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**Datasheet for the decision
of 25 September 2013**

Case Number: T 0297/09 - 3.4.03
Application Number: 02800278.0
Publication Number: 1432293
IPC: H05K 3/34, H05K 3/24,
H05K 3/46, H01L 23/12,
C23C 18/31, C23C 18/44
Language of the proceedings: EN

Title of invention:

Printed wiring board and production method for printed wiring board

Applicant:

IBIDEN CO., LTD.

Headword:

-

Relevant legal provisions (EPC 1973):

EPC Art. 56, 84

Keyword:

"Clarity, conciseness (no)"
"Inventive step (no)"

Decisions cited:

-

Catchword:

-



Case Number: T 0297/09 - 3.4.03

D E C I S I O N
of the Technical Board of Appeal 3.4.03
of 25 September 2013

Appellant: IBIDEN CO., LTD.
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Decision under appeal: Decision of the Examining Division of the
European Patent Office posted 5 September 2008
refusing European patent application
No. 02800278.0 pursuant to Article 97(2) EPC.

Composition of the Board:

Chairman: G. Eliasson
Members: R. Q. Bekkering
T. Bokor

Summary of Facts and Submissions

- I. This is an appeal against the refusal of application 02 800 278 for lack of clarity, Article 84 EPC 1973.
- II. With the statement setting out the grounds of appeal dated 14 January 2009, the appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the following:

Main request:

Claims 1 to 3 headed "*Main Request*" and claim 4 headed "*Main Request + Auxiliary Request I + Auxiliary Request II*" filed with the statement setting out the grounds of appeal;

First auxiliary request:

Claims 1 to 3 headed "*Auxiliary Request I*" and claim 4 headed "*Main Request + Auxiliary Request I + Auxiliary Request II*" filed with the statement setting out the grounds of appeal;

Second auxiliary request:

Claims 1 to 3 headed "*Auxiliary Request II*" and claim 4 headed "*Main Request + Auxiliary Request I + Auxiliary Request II*" filed with the statement setting out the grounds of appeal;

Third auxiliary request:

Claim 1 headed "*Auxiliary Request III*" filed with the statement setting out the grounds of appeal.

III. The summons to oral proceedings, requested by the appellant, were provided with an annex in which a provisional opinion of the board on the matter was given.

Reference was made to the following documents:

D3: WO 01/31984 A

D3': EP 1 162 867 A

D4: JP 11 017 321 A

D11: "*Gold Properties/Guidelines*", Precious Metals Plating Company, Santa Ana (Ca), USA, pages 1 to 4

D12: S.F. Rudy, "*Functional Plating - Applications for 16 Deposits*", Plating & Surface Finishing, October 2002, pages 28-29

D13: Military specification, Gold plating, Electrodeposited, MIL-G-45204C, from June 1983

D14: US 6 086 946 A

D15: JP 10 163 357 A

In the annex it was noted that the subject-matter of claim 1 of the appellant's main and first auxiliary

request was considered to lack clarity and conciseness, Article 84 EPC 1973, and the subject-matter of claim 1 according to all requests appeared to lack an inventive step, Article 56 EPC 1973, with respect to the documents cited above.

- IV. In response to the summons, the appellant withdrew the request for oral proceedings and asked the board to decide on the matter in written proceedings.

Thereupon, the oral proceedings were cancelled by the board.

- V. Claim 1 of the main request reads as follows:

"A printed wiring board (110) having a solder bump (76 U) provided on a conductor circuit (158) exposed by an opening through an organic resin insulating layer (70), characterized in that
a single metal layer (174) of soft gold plating is provided on said exposed conductor circuit (158), and said solder bump (76 U) is provided on said single metal layer."

Claim 4 of the main request reads as follows:

"A printed wiring board manufacturing method for providing a single metal layer (174) of soft gold on a conductor circuit (158) mainly comprising of copper and having a part of an organic resin insulating layer (70) exposed and opened to form a solder pad by executing at least steps (a) to (c):

(a) the step of immersing the printed wiring board having said conductor circuit (158) exposed from the

organic resin insulating layer (70) in an etchant of one of sulfuric acid-hydrogen peroxide, cuprous chloride and ferrous chloride;

(b) the activation step using acid; and

(c) the step of providing said single metal layer of soft gold on said conductor circuit by substitutional plating."

