(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
24 April 2003 (24.04.2003)

PCT

(10) International Publication Number
WO 03/034363 A1

(51) International Patent Classification[7]: G08B 21/00, 21/18

(21) International Application Number: PCT/SE01/02295

(22) International Filing Date: 19 October 2001 (19.10.2001)

(25) Filing Language: English

(26) Publication Language: English

(71) Applicant *(for all designated States except US)*: **PERTINAX INTERNATIONAL LIMITED** [—/—]; 11th Floor - 7, No. 77, Section 1, Hsin Tai Wu Road, Hsih Chih City 221, Taipei County, Taiwan (TW).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: **JELF, Martin** [SE/—]; 8th Floor, No. 417-1, Section 6, Min Chuan East Road, 114 Taipei City, Taiwan (TW).

(74) Agents: **SVENSSON, Niklas** et al.; Albihns Stockholm AB, Box 5581, S-114 85 Stockholm (SE).

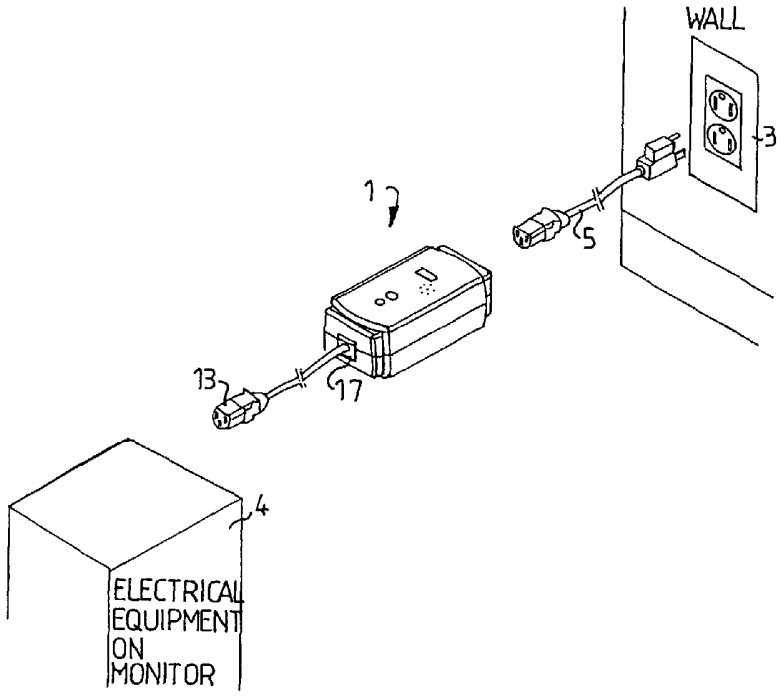
(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: INPUT/OUTPUT SIGNAL POWER DOWN ALARM DETECTOR



(57) Abstract: The present invention relates to a warning device (1), which detects failure in a power system, comprising an Alarm Circuit (90) to indicate power failure, where the power failure detection is performed by elements pure electrical, and the device (1) is lightweight and self-supporting.

WO 03/034363 A1

INPUT / OUTPUT SIGNAL POWER DOWN ALARM DETECTOR

FIELD OF THE INVENTION

This invention relates to warning devices, which detect failure in a power system.

BACKGROUND OF THE INVENTION

It is today known to use warning devices to detect and warn of a power interruption between a power source and an electrical appliance connected thereto.

Such a warning device can for example be studied in the US Patent 4,097,843, which refers to a warning device being connectable between an electrical appliance and a power source through a plug and leads. The alarm system of this warning device consists of a bell, a battery and a circuit there between, which circuit comprises an on-off switch connected to a spring-biased blade. The spring-biased blade is drawn towards a coil as long as the coil is energised by the power source, thus keeping the circuit open. When a loss of power accrues, the coil becomes de-energised and the spring-biased blade falls back closing the bell-alarm circuit, and the bell rings

One disadvantage with this warning device is that it comprises several non-electrical parts, which makes it sensitive to outer damage and also less durable. The non-electrical parts are also relatively heavy and the device therefore must rest on some sort of support when being used, which is unpractical.

