FORM 7

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952-1969

DECLARATION IN SUPPORT OF AN APPLICATION FOR A PATENT OR A PATENT OF ADDITION

In support of the Application made by STANDARD TELEPHONES AND CABLES PTY. LIMITED for a patent ~~of addition~~ for an invention entitled:

"TELEPHONE PROTECTION CIRCUIT"

I, PATRICK MICHAEL CONRICK,

of STANDARD TELEPHONES AND CABLES PTY. LIMITED, 252-280 Botany Road, Alexandria, Sydney, New South Wales, Australia

do solemly and sincerely declare as follows:

1. I am authorised by STANDARD TELEPHONES AND CABLES PTY. LIMITED the applicant for the patent ~~of addition~~, to make this declaration on its behalf.

2. FREDERICK DENIS MONTANO, of 43 Lamette Street, CHATSWOOD, New South Wales, 2067, Australia

is/~~are~~ the actual inventor of the invention, and the facts upon which
is entitled to make the application are as follows:

STANDARD TELEPHONES AND CABLES PTY. LIMITED
IS THE ASSIGNEE OF THE SAID INVENTORS.

Declared at Sydney this 4th day of October 19 88

STANDARD TELEPHONES AND CABLES PTY. LTD.

F003061 10/10/88

Declarant

To: The Commissioner of Patents

(12) PATENT ABRIDGMENT (11) Document No. AU-B-73008/87
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 601737

(54) Title
**TELEPHONE PROTECTION CIRCUIT**

International Patent Classification(s)
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(74) Attorney or Agent
**STANDARD TELEPHONES & CABLES PTY. LTD., BOX 525 G.P.O., SYDNEY N.S.W. 2001**

(56) Prior Art Documents
**US 4079211**
**EP 32085**

(57) Claim

1. A surge protection circuit for equipment having transmission and reception circuits, the equipment being connected to a telephone line having an earth wire and a subscriber line comprising first and second wires, the protection circuit including a polarity guard having a pair of input terminals connected to the subscriber line and a pair of output terminals connected to the equipment transmission and reception circuits, wherein, in parallel with the transmission and reception circuits there is a surge protection device in series with a first diode, the first diode being forward biased with respect to the polarity of the polarity guard output, the earth wire is connected to the junction of the protection device and the first diode by a second diode connected to pass surges of a first polarity between the earth wire and the output of the polarity guard, the second diode

.../2

and the protection device being shunted by a third diode, connected to pass surges between the earth wire and the polarity guard output of the opposite polarity from those surges passed by the second diode, the latter surge path including the first diode.

AU-AI-73008/87

PCT

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International Bureau

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(33) Priority Country: AU

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(72) Inventor; and

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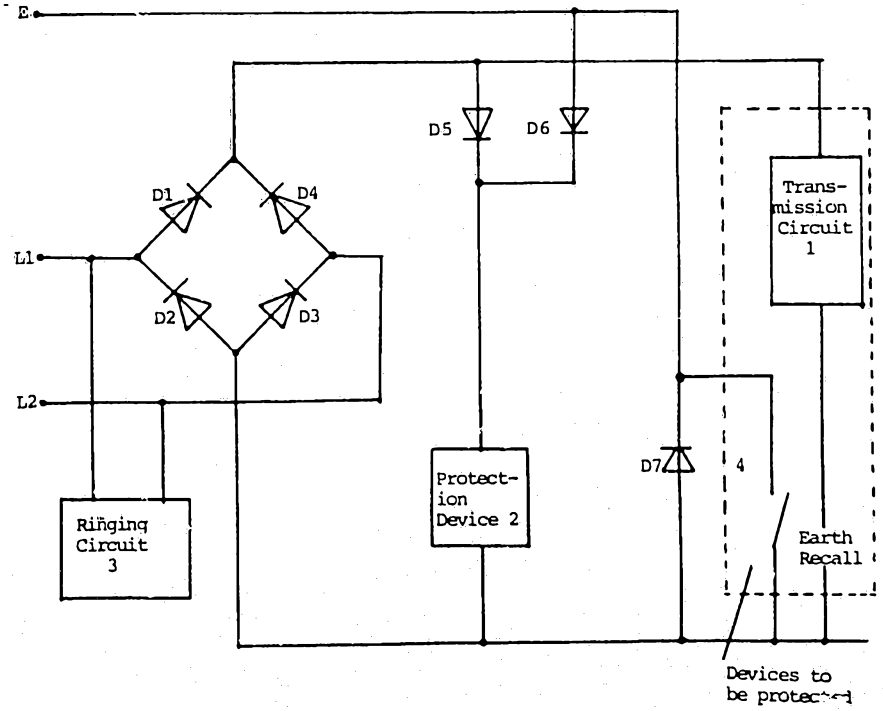
**Published**
*With international search report.*



(54) Title: TELEPHONE PROTECTION CIRCUIT




(57) Abstract

A protection circuit for a telephone having a two wire subscriber line (L1, L2) and an earth line (E) comprises a single surge protection device (2) connected between a bridge rectifier polarity-guard (D1, D2, D3, D4) which is across the subscriber line and the remainder of the telephone circuitry (1, 4) which is connected to the output of the polarity guard. Three diodes (D5, D6, D7) are used to interconnect the earth line and the pair of output lines from the polarity guard to the protection device in such a way as to prevent surges from being fed to the remainder of the telephone circuit, the surge paths including one or two arms of the polarity guard.

