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Application ID: 40784 / 89 PCT Number : PCT/SE89/00441

612059

Applicant-Name
Telefonaktiebolaget LM Ericsson
S-126 25 Stockholm,
Sweden

Title : A printed circuit board for mounting in ~~the~~ a back plane ~~of a card frame~~.

| Priority Country | Priority Date | Priority App. No. |
|---|---|---|
| SE | 12 OCT 88 | 8803634 |

Address-for Service :
WATERMARK
MELBOURNE

Date of Lodgement : 23 AUG 89

AUSTRALIAN PATENT OFFICE

# DECLARATION IN SUPPORT OF A CONVENTION APPLICATION FOR A PATENT OR PATENT OF ADDITION

In support of the Convention Application made by[1] Telefonaktiebolaget LM Ericsson, S-126 25 STOCKHOLM SWEDEN a company organized under the laws of Sweden

(hereinafter referred to as the applicant) for a Patent for an invention entitled:[2] A PRINTED CIRCUIT BOARD FOR MOUNTING IN A BACKPLANE

We I,[3] Mr Tage Lövgren, Mickelsbergsvägen 134, S-126 63 HÄGERSTEN SWEDEN of Lennart Grabe, Ymervägen 32, S-182 63 DJURSHOLM SWEDEN

do solemnly and sincerely declare as follows:

1. We are authorised by the applicant for the patent to make this declaration on its behalf.

2. The basic application as defined by Section 141 of the Act was made in[4] Sweden on the 12th day of October 1988, by Telefonaktiebolaget LM Ericsson

~~xxxxxxxxxxx~~ ~~day of xxxxxx~~ ~~19 xxxx~~ ~~by xxxxxxxxxxxxxxx~~

1) Torbjörn Rolf Olsson, Norrskensbacken 70, S-146 00 TULLINGE SWEDEN 2) Björn Ture Kassman, Glimmervägen 3, S-136 48 HANINGE 3.[5] SWEDEN 3) Karl-Gustaf Olsson, Dalagatan 52A, S-113 24 STOCKHOLM SWEDEN 4) Stig Carl-Oskar Ernolf, Folkungavägen 32M, S-191 50 SOLLENTUNA SWEDEN 5) Per-Ove Nilsson, Skyllbergsgatan 16,3trp,S-124 45 BANDHAGEN SWEDEN 6) Rolf Ingvar Birger Kjellsson, Juvelarvägen 27, S-126 41 HÄGERSTEN SWEDEN 7) Lars Herbert Widoff, Enbackagatan 10, S-652 21 KARLSTAD SWEDEN

~~is~~/are the actual inventor~~s~~ of the invention and the facts upon which the applicant is entitled to make the application are as follow:

The applicant is the assignee of Torbjörn Rolf Olsson, Björn Ture Kassman, Karl-Gustaf Olsson, Stig Carl-Oskar Ernolf, Per-Ove Nilsson, Rolf Ingvar Birger Kjellsson, Lars Herbert Widoff

4. The basic application referred to in paragraph 2 of this Declaration was the first application made in a Convention country in respect of the invention the subject of the application.

DECLARED at Stockholm, Sweden

this 2nd day of May 1990

[6] TELEFONAKTIEBOLAGET LM ERICSSON

Lennart Grabe
Senior Vice President
and General Counsel

Tage Lövgren
Manager of Patent
and Trademark
Department

To: THE COMMISSIONER OF PATENTS.

(1) Here insert (in full) Name of Company.

(2) Here insert title of Invention.

(3) Here insert full Name and Address, of Company official authorized to make declaration.

(4) Here insert basic Country or Countries followed by date or dates and basic Applicant or Applicants.

(5) Here insert (in full) Name and Address of Actual Inventor or Inventors.

(6) Signature.

Edwd. Waters & Sons, Melbourne.