A further disadvantage with the warning device according to the US Patent 4,097,843 is that it comprises an audio alarm only, and is consequently not adapted to be used by people with impaired hearing or in places where loud sound-levels are frequent, such as dance halls or concert halls.

It is today also a well-known problem that electrical appliances are of vital importance in hospitals, which often makes hospital patients exposed to power failures, malfunctioning appliances etc. The more time needed for a caregiver to detect the fault and to take measures, the more dangerous the situation becomes for the patient. It would therefore be advantageous if a warning device could be provided, which detects malfunctions in the appliances and immediately alarms the caregiver.

OBJECT OF THE INVENTION

It is therefore an objective of the present invention to provide a durable and lightweight, and thus also self-supporting, warning device, connectable between a wall receptacle and an electrical appliance, which detects failure in both a main power supply and an appliance it is used on. Another objective is to provide the aforementioned warning device with both audio-visual and visual alarms.

SHORT DESCRIPTION OF THE INVENTION

The above stated objects are obtained with the present invention, having the features set forth in Claim 1, that describes a warning device, which detects failure in a power system, comprising an Alarm Circuit to indicate power failure. The present invention is further characterised in that the power failure detection is performed by elements pure electrical and that the device is lightweight and self-supporting.

BRIEF DESCRIPTION OF THE FIGURES

The present invention will now be further elucidated by means of examples of a preferred embodiment in a non-limiting way, where

Figure 1 shows a perspective view of the preferred embodiment of the present invention;

Figure 2 shows a perspective view of the preferred embodiment of the present invention;

Figure 3 shows a cross section view of the preferred embodiment of the present invention;

Figure 4 shows a block diagram generally illustrating a detection arrangement for detecting a malfunctioning in an appliance or a power source; and

Figure 5 shows a schematic circuit diagram of the arrangement of Fig. 4.

DETAILED DESCRIPTION OF THE FIGURES

Referring to Fig. 1, a device 1 is designed with a female cable connector 13, to connect the device 1 with an appliance 4, and a male connector (not shown in Fig. 1), to be connected to a main power source in the shape of a wall socket 3 through an extension flex 5. The connectors 13 are both of IEC-320 type and the female connector 13 is attached to the device 1 by means of a strain-release 17 in order to protect the wires inside the cable.

In another embodiment, an adapter could replace the extension flex 5, and the device 1 could thus be attached to the wall socket 3. Such an arrangement would have the advantage of being more discreet and less ungainly. Also, an ordinary female connector, to be connected to the appliance 4 through an adapter or an extension flex, could replace the female cable connector 13.

In Fig. 2, the device 1 of Fig. 1 is displayed from a perspective view. A box-like housing 120, having detachable top and bottom portions 121 and 122, accommodating the main components of the arrangement, constitutes the device 1. The top portion 121 functions in the preferred embodiment as a removable cover of the housing 120, which removal exposes the interior of the device 1. The housing 120 is preferably constructed of ABS-fire retardant moulded plastic.

A plug (not shown in Fig. 2) of the male connector (not shown in Fig. 2) is mounted between the top and bottom portions 121 and 122 of the housing 120 on the opposite side of the female cable connector 13, and is adapted to connect into a rubber cable assembly (not shown in Fig. 2).

Further on, the device 1 is provided with a visual alarm 91 and an audio alarm (not shown in Fig. 2). The visual alarm 91 comprises a light-emitting diode (LED) 93 arranged at an opening 94 in the top portion 121, preferably covered with a protective transparent membrane 130, while the audio alarm comprises a buzzer (not shown in Fig. 2) located closer to the male connector, indicated only by the small apertures 95 in the top portion 121. Next to the apertures 95 is a somewhat larger opening 78, through which a slide switch 79 is manoeuvrably arranged. By moving the slide switch 79 in a direction transverse to the principal axis of the device 1, a user can select between using the visual alarm 91 only or both the visual and the audio alarm, an option which from now on will be referred to as an audio-visual alarm 91. Finally, the device 1 includes a reset button 53, projecting from the inner

of the housing 120 through an aperture 119 in the top portion 121 for deactivation and activation of the alarms 91 of the present invention.

