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**D E C I S I O N**  
**of 9 October 2000**

**Case Number:** T 0125/99 - 3.4.2

**Application Number:** 91308756.5

**Publication Number:** 0478313

**IPC:** H05K 3/46

**Language of the proceedings:** EN

**Title of invention:**

A multilayer printed circuit board and manufacturing method therefor

**Patentee:**

International Business Machines Corporation

**Opponent:**

Ciba Spezialitätenchemie Holding AG  
Robert Bosch GmbH

**Headword:**

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**Relevant legal provisions:**

EPC Art. 123(2)

**Keyword:**

"Added subject-matter"

**Decisions cited:**

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**Catchword:**

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Case Number: T 0125/99 - 3.4.2

**D E C I S I O N**  
of the Technical Board of Appeal 3.4.2  
of 9 October 2000

**Appellant:** International Business Machines  
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**Representative:** Burt, Roger James, Dr.  
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**Respondent:** Ciba Spezialitätenchemie Holding AG  
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**Respondent:** Robert Bosch GmbH  
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**Decision under appeal:** Decision of the Opposition Division of the  
European Patent Office posted 2 December 1998  
revoking European patent No. 0 478 313 pursuant  
to Article 102(1) EPC.

**Composition of the Board:**

**Chairman:** E. Turrini  
**Members:** A. G. Klein  
V. Di Cerbo

## Summary of Facts and Submissions

- I. European patent No. 0 478 313 (application No. 91 308 756.5) was revoked by the Opposition Division on the ground that its subject-matter lacked an inventive step in view of the prior art citations on the file.
- II. The appellant (proprietor of the patent) filed an appeal against the Opposition Division's decision.
- III. Oral proceedings were held on 9 October 2000 at the end of which the appellant requested that the decision under appeal be set aside and that the patent be maintained as amended, on the basis of a set of claims in accordance with either his main or his auxiliary requests.

Independent claim 2 of his main request reads as follows:

"2. A multilayer printed circuit board comprising:

an insulating substrate (10);

a laminate provided on each side of said substrate, each said laminate comprising wiring layers and at least one insulating layer between each of said wiring layers;

a conductive through hole (32) extending through said substrate and said laminates;

each of said wiring layers (12, 22, 36) including signal wiring conductors (16, 26, 40) which are

interconnected only by conductive vias (24, 34) formed by photoprocessing said least one insulating layer;

the outermost wiring layer of each said laminate including signal wiring conductors (40, 40') and power supply conductors (44, 46); and

the power supply conductors in said outermost wiring layers of said laminates being interconnected by said conductive through hole;

whereby the conductive vias are used for interconnection of the signal wiring conductors in the wiring layers and the conductive through hole is used for a power connection."

Independent claim 2 of the appellant's auxiliary request reads as follows:

"2. A method of manufacturing a multilayer printed circuit board comprising:

an insulating substrate (10);

a laminate provided on each side of said substrate, each said laminate comprising wiring layers and at least one insulating layer between each of said wiring layers;

a conductive through hole (32) extending through said substrate and said laminates;

each of said wiring layers (12, 22, 36) including signal wiring conductors (16, 26, 40) which are interconnected only by conductive vias (24, 34) formed

by photoprocessing said least one insulating layer;

the outermost wiring layer of each said laminate including signal wiring conductors (40, 40') and power supply conductors (44, 46); and

the power supply conductors in said outermost wiring layers of said laminates being interconnected by said conductive through hole;

whereby the conductive vias are used for interconnection of the signal wiring conductors in the wiring layers and the conductive through hole is used for a power connection

said method comprising the steps of:

- (a) preparing the insulating substrate (10) with both surfaces being clad with copper;
- (b) patterning the copper layers (12, 14) on both sides of said substrate to form wiring layers including signal wiring conductors (16, 16');
- (c) depositing an insulating layer (18, 18') on each of said wiring layers;
- (d) by photoprocessing, forming vias (20, 20') in said insulating layers to expose selected portions of said wiring conductors in said wiring layers;
- (e) depositing a copper layer (22, 22') on each of said insulating layers, including said vias;
- (f) patterning the deposited copper layers (22, 22')

to form wiring layers including signal wiring conductors (26, 26');

- (g) repeating said steps (c) - (f), at least once;
- (h) depositing an insulating layer (28, 28') on each of the top wiring layers;
- (i) by photoprocessing, forming vias in the insulating layers formed in step (h) to expose selected portions of the signal wiring conductors (26, 26') in said top wiring layers;
- (j) forming the through hole (32) at a selected location of the resulting structure;
- (k) depositing a copper layer (36, 36) on the entire surface of said structure, including said through hole (32); and
- (l) patterning the deposited copper layer (36) to form, on each side of said substrate, the outermost wiring layer including the signal wiring conductors (40, 40') and the power supply conductors (44, 46), said power supply conductors in said outermost wiring layers being interconnected by said through hole (32)."