(12) PATENT ABRIDGMENT (11) Document No. AU-B-40784/89
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 612059

(54) Title
A PRINTED CIRCUIT BOARD FOR MOUNTING IN A BACK PLANE

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(87) PCT Publication Number : WO90/04321

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| (31) Number | (32) Date | (33) Country |
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(56) Prior Art Documents
US 4131933
US 4511950
US 3992686

(57) Claim

1. A printed circuit board provided with electrical contact devices (7) and intended to be mounted in the back plane of a card frame (2), such as to form a magazine (1) in which printed circuit cards (6) can be inserted perpendicularly to said plane, said circuit cards having electrical contact devices (8) which correspond to the contact devices on the printed circuit board, and said printed circuit board forming an electrical connecting unit for the circuit cards located in the back plane of the magazine, characterized in that the printed circuit board (3) is a self-supporting and stiffening construction in the form of a sandwich element (10), the sandwich element (10) comprising a spacer element (11) which is bonded adhesively to the board and to a bottom plate (12).

OPI DATE 01/05/90 APPLN. ID 40784 / 89

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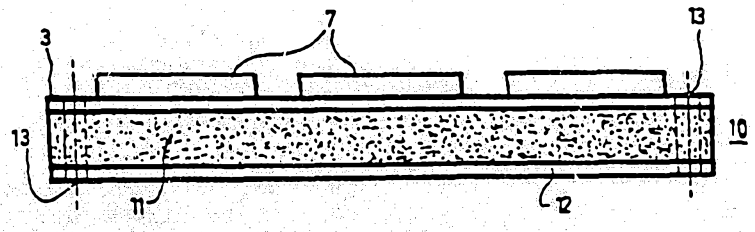
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(81) Designated States: AU, BR, DK, FI, JP, KR, NO.

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

(54) Title: A PRINTED CIRCUIT BOARD FOR MOUNTING IN ~~THE~~ A BACK PLANE ~~OF A CARD FRAME~~




(57) Abstract

The present invention relates to a printed circuit board provided with electrical contact devices (7) and intended to be mounted in the back plane of a card frame (2) such as to form a magazine (1) in which printed circuit cards (6) having electrical contact devices (8) corresponding to the contact devices (7) on the board can be inserted at right angles to the back plane. The circuit board (3) forms an electrical connecting unit for the circuit cards in the back plane of the magazine. In accordance with the invention, the circuit board is configured to provide a self-supporting and stiffening structure in the form of a sandwich element (10).

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# A PRINTED CIRCUIT BOARD FOR MOUNTING IN ~~THE~~ A BACK PLANE

## TECHNICAL FIELD

The present invention relates to a printed circuit board provided with electrical contact devices and intended to be mounted in the back plane of a card frame such as to form a magazine for printed circuit cards capable of being inserted at right angles to the back plane and having electrical contact devices corresponding to the contact devices on the printed circuit board, said printed circuit board forming an electrical coupling unit which functions to connect the printed circuit cards to the back plane of the magazine.

## BACKGROUND ART

Magazines intended for accomodating printed circuit cards included, for instance, in telephone exchange systems normally comprise a card frame which consists of two end plates, profiled sections which are screwed to respective end plates, and a back plate which is mounted in the back of the card frame and which functions to stiffen the actual card frame mechanically, and together with the profiled sections, to support a printed circuit board which constitutes the coupling unit between printed circuit cards inserted into the magazine at right angles to the printed circuit board. The printed circuit board and the printed circuit cards are provided with mutually cooperating devices, for connecting the card to the circuit board electrically.

Because the printed circuit board is relatively thin and has practically no resistance to bending and torsion forces, the forces occurring when inserting a printed circuit card into the magazine and removing a card therefrom are taken up by the rear profiled sections of the magazine and the back plate thereof. In the case of large magazines, it is necessary to further stiffen the printed circuit board, with the aid of additional profiled sections located in the back plane of the card frame. Consequently, the mechanical construction of the magazine in its back plane often becomes complicated and bulky. Attachment of the printed circuit board is also complicated and the various working steps involved are time consuming. Furthermore, the requisite mechanical stiffening of the printed circuit board means renders part of the board surface unavailable for use, because of the presence of the necessary attachment devices.

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DISCLOSURE OF INVENTION

Consequently, the object of the present invention is to avoid the drawbacks associated with known magazines, by configuring a printed circuit board as a self-supporting structure, in the form of a torsionally rigid sandwich element.

According to one preferred embodiment, the sandwich element comprises a spacer element which is bonded to a bottom plate and also to the printed circuit board.