VI. Claim 1 of the first auxiliary request corresponds to claim 1 of the main request, with the characterising portion reading as follows (modifications highlighted):

*"a single metal layer (174) of soft gold plating is provided on said exposed conductor circuit (158), **such that diffusion of soft gold into the conductor circuit is prevented** and said solder bump (76 U) is provided on said single metal layer."*

Claim 4 of the first auxiliary request corresponds to claim 4 of the main request.

VII. Claim 1 of the second auxiliary request corresponds to claim 1 of the first auxiliary request, with the characterising portion reading as follows (modifications highlighted):

*"a single **plated** metal layer (174) of soft gold **plating** is provided on said exposed conductor circuit (158), such that diffusion of soft gold into the conductor circuit is prevented and said solder bump (76 U) is provided on said single metal layer."*

Claim 4 of the second auxiliary request corresponds to claim 4 of the main request.

VIII. Claim 1 of the third auxiliary request corresponds to claim 4 of the main request.

IX. The appellant submitted with the statement setting out the grounds of appeal in substance the following arguments:

The expression "*soft gold*" had a well-recognized meaning in the relevant art, namely in the art of plating, as shown by document D12. Moreover, it was clear that the term "*soft*" was coupled to the term "*gold*" and not to the term "*plating*". Thus, contrary to the Examining Division's opinion, independent claim 1 alone fulfilled the requirements of Article 84 EPC.

Moreover, according to the invention, a single metal layer of soft gold was provided on an exposed conductor circuit, which provided several advantages over the prior art.

Document D3 disclosed a two-layer design in Fig. 13 with a nickel-plated layer 172 and a gold plated layer 174. Document D4 did not disclose the use of soft gold as a single-layer film, since soft gold would not diffuse into the copper layer.

Accordingly, the subject-matter of claim 1 of the main and the first and second auxiliary request involved an inventive step.

Moreover, D4 and D3 showed neither removing the surface layer of the conductor circuit exposed by the opening through the organic resin insulating layer with an

etchant (cf step (a)) nor the subsequent activation step using an acid (cf step (b)).

Accordingly, the subject-matter of method claim 4 of the main and the first and second auxiliary request, as well as claim 1 of the third auxiliary request involved an inventive step.

Reasons for the Decision

1. The appeal is admissible.
2. *Main request*
 - 2.1 *Clarity, conciseness*

The board considers that, as argued by the appellant, at the priority date of the application the expression "*soft gold*" as such had a well-recognized meaning to a person skilled in the art. In particular, according to documents D11 and D12, and notably pre-published specification D13, plated "*soft*" gold is of Type III (purity 99.9 % gold minimum), Grade A (Knoop hardness 90 maximum), whereas plated "*hard*" gold is of Type I or II (purity 99.7 or 99.0 % gold minimum) and contains Ni and/or Co to increase the hardness to Grade C (Knoop hardness 130 to 200), making it suitable for applications where wear resistance is required such as in electrical connectors.

However, as noted in the annex to the summons to the oral proceedings, the expression "*a single metal layer of soft gold plating*" in claim 1 is considered to lack

clarity and conciseness, as the terms "metal" and "layer" are redundant in view of the more specific definitions "gold" and "plating", respectively. Moreover, it is unclear whether "soft" refers to the "gold" or to the "plating".

Accordingly, claim 1 of the main request lacks clarity and conciseness, contrary to the requirements of Article 84 EPC 1973.

2.2 *Novelty, inventive step*

2.2.1 Moreover, taking the expression "a single metal layer of soft gold plating" to mean a single plated layer of soft gold, the subject-matter of claim 1 of the main request lacks an inventive step in the sense of Article 56 EPC 1973.

2.2.2 Document D3 discloses, using document D3' which is a family member of document D3 as translation, a printed wiring board having a solder bump (176) provided on a conductor circuit (165) exposed by an opening through an organic resin insulating layer (170) (cf document D3', figure 13 and corresponding description, paragraphs [0138] to [0148]).