The respondents (opponents) requested that the appeal be dismissed.

IV. The appellant in support of his requests stressed in particular that the independent claims now explicitly specified that the signal wiring conductors were interconnected "only" by the conductive vias also set

out in the claims. This amendment was considered necessary to more clearly distinguish the claimed subject-matter from the prior art. It was introduced by way of clarification but it did not add any new subject-matter to the original claims which could not reasonably have been read in any other way.

In respect of the embodiment disclosed in the patent in suit in conjunction with Figures 2A to 2I, comprising a laminate of stacked wiring layers and insulating layers on each side of an insulating substrate, interconnection of the signal wiring layers did not necessarily require the provision of through-holes. It could in particular be achieved through edge connectors.

The statement in the description that through-hole connections for signal wiring conductors were "reduced" as compared to the prior art constructions was consistent with the fact that no such through-hole connections were left, which amounted to a reduction to zero.

- V. Both respondents contested that the application documents originally filed actually disclosed signal wiring conductors being interconnected "only" by conductive vias. They also raised further objections against the clarity of the claims and against the patentability of their subject-matter.

## **Reasons for the Decision**

1. The appeal is admissible.

2. *Compliance of the amendments brought to the claims with the requirements of Articles 123(2) EPC*

2.1 The independent claims 2 of the appellant's main and auxiliary requests are directed respectively to a multilayer printed circuit board and to a method of manufacturing such a multilayered printed circuit board, both of which involve the provision on each side of an insulating substrate of a laminate comprising wiring layers and at least one insulating layer between each of said wiring layers.

A specific embodiment of such multilayered printed circuit board and of its manufacturing method was disclosed in the application documents as originally filed in conjunction with Figures 2A to 2I, and defined in independent claims 2 and 8, respectively.

As a result of the amendments brought to the claims, present claims 2 of the appellant's main and auxiliary request now state that the signal wiring conductors in the wiring layers are interconnected "only" by conductive vias.

2.2 The appellant admitted that the original application documents did not **expressly** indicate that the wiring conductors were "only" interconnected by conductive vias, and that they did not **explicitly** exclude an interconnection of the wiring conductors through conductive through-holes.

2.3 The Board could not find any **implicit** support in the original application document to the above amendments, neither in conjunction with the variant addressed in claims 2 of a construction comprising an inner



insulating substrate and a laminate provided on each of its sides, nor otherwise.

Indeed, the construction shown only partially in Figures 2A to 2I is intended for the mounting of components on both sides (see the last paragraph of page 2 of the description as originally filed), which implies that the signal wiring conductors of the respective sides are connected to each other in some way. Whilst it is correct that this interconnection could be achieved through connectors mounted at the edges of the circuit board, as was submitted by the appellant, the original application documents are entirely silent in this respect and they certainly do not exclude that through-holes be provided to that purpose at some portion of the printed circuit board not shown in the partial representations of Figures 2A to 2I. The original disclosure of the embodiment of Figures 2A to 2I does not therefore unambiguously disclose the technical limitation which now results from the indication in claims 2 of the main and auxiliary requests that interconnection of the signal wiring conductors is achieved "only" by conductive vias.

An interpretation of the application documents as originally filed to the effect that interconnections of the signal wiring conductors by means of through-hole connections are excluded would not be consistent either with the statement in the penultimate paragraph of page 7, according to which through-hole connections for single wiring conductors are "reduced", as compared to prior art arrangements. The reference to a mere **reduction** of the number of through-hole connections for the signal wiring conductors clearly allows for a few

such connections being maintained.

2.3 For these reasons, the feature introduced into claims 2 of the appellant's main and auxiliary requests that signal wiring conductors are interconnected "only" by conductor vias extends beyond the content of the application as filed, is in contravention of the provisions of Article 123(2) EPC.

The appellant's requests cannot be allowed, accordingly.

## **Order**

**For these reasons it is decided that:**

The appeal is dismissed.

The Registrar:

The Chairman:

P. Martorana

E. Turrini