The spacer element preferably comprises a layer of foam plastic, and the bottom plate is preferably manufactured from a material which has the same coefficient of linear expansion as the printed circuit board.

According to one preferred embodiment, the spacer element covers the whole of the rear side of the printed circuit board. The printed circuit board is preferably provided along the edges thereof with fastener elements or through-passing holes for attachment of the board to the card frame with the aid of screws or like fasteners.

The spacer element is preferably mounted on the printed circuit board, subsequent to completing the construction of said board and testing the same.

A printed circuit board configured in accordance with the invention provides several advantages. One advantage is that no separate mechanical constructions need be arranged in the back plane of the card frame for the purpose of taking up forces and for stiffening the magazine, since the forces which occur when inserting the printed circuit cards into the magazine and when removing said cards therefrom are taken up by the printed circuit board itself, which also serves to stiffen the card frame.

Another advantage is that because no separate devices are required for stiffening the printed circuit board in the card frame, the whole of the surface of said board is available for coaction with electrical contact devices. The contact devices can therefore be placed freely within the surface area provided and enables the use of different types of electrical contact devices.

A further advantage is that the size of the self-supporting, torsionally rigid printed circuit board is not restricted by the presence of mechanical stiffening constructions in the back plane of the magazine, and consequently the board can be manufactured in sizes which are independent of the size of the card frame, i.e. there can be produced a printed circuit board for common use with several magazines at one and the same time.

Further advantages afforded by an inventive printed circuit board will be apparent from the following description and the accompanying drawing.

## BRIEF DESCRIPTION OF DRAWING

Figure 1 illustrates schematically and in perspective a card frame and a printed circuit board according to the invention, intended for forming a circuit card magazine.

Figure 2 is a side view of the inventive printed circuit board.

## BEST MODE FOR CARRYING OUT THE INVENTION

Figure 1 is a perspective view of a magazine 1 which comprises a card frame 2 and a printed circuit board 3 according to the invention. The card frame 2 is of conventional construction, and consists of two end plates 4 and four profiled sections 5 which connect the end plates together and are fastened at respective corners, for instance by means of screws. The card frame 2 is normally made of aluminium. Instead of the conventional back plate, the back plane of the magazine 1, however, consists of a printed circuit board 3, the nature of which will be described in more detail herebelow.

Printed circuit cards 6 can be inserted perpendicularly to the thus formed back plane of the magazine, i.e. perpendicularly to the printed circuit board 3. The board 3 constitutes an electrical connecting unit between the printed circuit cards 6 and is, to this end, provided with electrical contact devices 7, whereas the printed circuit cards are provided with electrical contact devices 8 corresponding to the contact devices of the printed circuit board, as shown schematically in Figure 1. The cards 6 are guided in the card frame 2 by means

of guide rails 9, for instance plastic rails, which extend in the card frame 2 beneath the upper and lower profiled sections 5 respectively.

The printed circuit board 3 will now be described with reference to Figure 2. The board is manufactured, e.g., of glass-fibre reinforced epoxy-resin and is provided with conductor paths, such as to enable the board to function as an electrical connecting unit for the printed circuit cards 6. As beforementioned, electrical contact devices 7 are mounted on the front face of the board. In order to make the board 3 a self-supporting unit, the rear side of the board is configured with a stiffening construction in the form of a sandwich element 10. According to one preferred embodiment, the sandwich element 10 comprises a spacer element 11 bonded adhesively to a bottom plate 12 and secured to the circuit board. The spacer element comprises a layer of foamed plastic, e.g. PVC, and the bottom plate 12 is manufactured from a material which has the same coefficient of linear expansion as the printed circuit board 3, normally a glass-fibre reinforced epoxy. The spacer element 11 is bonded adhesively to the circuit board 3, preferably subsequent to said board having been completed and tested and provided with electrical contact devices 7.

In order to enable the board 3 to be mounted in the back plane of the card frame 2, the board 3 is provided along the edges thereof with through-passing holes 13, and the board 3 is screwed firmly to the rear profiled sections 5 of the card frame 2, or fastened in some other suitable manner. Alternatively, fasteners can be provided along the edges of the printed circuit board and fastened to the profiled sections of the card frame.

