

The opinion in support of the decision being entered today was *not* written for publication and is *not* binding precedent of the Board.

Paper No. 44

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte DONALD C. ABBOTT

Appeal No. 1997-2834
Application No. 08/190,729

ON BRIEF

Before KIMLIN, GARRIS, and DELMENDO, Administrative Patent Judges.

DELMENDO, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on an appeal under 35 U.S.C. § 134 from the examiner's final rejection of claims 51 through 59, 72 through 74, and 81 through 86 and refusal to allow claims 60 through 71, 75 through 80, and 87 through 94. These are the only claims remaining in the application.

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Claim 51 is illustrative of the claims on appeal and is reproduced below:

51. A corrosion resistant lead frame for electrically contacting an integrated circuit, comprising:

a base metal layer having a first standard reduction potential;

an isolation layer disposed upon said base metal layer and having a second standard reduction potential, said second standard reduction potential being greater than said first standard reduction potential;

an intermediate layer disposed upon said isolation layer and having a third standard reduction potential, said third standard reduction potential being less than both said first and second standard reduction potentials; and

a top metal layer disposed upon said intermediate layer and having a standard reduction potential substantially equal to said second standard reduction potential.

The subject matter on appeal relates to a corrosion resistant lead frame for an integrated circuit and a method for fabricating such a lead frame (appeal brief, page 2). The lead frame comprises the recited base metal, isolation, intermediate, and top metal layers. According to the appellant, the isolation layer is used to decouple the top metal layer and the base metal layer by providing a standard reduction potential that is substantially equal to the standard reduction potential of the top metal layer (appeal

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brief, page 3). This prevents the base metal ions, which are typically soluble in the intermediate layer, from migrating under the potential difference between the base metal layer and the top metal layer to the surface of the top metal layer to form corrosion products (*id.*).

As evidence of unpatentability, the examiner relies upon the following prior art references:

Levine (Levine '958) 1986	4,601,958	Jul. 22,
Levine (Levine '796) 1987	4,666,796	May 19,
Levine (Levine '067) 1989	4,835,067	May 30,

In addition, the examiner relies upon the appellant's admission of the prior art, as described on pages 1 and 2 of the present specification.

The sole ground of rejection presented for our review in this appeal is as follows:¹

Claims 51 through 94 stand rejected under 35 U.S.C. § 103 as unpatentable over the appellant's admitted prior art in

¹ In the advisory action of February 6, 1995, the examiner withdrew the rejection of claims 60 through 71, 75 through 80, and 87 through 94 under the first paragraph of 35 U.S.C. § 112 as set forth on pages 2 and 3 of the final Office action.

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view of Levine '958, Levine '796, or Levine '067 (examiner's answer, pages 4 and 5).

We have carefully reviewed the entire record, including all of the arguments and evidence advanced by both the examiner and the appellant in support of their respective positions. This review leads us to conclude that the examiner's rejection is not well founded. Accordingly, we reverse. The reasons for our determination follow.

The appellant explains the problem of a prior art lead frame as follows:

. . . Typically, the base metal of the lead frame is copper because of its high thermal conductivity. . . In some instances, a nickel layer [i.e., intermediate layer] on the order of 100 microinches is formed over the base metal to prevent temperature driven diffusion of the copper to the surface of the lead frame. Corrosion products formed by copper diffusion, such as copper sulfides and oxides, will degrade the solderability of the lead frame and will reduce the shelf life of the final product.

The nickel layer, however, contains pores through which the corrosion products may migrate. A nickel layer thickness of at least 400 microinches would be needed to reasonably assure that no continuous paths through the nickel layer would be available for copper migration. Unfortunately, a thickness of this magnitude will crack when the leads are eventually bent to form the dual inline package (DIP) or surface mount integrated circuit (SMIC).