# Telephone Protection Circuit

## Technical Field

This invention relates to an electronic protection circuit for a telephone subset.

## Background Art

Subsets are now utilizing integrated circuits which are not as robust in regard to line surges as many conventional components, though surge protection has been applied to the conventional subsets. Because of the layout of the various components of a subset and the possibility of transverse or longitudinal faults it has been found that two or three protection devices have been required to protect the various subset blocks, e.g. the ringing circuit and the rectifier bridge and the rest of the subset circuitry. In subsets which have an earth line, e.g. phones connected to PMBX's or some PABX's or in some Telecom administrations where it is necessary to make an earth contact to seize a line, there is also a requirement to have protection on the earth line. Some administrations require all subsets to be adapted to be used with either earth recall or timed loop break.

Surges which may occur include transverse lightning surges of 2kv between the wires of the subscriber line, or longitudinal surges of 5kv between the line and the earth. Other faults include mains cross, spikes generated by signalling and induced currents.

Normally protection devices are provided between L1 and E, L2 and E and between L1 and L2.

## Disclosure of the Invention

This specification discloses the use of a single protection device connected by diodes to steer the surges from the various line configurations through the protective device. The diodes need to have a rapid response time and a high surge rating. An acceptable rating has been found to be 30A for 8ms. Diodes capable of this are cheap and readily available, offering considerable saving over the cost of the protective devices.

This specification discloses a protection circuit for a telephone having an earth wire and a subscriber line comprising first and second wires, wherein there is a polarity guard, a pair of input terminals connected to the subscriber line and a pair of output terminals connected to the telephone transmission and reception circuit, wherein, in parallel with the telephone circuit there is a protection device in series with a first diode, the first diode being forward biased with respect to the polarity of the polarity guard output, the earth wire is connected to the junction of the protective device and the first diode by a second diode connected to pass surges of a first polarity between the earth wire and the output of the polarity guard the second diode and the protection device being shunted by a third diode, connected to pass surges between the earth wire and the polarity guard output of the opposite polarity from those surges passed by the second diode, the latter surge path including the first diode.

Brief Description of the Drawings

The invention will be described with reference to the drawing, in which:

Fig. 1 shows the layout of a circuit embodying the protection systems.

Best Mode of Carrying Out The Invention

In Fig. 1 the subscriber line wires connect to terminals L1 and L2 which feed into a polarity guard comprising bridge rectifier D1, D2, D3, D4. The output of the bridge is connected to the subset circuit 1 in parallel with protective device 2 which is in series with diode D5. The earth line E is connected to the protective device 2 by diode D6 and, for surges of the opposite polarity by diode D7.

The operation of this protection circuit is described below.

For a transverse surge between L1 and L2 the bridge ensures that the surge is of the correct polarity to pass through the protective device. The path of the surge is via D5 which is poled to be forward biassed with reference to the bridge output. The protective device 2 may for instance

be a metal oxide varistor (MOV), one or more power zener diodes, or thyristor clamps, which appear as an open circuit at normal operating voltages and exhibit a breakdown characteristic at a specified overvoltage.

For a surge between L1 and E the path may be E, D6, 2, D2, L1. If the polarity is opposite the path would be E, D7, 2, D5, D1.

Similarly where the surge is between L2 and E the paths are, E, D6, 2, D3, L2; or for reverse polarity E, D7, 2, D5, D4.

D5 serves the purposes of preventing the surge being fed from E through D6 to D1/D4, (across the subset) and bypassing the protective device.

The ringing circuit 3, which in modern phones may also be electronic, is also protected from the surge. The protective device clamps the voltage which appears across the output of the bridge by drawing a heavy current.

In phones fitted with an earth recall facility, the button 4 is connected in parallel with diode D7. This may be a mechanical or electronic switch.

Industrial Applicability

The invention allows the substitution of diodes for much more expensive protection devices in the manufacture of telephone subsets and other equipment to be connected to phone lines.

