(12) UK Patent Application (19) GB (11) 2 154 392 A

(43) Application published 4 Sep 1985

(21) Application No 8403964

(22) Date of filing 15 Feb 1984

(51) INT CL⁴
H04M 1/68

(52) Domestic classification
H4K 1A10 FH

(56) Documents cited
GB A 2068682 GB A 2014826 GB 0881274

(58) Field of search
H4K

(71) Applicant
Peter Henderson,
21 Nelson Place, Ryde, Isle of Wight PO33 2ET

(72) Inventor
Peter Henderson

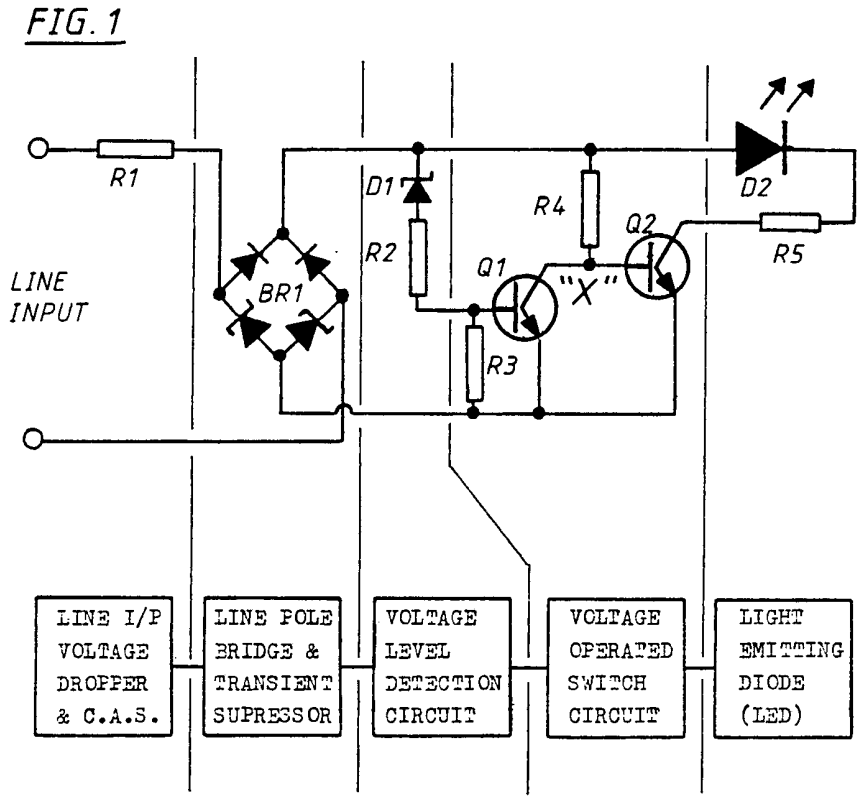
(74) Agent and/or Address for Service
Peter Henderson,
21 Nelson Place, Ryde, Isle of Wight PO33 2ET

(54) Telephone in use indicator (line busy lamp)

(57) An opto-electronic device, which by the electrical connection to both legs of a line, will indicate whether an extension telephone set on the same line is in use. The device consumes negligible line current both in lit mode and unlit mode, requires no additional power source nor any modifications to be made to installation nor to the circuit of any telephone or similar Telecom equipment into which it will be fitted. The light output can be constant or by inclusion of a flasher circuit made to pulsate.

The device functions by using a voltage dependant switch Q1, Q2 to turn the LED on when the line voltage drops due to the line being loaded (used), regardless of where on that line it is being used or however many other line status indicators are fitted into other extensions, phones with or without this device fitted can be freely mixed on each line.