The implementation of the slide-switch 79 is advantageous, giving a user the opportunity to choose the type of alarm 91 to be used. It should also be noted that by using a slide-switch 79 instead of a pin, sharp edges and projecting attributes are avoided, which is to prefer, as the device 1 might be placed on the ground. The slide-switch 79 is also safer than, for example, a button-switch or a pin, which very easily can be unintentionally operated.

The reset button is optional, and can in an alternative embodiment be completely removed, since the alarms, in the preferred embodiment as well as in the alternative embodiment, preferably are automatically deactivated as soon as power is restored.

It in yet another embodiment possible to use an audio alarm only.

Fig 3 illustrates a cross-section of the device 1 of Fig. 1 and 2 taken along the principal axis. The LED 93, as well as the slide-switch 79 and the reset button 53, is connected to an Alarm Circuit (not shown in Fig. 3) on a circuit board 123, in the inner of the housing 120. So is the buzzer, though not visible in Fig 3. The Alarm Circuit is powered by a battery 41, preferably a nickel metal hydride battery with a life span of 2 – 3 years, which is recharged as long as the device is fed with A.C. and activated only in the case of a halting of said A.C..

Referring to Fig. 4, a functional block diagram of the arrangement is illustrated. A warning device, connected between an A.C. Outlet 100 and an electrical appliance, monitors a current conducted there between. As the current, from either the A.C. Outlet 100 or from an Appliance Current Inlet 10, is fed to the device, the current is conducted to a Voltage Conversion Circuit 20 within the device.

From the Voltage Conversion Circuit 20 the A.C. is directed to a D.C. Rectifier Filter Regulation 30, where the A.C. is converted to a D.C. at about 4.5 to 5 volts for powering of the device.

D.C. from the D.C. Rectifier Filter Regulation 30 is then fed to a Charge Circuit and Rechargeable Battery Backup 40 (only schematically shown) to recharge a rechargeable battery when necessary. The battery powers the visual or the audio-visual alarm in the absence of a main power supply and/or in an event of a malfunctioning in the electrical appliance, which malfunctioning results in a halted current. Power from the D.C. Rectifier Filter Regulation 30 is also directed to a Power down Detector 50, which monitors the arrangement and reacts to an absence of a D.C. by triggering a Chirping/Flashing Control 60. The Chirping/Flashing Control 60 generates a visual or an audio-visual alert, depending on the position of the slide-switch, as the Alarm Circuit 90 is activated. After the alarm is signalled it continuously flashes or chirps and flashes until reset by the reset-button or until power is restored.

The preferred embodiment, shown in Fig. 4, can for example be used together with electrical appliances in a hospital, such as alternating pressure therapy mattresses used by bedridden patients to avoid and heal bedsores, to make a caregiver attentive to malfunctions in the appliances and sudden power failures.

In an additional embodiment one could also visualise a device, so constructed that it, at a power failure, activates not only the battery and the alarms but also a secondary source of power connected to the appliance, so that the power supply to the appliance continues even after the power failure.

Referring to Fig. 5, the wiring diagram shows the node-to-node wiring as well as the physical relationship between all circuit elements, connected in a fashion to provide the arrangement, as described above.

The Equipment Current Inlet 10 (only schematically shown) comprises the plug 14 of the male connector 15 connected to a node 11 and also a node 12 connected to the female cable connector 13. The A.C., fed into the device through the plug 14, is thus further conducted through the node 11 into the Voltage Conversion circuit 20 (only schematically shown).

The Voltage Conversion Circuit 20 comprises a limit protection voltage circuit provided by diodes 21, 22 and a transformer 23. In case of a sudden power failure, due to a failure in the appliance or in the main power supply, the transformer 23 detects the halted flow of electrons, whereby the battery circuit 40, comprising a diode 42 and a battery 41, is automatically activated. The diode 42 is provided as a path controller to make sure that the battery 41 is not discharged and the battery 41 is preferably of a nickel metal hydride type, which in an efficient way combines non-polluting qualities with excellent recharge-capabilities.