Because the printed circuit board is a self-supporting, stiffening structure, as described in the aforegoing, no separate mechanical reinforcements are required in the back plane of the magazine, in order to stiffen the magazine and to support the circuit board. Furthermore, because the circuit board is attached to the card frame solely along the edge surfaces of the board, the whole of the surface of the board is avilable for the provision of electrical contact devices, which can thus be placed freely within the available surface area.

It will be understood that the invention is not restricted to the described and illustrated embodiment, and that modifications can be made within the scope of the accompanying claims.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. A printed circuit board provided with electrical contact devices (7) and intended to be mounted in the back plane of a card frame (2), such as to form a magazine (1) in which printed circuit cards (6) can be inserted perpendicularly to said plane, said circuit cards having electrical contact devices (8) which correspond to the contact devices on the printed circuit board, and said printed circuit board forming an electrical connecting unit for the circuit cards located in the back plane of the magazine, characterized in that the printed circuit board (3) is a self-supporting and stiffening construction in the form of a sandwich element (10), the sandwich element (10) comprising a spacer element (11) which is bonded adhesively to the board and to a bottom plate (12).

2. A printed circuit board according to claim 1, characterized in that the spacer element (11) comprises a layer of a foamed plastic.

3. A printed circuit board according to claim 1, characterized in that the bottom plate (12) is made of a material which has the same coefficient of linear expansion as the printed circuit board (3).

4. A printed circuit board according to any one of claims 1-3, characterized in that the spacer element (11) covers the whole of the rear surface of the printed circuit board (3).

5. A printed circuit board according to any one of claims 1-4, characterized in that the spacer element (11) is mounted on the printed circuit board (3) subsequent to said board having been completed and tested and provided with said electrical contact devices (7).

6. A printed circuit board according to any one of the preceding claims, characterized in that the printed circuit board (3) is provided along the edges thereof with fastener elements or through-passing holes (13) for attaching the board to the card frame (2) with the aid of screw fasteners or the like.

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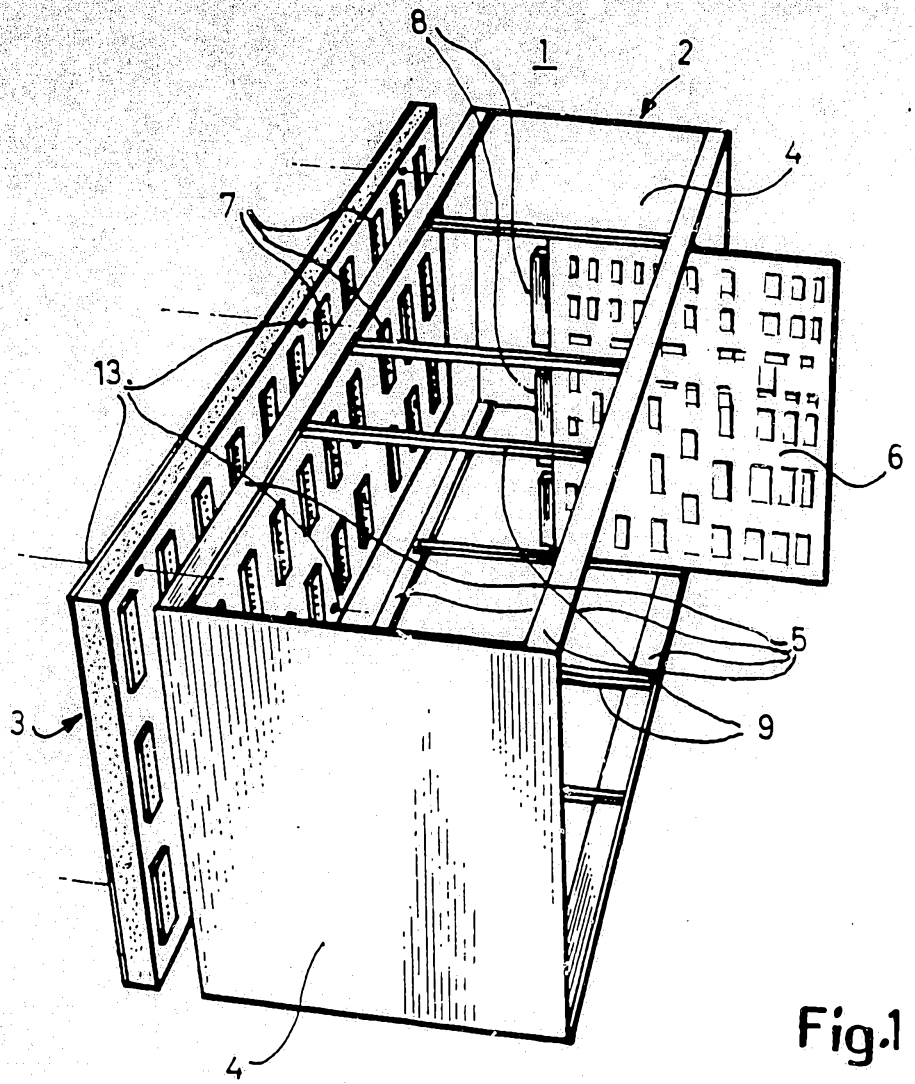