FIG. 1



GB 2 154 392 A

FIG. 1

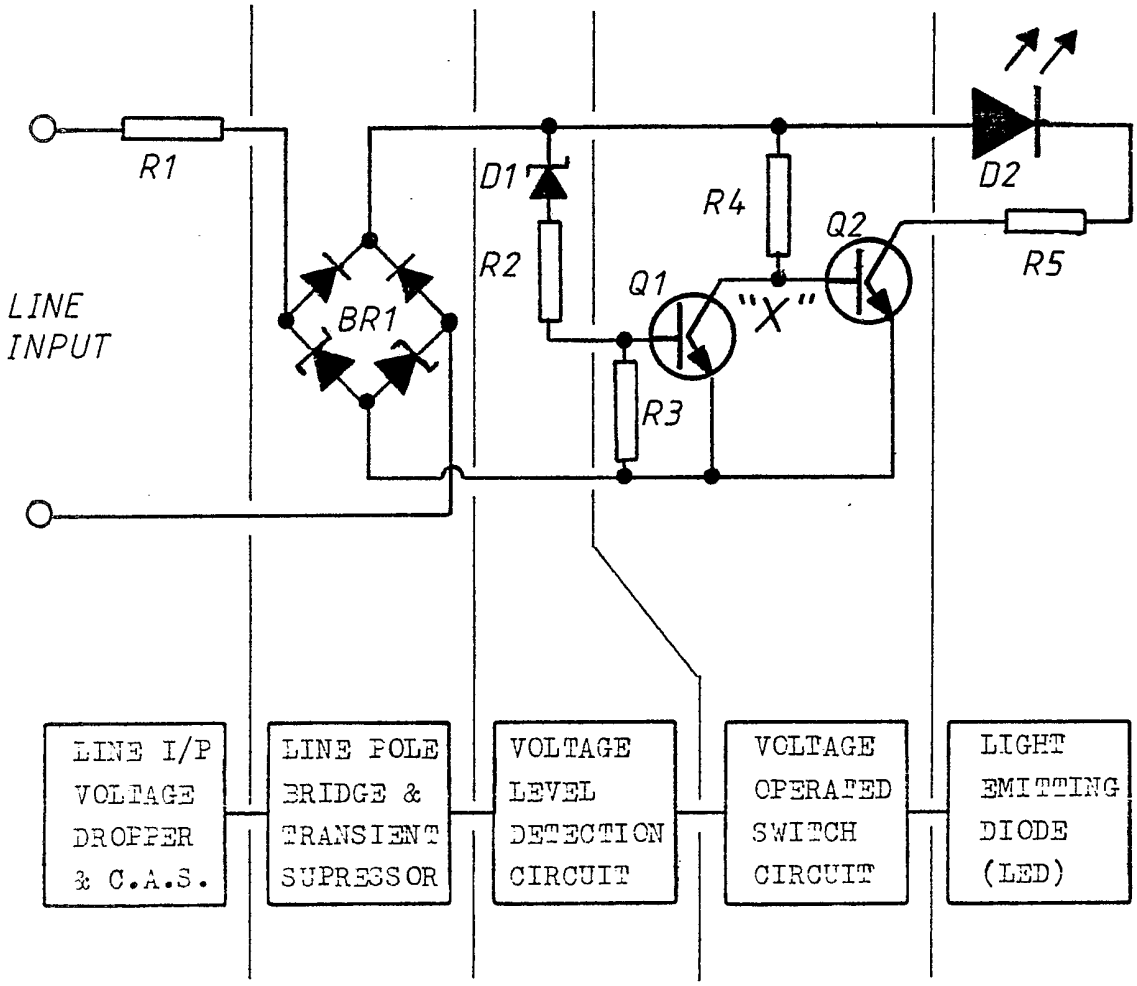
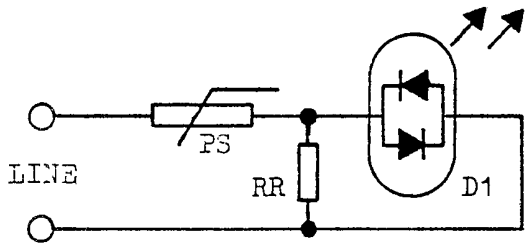