As long as there is an A.C. present, a full-wave rectifier input circuit, comprising diodes 31, 32, 33, 34, in the D.C. Rectifier Filter Regulation 30 (only schematically shown) converts it to a D.C. at a regulated voltage of about 4.2 to 5 volts, which D.C. is used to continually recharge the battery. The D.C. Rectifier Filter Regulation 30 also comprises an energy storage capacitor 35, a resistor 36 and yet another diode 37.

The above mentioned power failure results in a D.C. interruption, which is detected by the Power down Detector circuit 50 (only schematically shown) and its associated circuitry. Signals are thereafter sent through a NAND gate 59 to the Chirping/Flashing Control 60 (only schematically shown) to trigger the LED 91 and perhaps also the buzzer 96. An optional CMOS IC NAND or NOR can be used as an energy-saver for the circuit system.

Finally, the signals are detected by the Chirping/Flashing Control 60 through the resistor 61, after which the signals reach to the base of transistor 62. As a result, the transistor 62 is switched on and the capacitor 63 discharged, generating voltage across resistors 64 and 65. Accordingly, a derived signal, which reaches the voltage comparator 67, generates a positive difference of voltage therein.

The comparator 67 then produces an output to an oscillatory circuit, which comprises a resistor 68 and a capacitor 69, which may be an astable multivibrator, and a diode 73 and a capacitor 69, optional and implemented to control power consumption, e.g. to save power. The oscillatory circuit activates and generates pulses through a comparator 74 to periodically turn on a transistor 77, whereby the Alarm Circuit 90 (only schematically shown) will be activated.

CLAIMS

1. A warning device (1), which detects failure in a power system, comprising an Alarm Circuit (90) to indicate power failure, **characterised in**

that the power failure detection is performed by elements pure electrical; and

that the device (1) is lightweight and self-supporting.

2. A warning device (1) according to Claim 1 **characterised in** that the device (1) comprises at least one male or female connector (15, 13).

3. A warning device (1) according to Claim 2 **characterised in** that the device (1) can be connected to a main power source (3) by means of an adapter.

4. A warning device (1) according to any of the proceeding Claims **characterised in** that it comprises at least one male or female cable connector (13).

5. A warning device (1) according to any of the proceeding Claims, **characterised in** that the Alarm Circuit (90) comprises both an audio alarm (92) and/or a visual alarm (91).

6. A warning device (1) according to Claim 5 **characterised in** that the device (1) comprises a switch (79), to allow a user to choose between the visual alarm (91), the audio alarm (92) or an audio-visual alarm (91, 92).

7. A warning device (1) according to Claim 6 **characterised in** that the switch (79) is a slide-switch (79).

8. A warning device (1) according to any of the proceeding Claims **characterised in** that the device (1) comprises a reset button (53) to terminate the alarm signal/signals.

9. A warning device (1) according to any of the proceeding Claims **characterised in** that the device (1) comprises a rechargeable battery (41), which is continually recharged as long as an A.C. is fed to the device (1), and which powers the Alarm Circuit (90) in the absence of said A.C.

