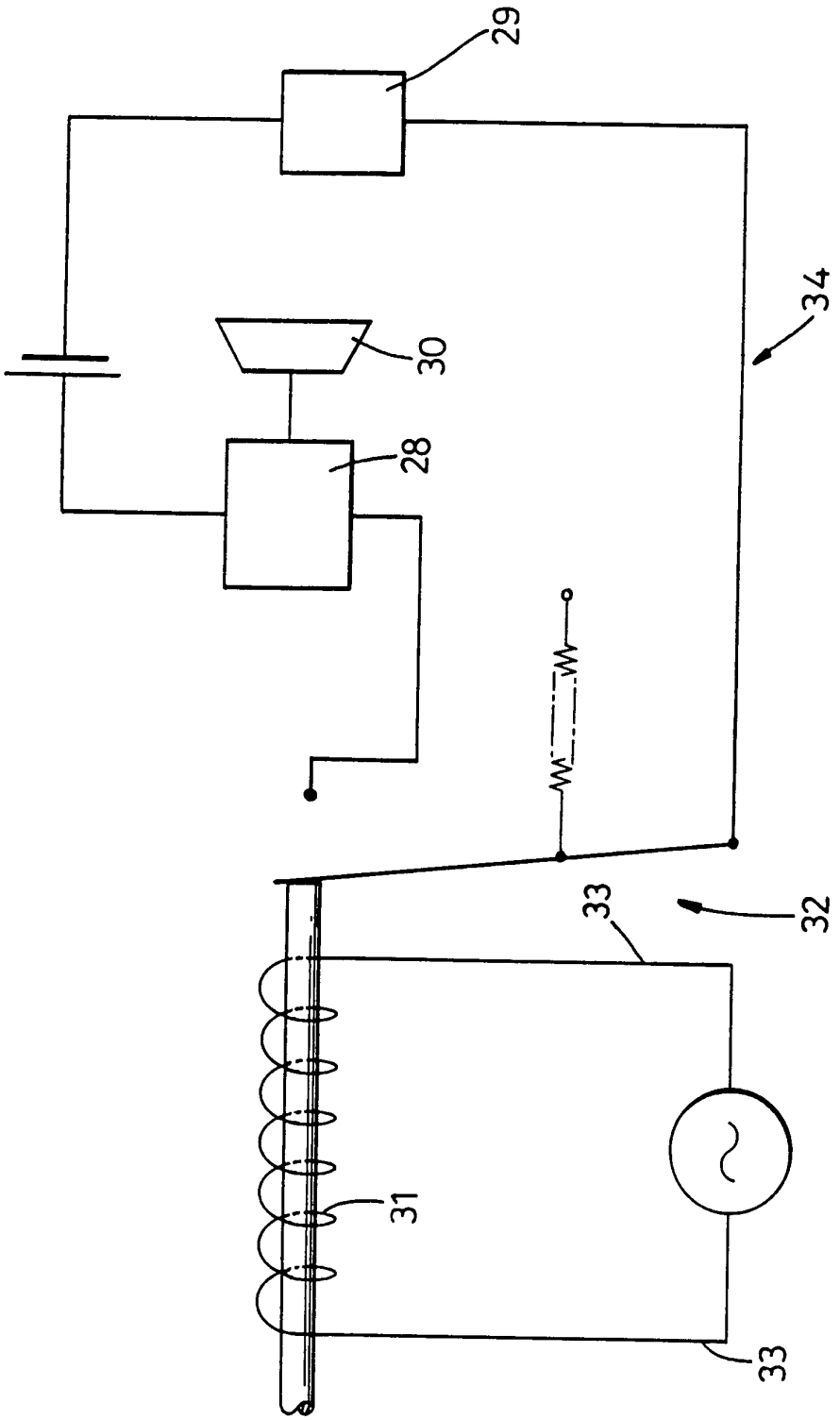

Fig. 4

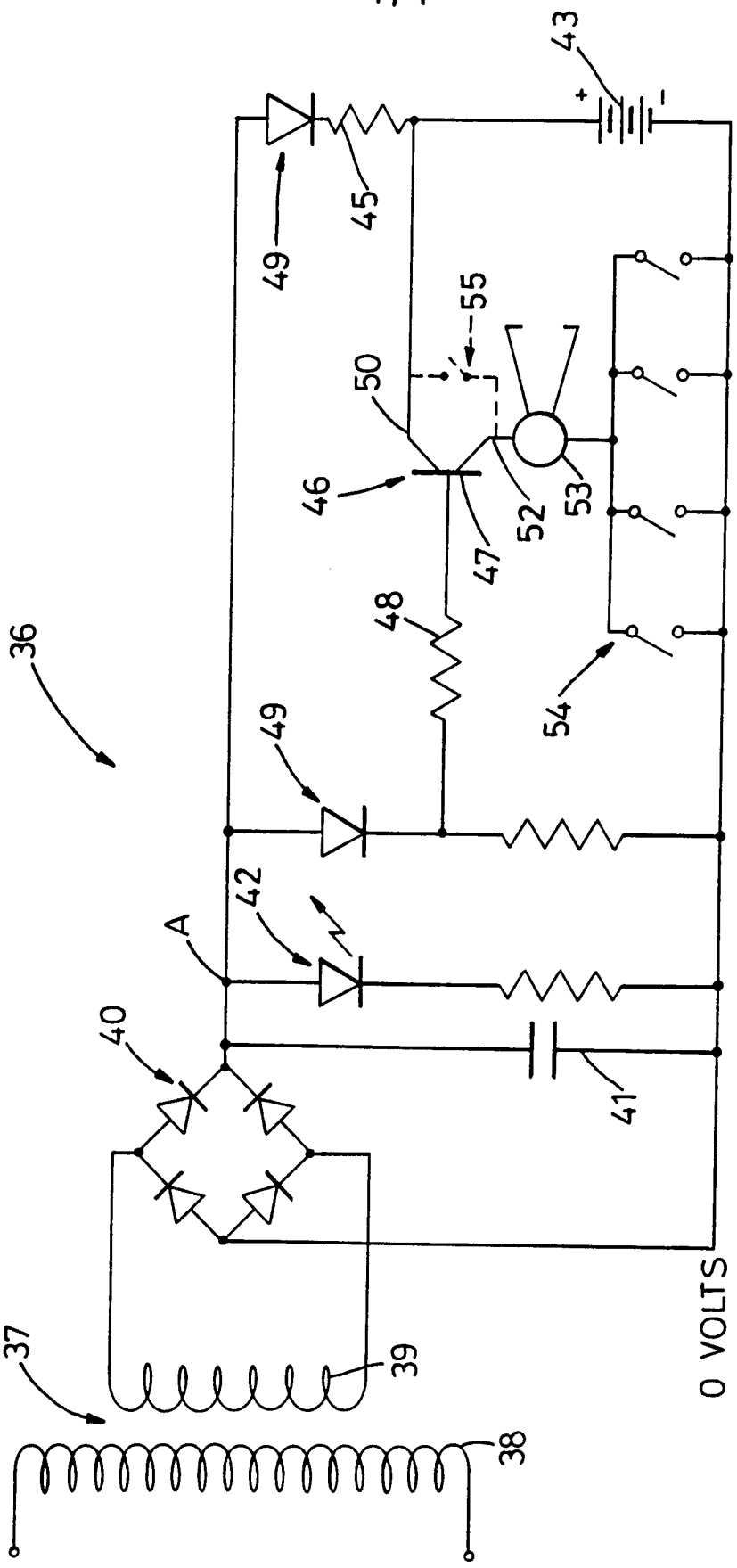

Fig. 5

INTERNATIONAL SEARCH REPORT

Inter ›nal Application No
PCT/GB 95/00724

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 G08B13/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 G08B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO,A,85 03791 (COLLINS R.) 29 August 1985 see page 1, line 1 - page 9, line 12; figures 1,2	1-17
X	EP,A,0 109 227 (VIDEO ALARMS & SYSTEMS COMPANY) 23 May 1984 see page 2, line 15 - page 4, line 24; figures 1,2	1-17
X	US,A,3 836 901 (MATTO V.) 17 September 1974 see the whole document	1-17

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Information on patent family members

Inte: ›nal Application No
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Patent document cited in search report	Publication date	Patent family member(s)		Publication date
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		EP-A-	0172173	26-02-86
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