R1
D1
R2
R4
Q2
D2
R5
LINE
INPUT
BR1
Q1
"X"
R3
LINE I/P VOLTAGE DROPPER & C.A.S.
LINE POLE BRIDGE & TRANSIENT SUPRESSOR
VOLTAGE LEVEL DETECTION CIRCUIT
VOLTAGE OPERATED SWITCH CIRCUIT
LIGHT EMITTING DIODE (LED)

FIG. 2


LINE
PS
RR
D1

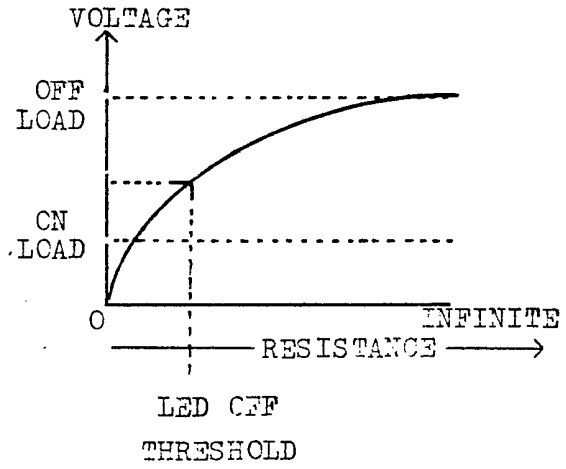

VOLTAGE
OFF LOAD
ON LOAD
0
INFINITE
RESISTANCE
LED OFF THRESHOLD

FIG. 3

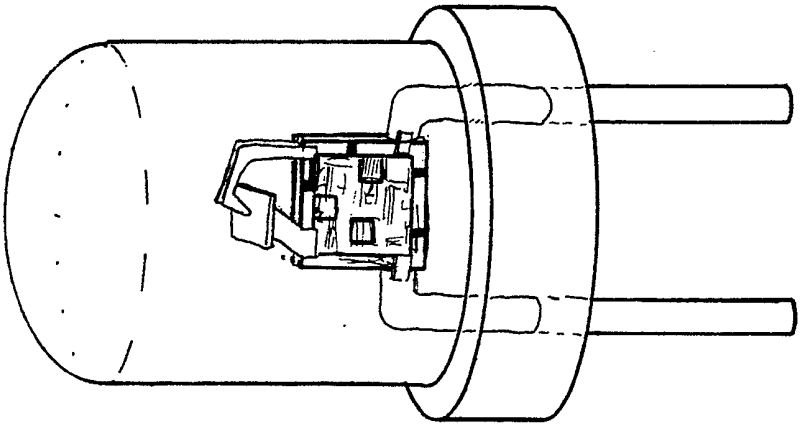


FIG. 4



SPECIFICATION

Telephone in use indicator (line busy lamp)

This invention relates to an Opto-Electronic Indicator which Illuminates whenever a Telephone Line is In Use.

Where more than one telephone is connected to an exchange line (4 Phones per line are permitted by British Telecom) there is a possibility that one may lift a Handset only to find that one of the other extensions is allready in use, further if you are using the phone and someone lifts annother handset this has the effect of disrupting the conversation or if during dialing will induce dail errors resulting in wrong numbers and time wasting.

What is required is a Light Emitting Diode (LED) to be fitted into each instrument to show when one of the other instruments is taken into use, this must be acheived without the need for extra wires to be run between instruments nor the necessity to fit any additional Equipment or batteries to be fitted to the line or to the instruments other than the Indicator, further such a device must consume very little current when on and practically none when off.

According to the present invention a Low current consuming Opto device comprising of a LED and a circuit to turn it on and off (by measuring the change in line voltage when a phone is off hook) is connected by two leads to the lines (Legs A & B) this can thus be fitted into any telephone old or new for connection into any Telephone Plan. The circuit can be made as an IC and moulded in base of the LED giving a body length of 9mm and a diameter of 5mm and reducing the current consumption.