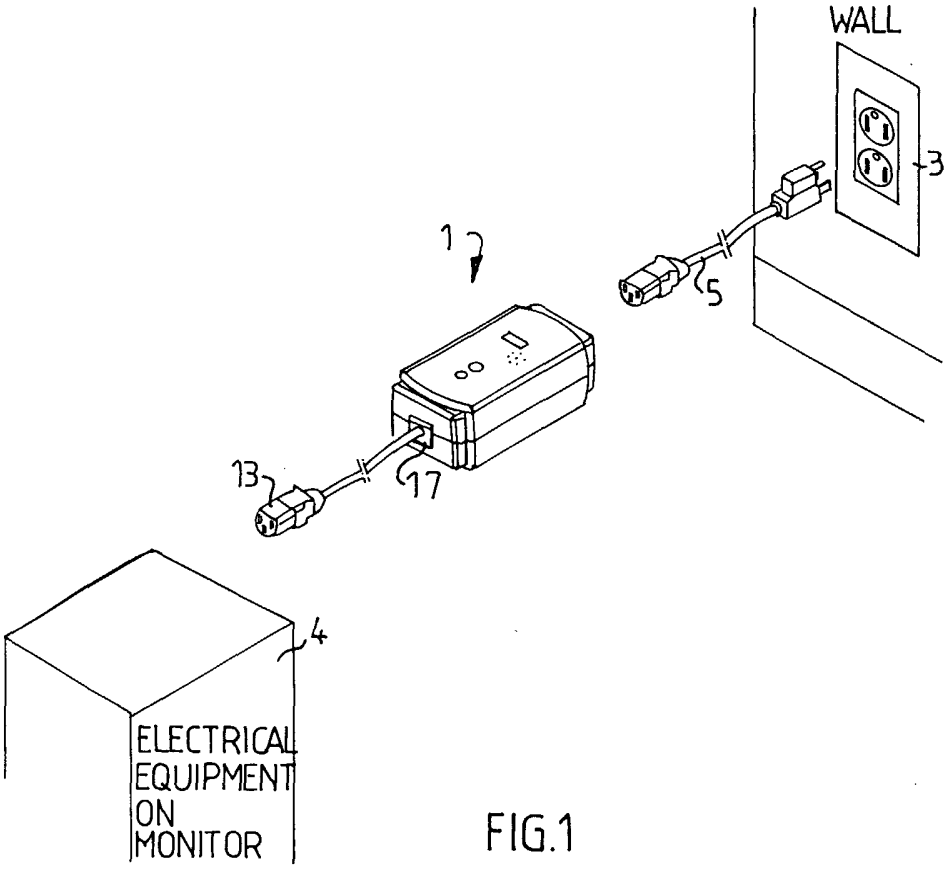

WALL
3
1
5
13
17
4
ELECTRICAL
EQUIPMENT
ON
MONITOR

FIG.1

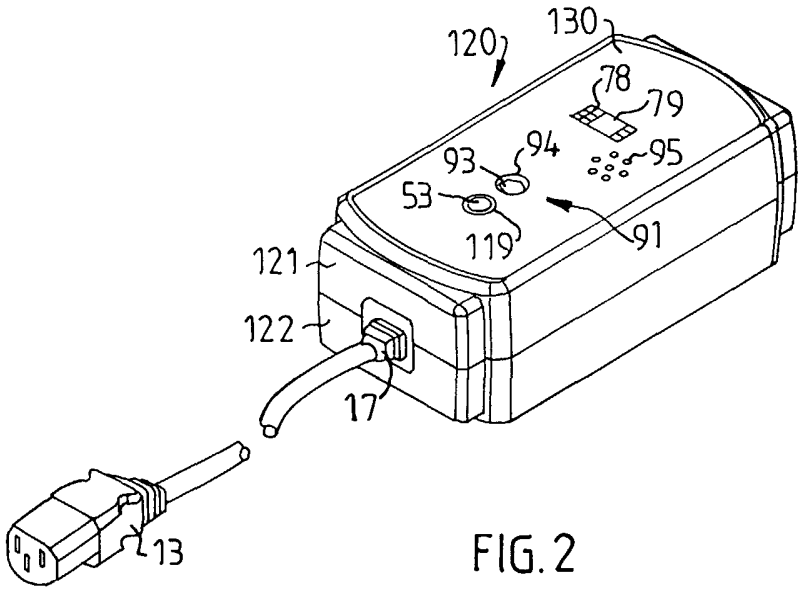

130
120
78
79
93
94
95
53
119
91
121
122
17
13

FIG. 2

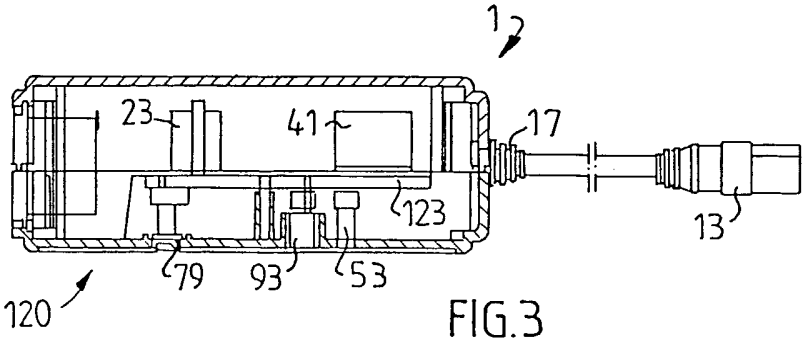

12
23
41
17
123
13
79
93
53
120

FIG.3