The claims defining the invention are as follows:

1. A surge protection circuit for equipment having transmission and reception circuits, the equipment being connected to a telephone line having an earth wire and a subscriber line comprising first and second wires, the protection circuit including a polarity guard having a pair of input terminals connected to the subscriber line and a pair of output terminals connected to the equipment transmission and reception circuits, wherein, in parallel with the transmission and reception circuits there is a surge protection device in series with a first diode, the first diode being forward biased with respect to the polarity of the polarity guard output, the earth wire is connected to the junction of the protection device and the first diode by a second diode connected to pass surges of a first polarity between the earth wire and the output of the polarity guard, the second diode and the protection device being shunted by a third diode, connected to pass surges between the earth wire and the polarity guard output of the opposite polarity from those surges passed by the second diode, the latter surge path including the first diode.

2. A protection circuit as claimed in claim 1, in which the equipment comprises the transmission and reception circuits of a telephone.

3. A protection circuit as claimed in claim 1 or claim 2, wherein the protection device comprises a device which exhibits substantially open circuit characteristics up to a breakdown voltage, at which it clamps the voltage.

4. A protection circuit as claimed in claim 1 or claim 2 or claim 3, in which the protection device comprises either a metal oxide varistor, or one or more zener diodes, or a thyristor clamping circuit.

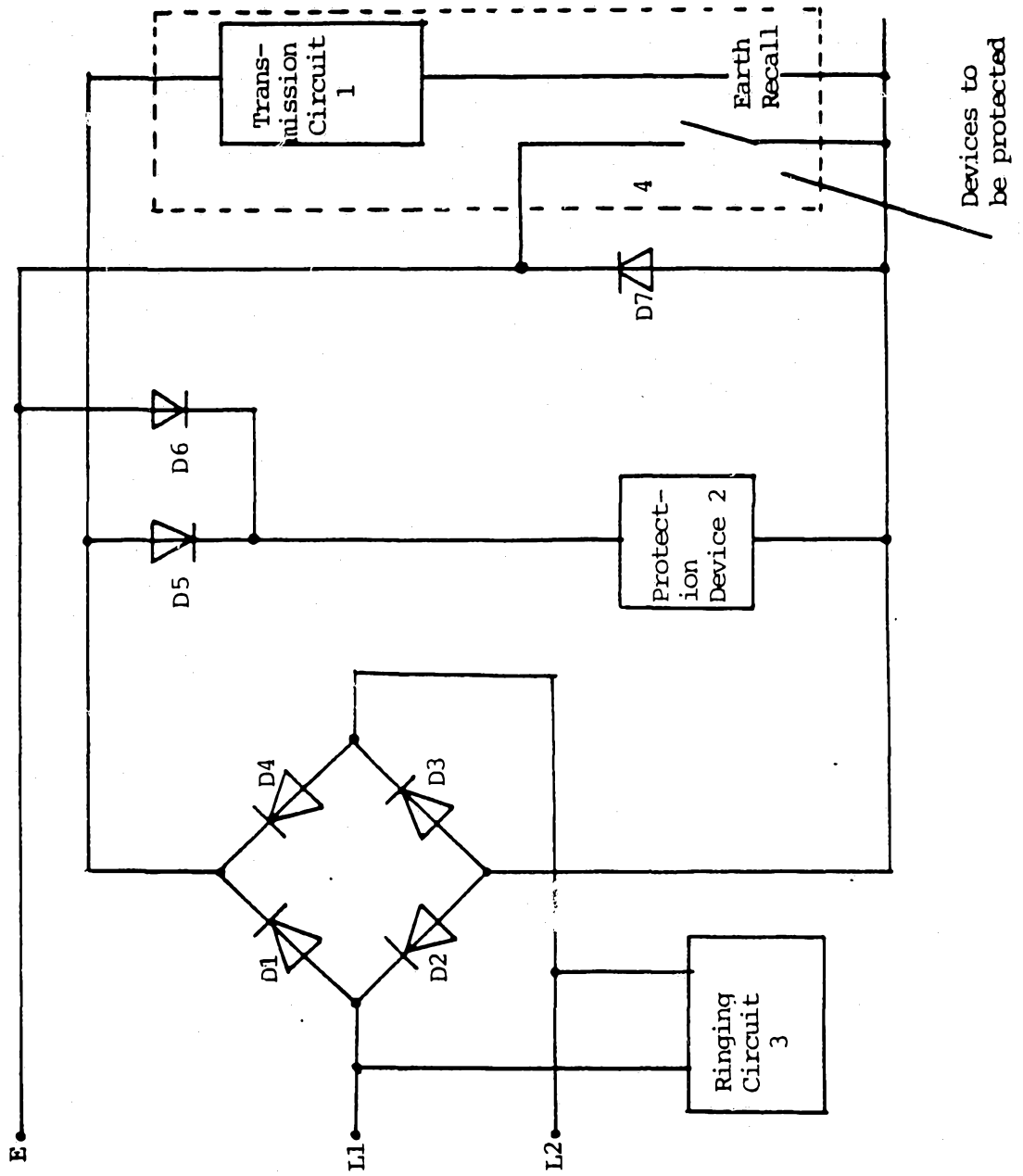
5. A protection circuit as claimed in any one of claims 1 to 4, wherein the polarity guard is a diode bridge rectifier.