Fig.1

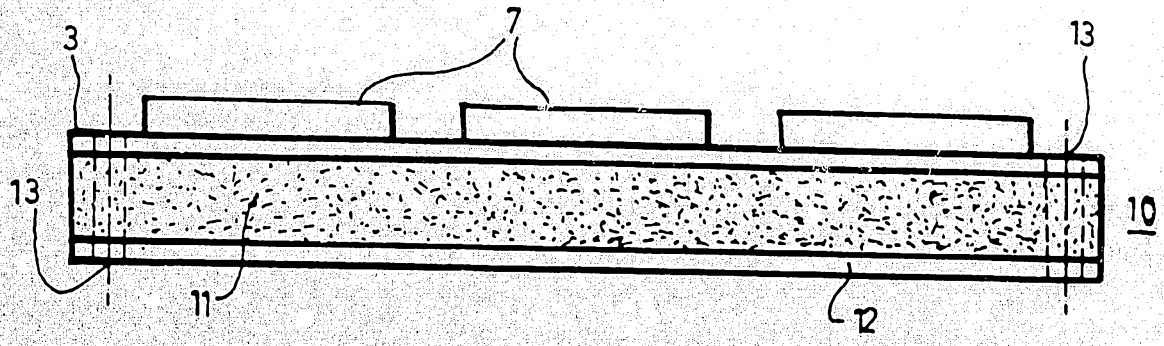



Fig 2

# INTERNATIONAL SEARCH REPORT

International Application No PCT/SE 89/00441

**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

IPC4: H 05 K 7/18

**II. FIELDS SEARCHED**

**Minimum Documentation Searched** [7]

| Classification System | Classification Symbols |
|---|---|
| IPC4 | H 05 K 7/14,18 |

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

SE, NO, DK, FI classes as above

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

| Category [9] | Citation of Document, [11] with indication, where appropriate, of the relevant passages [12] | Relevant to Claim No. [13] |
|---|---|---|
| X | US, A, 4131933 (AGARD ET AL) 26 December 1978, see claim 1 and detail 17 -- | 1 |
| A | US, A, 4511950 (BRUNNER ET AL) 16 April 1985, see column 3, line 43 - line 47 -- | |
| A | US, A, 3992686 (CANNING) 16 November 1976, see column 5, line 3 - line 7 -- | |

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* 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 |
|---|---|
| 1989-09-12 | 1989 -09- 20 |
| **International Searching Authority** | **Signature of Authorized Officer** |
| Swedish Patent Office | Sven-Olof Wirlée |

# ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO. PCT/SE 89/00441

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| US-A- 4131933 | 26/12/78 | FR-A-B- 2389298 | 24/11/78 |
| | | DE-A-C- 2817269 | 02/11/78 |
| | | JP-A- 53135461 | 27/11/78 |
| | | CA-A- 1069207 | 31/12/79 |
| | | GB-A- 1597451 | 09/09/81 |
| US-A- 4511950 | 16/04/85 | NONE | |
| US-A- 3992686 | 16/11/76 | NONE | |