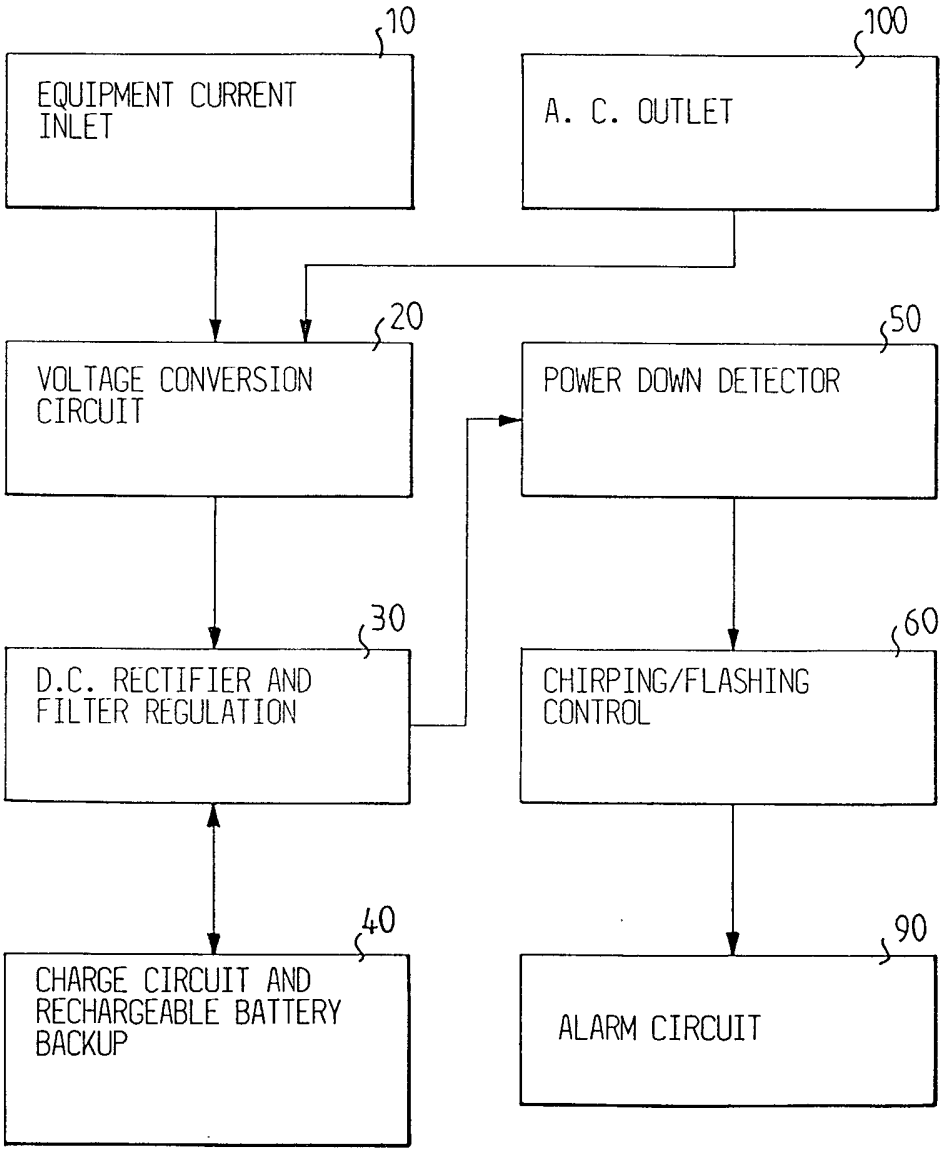

10
EQUIPMENT CURRENT INLET
100
A. C. OUTLET
20
VOLTAGE CONVERSION CIRCUIT
50
POWER DOWN DETECTOR
30
D.C. RECTIFIER AND FILTER REGULATION
60
CHIRPING/FLASHING CONTROL
40
CHARGE CIRCUIT AND RECHARGEABLE BATTERY BACKUP
90
ALARM CIRCUIT