The specific functioning of the device is hereby described with reference to the circuit diagram of the prototype circuit and the block diagram for it as shown in Fig. 1.

Reading circuit from left to right;–

Line connection is via two leads one to leg A the other to Leg B, the polarity of these connections may be transposed.

Voltage dropper and Call Answered suppressor is a resistor R1 and drops the voltage to a workable level and also prevents the line polarity bridge from rectifying the ringing AC and giving an errornous "Call Answered" flag state at the exchange.

Line polarity bridge and transient suppressor is a diode bridge of two conventional diodes and two zener diodes this connects the positive line leg to the circuit positive rail and the same for the negative side, If for any reason the voltage rises over that which the circuit can safely handle the zener diodes go bi-directional and bring the voltage back to a safe level.

Voltage level detection circuit is a zener diode and current limiting resistor in series and shown as D1 and R2. When the line is on load (Being Used) the line voltage sinks to about one third of its off load level, this low voltage is too low to pass backwards through D1 but when the line is off load the voltage rises and can now pass through D1 to operate the voltage operated switch

Voltage operated switch comprising of two NPN transistors Q1 & 2 and resistors R3 & 4. R4 drops voltage on positive rail to just sufficient to turn base of Q2 on ("X" on circuit) if however the zener diode D1 is conducting then it will turn the base of Q1 on and draw the voltage at "X" to Ov through Q1, this will deprive Q2 of its Base operating voltage and cause it to turn off.

Light emiting diode. The LED and a current limiting resistor (D2 & R5) are connected to the positive rail and through Q2 to the negative rail, when Q2 is on the LED will light and when Q2 is off the LED will remain dark.

Typical current consumption of the above circuit is;–

6mA when lit and 2mA when out

A possible alternative circuit using a polyswitch is shown in Fig. 2 the polyswitch being a specially designed voltage dependant resistor which goes high when the current/-voltage exceeds a predetermined value, when the voltage drops due to a phone being used the resistance of the polyswitch drops and allows the current to flow through the bi-directional LED, this LED is two LEDs in parallel in oposing directions in one LED body, this removes the need for polarity protection bridges ect. Again the above circuit could be manufactured as one component.

Fig. 3 shows a typical LED with IC or Polyswitch contained within its body.

Fig. 4 shows a typical location for such a device in a telephone.

CLAIMS

1. An Opto-electronic device being small and simple to fit into any telephone or similar telecommunications equipment, which will without any further modification to the line or equipment allow a user to see at a glance the line status.

2. A device as described in claim 1 but having a flashing light source.

3. A device as described in claim 1 but housed in a box along with a light operated alarm, the alarm not having any electrical connection to the telephone line.

4. A device as described in claims 1 & 3 with the light source being used to remotely turn on and off equipment, for example a telephone monitor and/or recorder.

5. A device as described in claim 1 or 2 and used as line test equipment.

6. An Integrated circuit version of the device as in claim 1 or 2 which can drive either an Opto device (L.E.D.) or another electronic device (e.g. relay)

CLAIMS

Superseded claims 1.

New or amended claims:–

1. An Opto Electronic device which will, by detecting changes in line Voltage indicate when a line is in use (regardless of where the line is in use nor where upon the line the above device is connected). The device is line powered and connects by two wires only to the two legs of the line, requires no adjustments once installed and requires no additional switches, batteries, wiring, or control equipment between the telephone equipment.

7. Any form of the above specified devices which will transmit by radio, ultrasonic, or infra red beam the lines status to a cordless phone Portable Unit or similar portable unit.

Printed in the United Kingdom for
Her Majesty's Stationery Office, Dd 8818935, 1985, 4235.
Published at The Patent Office, 25 Southampton Buildings,
London, WC2A 1AY, from which copies may be obtained.