6. A protection circuit substantially as herein described with reference to the accompanying drawing.

7. A protection circuit as claimed in claim 6 wherein the bridge rectifier comprises fourth, fifth, sixth and seventh diodes, in which the cathodes of the fourth and seventh diodes are connected to the positive terminal of the bridge rectifier output and the anodes of the fifth and sixth diodes are connected to the negative terminal of the bridge rectifier output, the first wire of the subscriber line being connected to the anode of the fourth diode and the cathode of the fifth diode, the second wire of the subscriber line being connected to the anode of the seventh diode and the cathode of the sixth diode, the anode of the first diode being connected to the positive terminal of the bridge rectifier, the cathod of the second diode being connected to the cathode of the first diode and the cathode of the third diode being connected to the anode of the second diode, whereby: surges of a first polarity between the first wire and the earth wire follow a path form the first wire through the fourth diode, the first diode, the protection device, and the third diode to the earth wire; surges of a second polarity between the first wire and the earth wire follow a path from the earth wire through the second diode, the protection device, and the fifth diode to the first wire; and surges of a first polarity between the second wire and the earth wire follow a path from the second wire through the seventh diode, the first diode, the protection device and the third diode to the earth wire; and surges of a second polarity between the earth wire and the second wire follow a path from the earth wire through the second diode, the protection device and the sixth diode to the second wire.

8. A telephone subset including a protection circuit as claimed in any one of claims 1 to 7.

9. A telephone subset as claimed in claim 8, having an earth recall switch in parallel with the third diode.


Trans-
mission
Circuit
1
Earth
Recall
Devices to
be protected
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D7
D6
D5
Protect-
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Device 2
D4
D3
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Ringing
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3
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L1
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# INTERNATIONAL SEARCH REPORT

International Application No PCT/AU 87/00097

## I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int. Cl.[4] H04M 1/74, H02H 9/04

## II. FIELDS SEARCHED

Minimum Documentation Searched [7]

| Classification System | Classification Symbols |
|---|---|
| IPC | H04M 1/74, H02H 9/00, 9/04, 9/06 |

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

AU: IPC as above, Australian Classification 04.35

## III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

| Category * | Citation of Document, [11] with indication, where appropriate, of the relevant passages [12] | Relevant to Claim No. [13] |
|---|---|---|
| Y | EP,A, 32085 (COMPAGNIE INDUSTRIELLE DE TUBES ET LAMPES ELECTRIQUES CITEL) 15 July 1981 (15.07.81) see abstract | (1-5,8) |
| Y | US,A, 4079211 (JANSSEN) 14 March 1978 (14.03.78) see lines 21-29, column 1 | (1-5,8) |
| Y | FR,A, 1596334 (COMPAGNIE DES COMPUTEURS) 24 July 1970 (24.07.70) see the drawing figure | (1-5) |
| A | GB,A, 1436625 (KABUSHIKI KAISHA SANKOSHA) 19 May 1976 (19.05.76) | |
| A | AU,B, 79340/82 (547598) (TELEFONAKTIEBOLAGET L.M. ERICSSON) 12 August 1982 (12.08.82) | |
| A | AU,B, 75677/81 (543627) (TELEFONAKTIEBOLAGET L.M. ERICSSON) 1 April 1982 (01.04.82) | |
| A | US,A, 4254442 (DIJMAHS & SCHOOFS) 3 March 1981 (03.03.81) | |
| A | GB,A, 1348476 (SIEMENS AKTIENGESELLSCHAFT) 20 March 1974 (20.03.74) | |

* Special categories of cited documents: [10]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document 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

"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

## IV. CERTIFICATION

| Date of the Actual Completion of the International Search | Date of Mailing of this International Search Report |
|---|---|
| 24 July 1987 (24.07.87) | (04.08.87) 4 AUGUST 1987 |
| **International Searching Authority** | **Signature of Authorized Officer** |
| Australian Patent Office | N.C. PETERSEN |

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON
INTERNATIONAL APPLICATION NO. PCT/AU 87/00097

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

| Patent Document Cited in Search Report | Patent Family Members | | |
|---|---|---|---|
| EP 32085 | FR 2472863 | | |
| US 4079211 | BE 843514 | DE 2627199 | FR 2316812 |
| | GB 1514662 | IT 1062379 | JP 52006003 |
| | NL 7507731 | SE 7607333 | |
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| | NL 7614118 | SE 7714316 | |

END OF ANNEX