In D3, a single plated layer of gold is provided on the exposed conductor. As indicated in the decision under appeal the claim wording does not exclude an intervening nickel layer, as neither is the single metal layer defined to be provided directly on the conductor circuit, nor is excluded that the nickel layer forms part of the exposed conductor.

As argued by the appellant, the plated gold layer of D3 is not specified to be soft gold.

Accordingly, the subject-matter of claim 1 is new over document D3, Article 54(1) EPC 1973.

2.2.3 The objective problem to be solved starting from document D3 is to provide a suitable gold plating.

According to documents D11, D12 and D13, and as is generally known to the skilled person, hard gold plating is used in electronic applications eg for electrical contacts which are subject to wear. Soft gold on the other hand is typically used in electronic applications where solderability or bondability is required (D11, page 2, second paragraph; D12, page 29, "*Soft Gold*"; D13, page 4, 3.6.6).

Accordingly, it would be obvious to a person skilled in the art to use soft gold in the arrangement of D3 where the excellent solderability of soft gold is clearly an advantage.

Moreover, from document D4 it is known that the gold plating can also be applied directly to the copper conductors of the printed wiring board, without an intervening nickel layer (cf table 3 and corresponding description). This is eg also known from document D14 (see abstract) and document D15 (see abstract).

Accordingly, the subject-matter of claim 1 of the main request, having regard to the state of the art, is obvious to a person skilled in the art and, thus, lacks an inventive step in the sense of Article 56 EPC 1973.

2.3 The appellant's main request is, therefore, not allowable.

3. *First auxiliary request*

3.1 Claim 1 of the first auxiliary request contains the additional feature "*such that diffusion of soft gold into the conductor circuit is prevented*".

3.2 *Clarity, conciseness*

Claim 1 lacks clarity and conciseness, Article 84 EPC 1973, for the same reasons given above for the main request.

3.3 *Inventive step*

Insofar as soft gold indeed does not diffuse into copper as alleged by the appellant, the above feature is inherent when soft gold is used. Since the use of soft gold is obvious, as discussed above, this feature does not add anything to inventive step.

Accordingly, the subject-matter of claim 1 lacks an inventive step in the sense of Article 56 EPC 1973.

3.4 The appellant's first auxiliary request is, therefore, not allowable either.

4. *Second auxiliary request*

The amendment to claim 1 addresses the clarity and conciseness issues above. However, it does not alter the finding on inventive step above.

Accordingly, the subject-matter of claim 1 lacks an inventive step in the sense of Article 56 EPC 1973.

The appellant's second auxiliary request is, thus, also not allowable.

5. *Third auxiliary request*

Document D3 discloses, using document D3' as translation, a printed wiring board manufacturing method for providing a single metal layer of gold (174) on a conductor circuit (165), mainly comprising of copper and having a part of an organic resin insulating layer (170) exposed and opened to form a solder pad, by substitutional plating (cf document D3', figure 13 and corresponding description, paragraphs [0138] to [0148]).

For in substance the same reasons given for claim 1 of the main request, it would be obvious to a person skilled in the art to use soft gold and to apply it directly to the copper conductors of the printed wiring board, without an intervening nickel layer.

Moreover, according to the description, steps (a) and (b) as claimed are for "scraping off" the surface of the copper conductor circuit prior to gold plating (cf eg page 41, second paragraph).

Accordingly, a further partial objective problem to be solved starting from document D3 is to provide a suitable surface treatment before gold plating.

Pre-treatments of the surface are however common (see eg document D13, page 3, 3.3) and would be applied by a person skilled in the art where needed without the exercise of inventive skills. Moreover, the solutions claimed are known etchants of the surface material (see eg document D3, paragraph [0148]) and thus an obvious choice for the skilled person for clearing the surface.

Accordingly, the subject-matter of claim 1 of the third auxiliary request, having regard to the state of the art, is obvious to a person skilled in the art and, thus, lacks an inventive step in the sense of Article 56 EPC 1973.

Hence, the appellant's third auxiliary request is not allowable either.

Order

For these reasons it is decided that:

The appeal is dismissed.

Registrar:

Chair:

S. Sánchez Chiquero

G. Eliasson