FIG.4

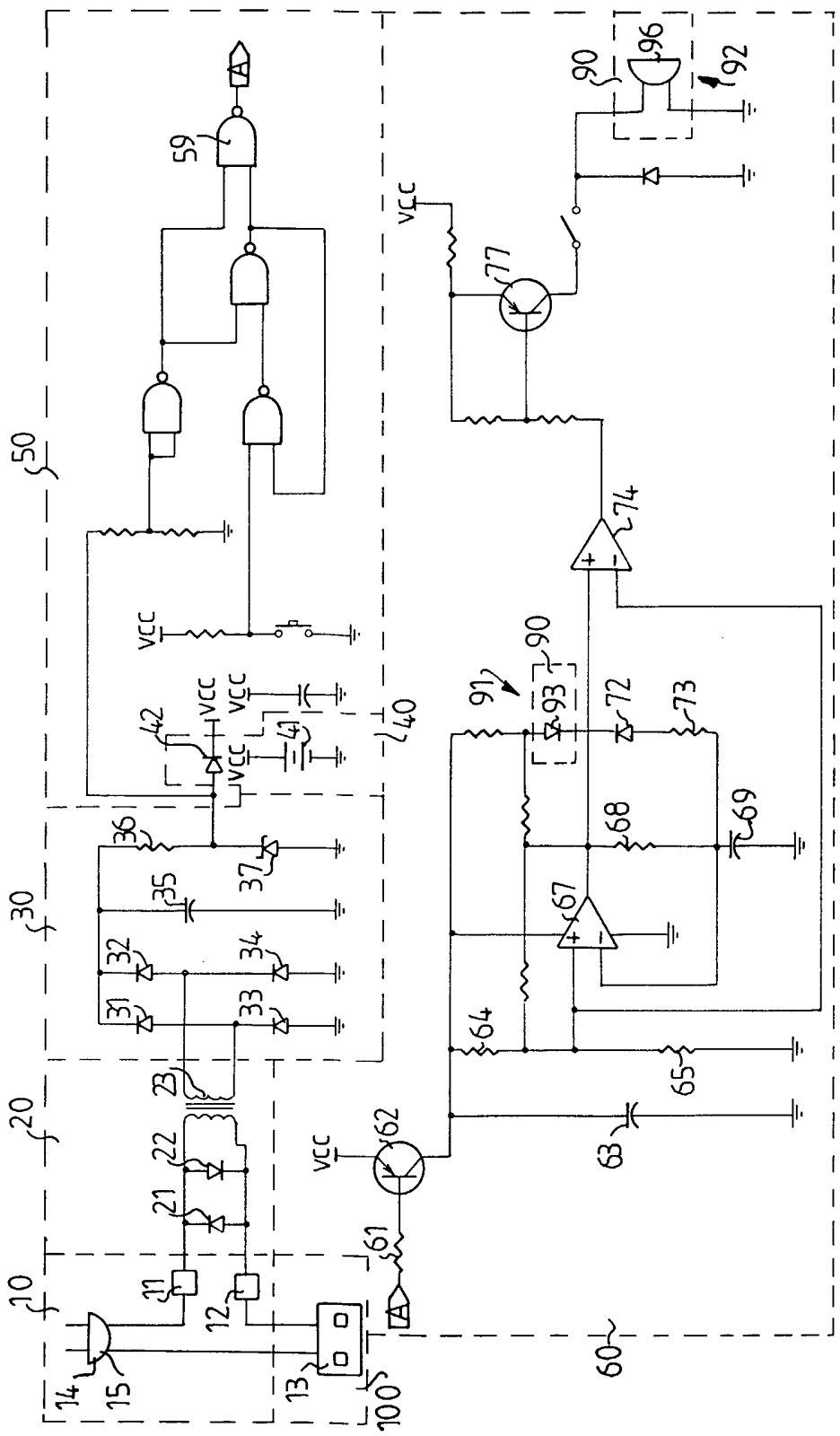

10
11
12
13
14
15
20
21
22
23
30
31
32
33
34
35
36
37
40
41
42
50
59
60
61
62
63
64
65
67
68
69
72
73
74
77
90
91
92
93
96
100
VCC