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A layer of palladium (Pd) [i.e., top metal layer] may be formed over the nickel layer. . . The palladium layer, however, will produce a galvanic potential between the palladium layer and the copper base, drawing copper ions to the surface. This galvanic couple accelerates pore corrosion in the palladium plated lead frame, which results in oxides and sulfides and other reaction products of copper appearing on the lead frame surface. The oxides and sulfides and other corrosion products discolor the surface of the lead frame and degrade its solderability. [Specification, pp. 2-3.]

The appellant has solved the problem described above with an isolation layer (e.g., a palladium/nickel alloy layer) between the base metal layer and the intermediate layer (specification, page 4).

The examiner admits that the appellant's admitted prior art does not teach how to solve the problem described above (examiner's answer, page 4). However, the examiner takes the position that "[i]t would be obvious to one of ordinary skill in the art that the known prior art concept of Levine would solve the problem of ion migration and corrosion in the lead frame construction disclosed as prior art by appellant because the known mechanism causing degradation and the mechanism to solve it are the same as Levine's" (examiner's answer, page 5). We disagree.

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As pointed out by the appellant, the problems to be solved and/or the solutions to the problems in the Levine patents are different from that of the present invention. We do not find any teaching in the relied upon prior art to show that a corrosion problem even existed in prior art lead frames.

Specifically, Levine '067 is concerned with solving the problem of corrosion in a sealing lid for semiconductor packages in which the sealing lid comprises a metal substrate (e.g., an iron alloy), a first layer of nickel, a first layer of gold, a second layer of nickel, and a second layer of gold (column 1, line 58 to column 2, line 6). Levine '067 solves the problem of corrosion by forming a base layer of a metal (e.g., gold) having an electromotive potential higher than the metal substrate, an intermediate layer of a metal (e.g., nickel) having an electromotive potential substantially lower than the electromotive potential of the base layer metal, and a cover layer having a metal with an electromotive potential which is high with respect to the base layer (column 2, lines 15-31). Although Levine '067 teaches that the intermediate layer can have an electromotive potential "somewhat similar to that of" the metal substrate (column 3, lines 41-46), there is no teaching or suggestion in Levine '067 of an intermediate

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layer having a standard reduction potential less than both the isolation layer and the base metal layer as defined in the appealed claims. Since Levine '067 is concerned with a different problem relative to the claimed invention and thus a different solution, we agree with the appellant that the combined teachings of the admitted prior art and Levine '067 cannot render the subject matter of the appealed claims to be unpatentable within the meaning of 35 U.S.C. § 103. *In re Spinnoble*, 405 F.2d 578, 585, 160 USPQ 237, 243 (CCPA 1969) ("[A] patentable invention may lie in the discovery of the source of a problem even though the remedy may be obvious once the source of the problem is identified. This is part of the 'subject matter as a whole' which should always be considered in determining the obviousness of an invention under 35 U.S.C. 103.").

Regarding Levine '796 and Levine '958, these prior art references are concerned with solving the problem of corrosion in sealing covers (or lids) comprising a base material (e.g., an iron alloy), a layer of nickel, and a layer of gold (column 1, line 15 to column 2, line 9 of Levine '796 and column 1, line 9 to column 2, line 29 of Levine '958). However, the solution proposed in these references is to use additional nickel and gold layers **18** and **20** (figures 2 and 3, column 2,

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lines 12-23, and column 4, line 65 to column 5, line 8 of Levine '796 and figures 2 and 3, column 2, lines 33-43, and column 5, lines 22-33 of Levine '958). Therefore, we cannot agree with the examiner that the combined teachings of the admitted prior art and Levine '796 or Levine '958 would have led one of ordinary skill in the art to arrive at the subject matter of the appealed claims, absent the benefit of the appellant's own disclosure.

The decision of the examiner is reversed.

REVERSED

EDWARD C. KIMLIN)	
Administrative Patent Judge)	
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)	BOARD OF PATENT
BRADLEY R. GARRIS)	APPEALS
Administrative Patent Judge)	AND
)	INTERFERENCES
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