FIG. 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 01/02295

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: G08B 21/00, G08B 21/18
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)

IPC7: G08B

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

SE,DK,FI,NO classes as above

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

EPO-INTERNAL,WPI DATA,PAJ, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5663711 A (J.B.SANDERS ET AL), 2 Sept 1997 (02.09.97), see the whole document,specially column 2, line 10 - 47 --	1-9
X	US 4419658 A (A.M.JAROSZ ET AL), 6 December 1983 (06.12.83), column 2, line 8 - line 57; column 3, line 43 - column 4, line 9, abstract --	1-9
X	EP 0109227 A1 (VIDEO ALARMS & SYSTEMS COMPANY LIMITED.), 23 May 1984 (23.05.84), see the whole document,specially page 3,line 14-page 4, line 24 --	1-9

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
10 June 2002	12 -06- 2002
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Gordana Ninkovic´ / itw Telephone No. +46 8 782 25 00

Form PCT/ISA/210 (second sheet) (July 1998)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 01/02295

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4255669 A (R.NAUGLE), 10 March 1981 (10.03.81), see the whole document	1-9
	--	
X	US 6229450 B1 (D.A.MALMSTEN), 8 May 2001 (08.05.01), see the whole document	1-9
	--	
A	US 4002397 A (J. WANG ET AL), 11 January 1977 (11.01.77), abstract	1-9
	--	
A	US 4074245 A (J.P.PODANY), 14 February 1978 (14.02.78), column 1, line 28 - line 41	1-9
	--	
A	US 4003044 A (W.O.RICHMOND,JR.), 11 January 1977 (11.01.77), abstract	1-9
	--	
A	GB 2158277 A (RAYMOND, JOHN CORTON), 6 November 1985 (06.11.85), abstract	1-9
	--	
A	GB 2285880 A (RADAMEC ELECTRONICS LTD.), 26 July 1995 (26.07.95), abstract	1-9
	--	
A	GB 2228353 A (KENWOOD LTD.), 22 August 1990 (22.08.90), abstract	1-9
	--	
A	US 4237450 A (A.R.CANEZ), 2 December 1980 (02.12.80), column 1, line 57 - column 2, line 31	1-9
	--	
A	GB 2283870 A (YIN HONG WONG), 17 May 1995 (17.05.95), abstract	1-9
	--	

INTERNATIONAL SEARCH REPORT

Information on patent family members

01/05/02

International application No.
PCT/SE 01/02295

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5663711 A	02/09/97	NONE	
US 4419658 A	06/12/83	NONE	
EP 0109227 A1	23/05/84	DE 3375673 D	00/00/00
		GB 2133192 A,B	18/07/84
		GB 8328123 D	00/00/00
US 4255669 A	10/03/81	CA 1164049 A	20/03/84
US 6229450 B1	08/05/01	NONE	
US 4002397 A	11/01/77	NONE	
US 4074245 A	14/02/78	NONE	
US 4003044 A	11/01/77	AU 8485075 A	24/03/77
		CA 1039812 A	03/10/78
		GB 1491166 A	09/11/77
GB 2158277 A	06/11/85	GB 8329432 D	00/00/00
		GB 8426933 D	00/00/00
GB 2285880 A	26/07/95	EP 0690888 A	10/01/96
		GB 9400587 D	00/00/00
		JP 8512097 T	17/12/96
GB 2228353 A	22/08/90	GB 8903739 D	00/00/00
US 4237450 A	02/12/80	NONE	
GB 2283870 A	17/05/95	GB 9323050 D	00/00/00
		GB 9421184 D	00/00/00