

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. 17

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte JOHN B. BOOS

Appeal No. 2000-0465
Application 08/826,110

ON BRIEF

Before KRASS, FLEMING and LALL *Administrative Patent Judges*.

FLEMING, *Administrative Patent Judge*.

DECISION ON APPEAL

This is a decision on appeal under 35 U.S.C. § 134 from the final rejection of claims 1-5, 7-11 and 13-16, all the claims pending in the instant application.

The instant invention discloses an electronic semiconductor device utilizing a new metallization scheme. Appellant's Specification, page 3, lines 22-23. As shown in Figure 1, an example of a semiconductor electronic device having an ohmic contact is provided with a contact metallization scheme of Pd/Pt/Au. Specification, page 10, line 23, to page 11, line 1. The device is composed of a semiconductor base composed of one

or more semiconductor materials, an electron conducting region in or constituting the base, and an ohmic contact of a palladium layer, a barrier layer, and a gold layer on top. Specification, page 4, lines 8-13. The palladium layer is in contact with the base.

Specification, page 4, lines 13-14.

Representative claim 1 reads as follows:

1. A semiconductor electronic device comprising a semiconductor base; an electron conducting region disposed in or constituting said base; and an ohmic contact disposed on said base, said ohmic contact comprises Pd/barrier/Au layers, with said palladium layer being in contact with said base.

In rejecting Appellant's claims, the Examiner relies on the following references:

Calawa et al. (Calawa)	4,952,527	Aug. 28, 1990
Hatano et al. (Hatano)	5,740,192	Apr. 14, 1999
		(Filed Dec. 17, 1996)

Claims 1, 7 and 13 stand rejected under 35 U.S.C. § 102 as being anticipated by Calawa. Claims 1-5, 7-11 and 13-16 stand rejected under 35 U.S.C. § 103(a) as obvious over Calawa and Hatano.

Rather than repeat the arguments of Appellant and Examiner, we refer the reader to the Appellant's Briefs¹ and Examiner's Answer² for the respective details thereof.

OPINION

With full consideration being given the subject matter on appeal, the Examiner's rejection and the arguments of Appellant and Examiner, for the reasons stated infra, we will reverse the Examiner's rejection of claims 1, 7 and 13 under 35 U.S.C. § 102 as

¹ Appellant filed an Appeal Brief on May 18, 1999. Appellant filed a Reply Brief on August 27, 1999. Appellant also filed an appendix and response on 8/24/2001 addressing the Examiner's directive.

being unpatentable over Calawa and reverse the Examiner's rejection of claims 1-5, 7-11 and 13-16 rejected under 35 U.S.C. § 103(a) as obvious over Calawa and Hatano.

We will first address the rejection of claims 1, 7 and 13 under 35 U.S.C. § 102. It is axiomatic that anticipation of a claim under § 102 can be found only if the prior art reference discloses every element of the claim. *See In re King*, 801 F.2d 1324, 1326, 231 USPQ 136, 138 (Fed. Cir. 1986) and *Lindemann Maschinenfabrik GMBH v. American Hoist & Derrick Co.*, 730 F.2d 1452, 1458, 221 USPQ 481, 485 (Fed. Cir. 1984).

Appellant's claims 1, 7 and 13 recite Pd/barrier/Au layers, the palladium layer being in contact with the semiconductor base of a semiconductor electronic device. Appellant argues that Calawa's ohmic contacts 18 of Ni/Ge/Au and Pd/Ge/Au do not teach a barrier. Appeal Brief, page 3, line 19, to page 4, line 2. More specifically, Appellant argues that Calawa does not teach, inherently or otherwise, a Ge layer acting as a barrier layer between palladium and gold. Reply Brief, page 1, lines 13-14. Appellant further argues that the Ge layer in Calawa is not intended to act as a diffusion barrier, but rather to act as a dopant. Reply Brief, page 1, lines 14-17. Appellant asserts that the standard use of Ge is as a dopant when forming n-type ohmic contacts to semiconductors, and cites support from the text entitled "Semiconductor Material And Device Characterization." Appeal Brief, page 1, line 17, to page 2, line 6. Appellant distinguishes the Ge layer in Calawa from a barrier layer acting as a diffusion barrier as serving completely different purposes. Reply Brief, page 2, lines 7-10.

² The Examiner, in response to Appellant's Brief, mailed an Examiner's Answer on July 2, 1999. An office communication was mailed on September 25, 2001 acknowledging Appellant's amendment to the claims.

As pointed out by our reviewing court, we must first determine the scope of the claim. “[T]he name of the game is the claim.” *In re Hiniker Co.*, 150 F.3d 1362, 1369, 47 USPQ2d 1523, 1529 (Fed. Cir. 1998).

We note that Appellant’s claim 1 recites an “ohmic contact compris[ing] Pd/**barrier**/Au layers, with said palladium layer being in contact with said base.” (emphasis added). The use of the Appellant’s claim language, “barrier,” reasonably allows for the reading of claim 1 language as requiring a barrier disposed between palladium and gold layers forming an ohmic contact on a semiconductor device.

Moreover, when interpreting a claim, words of the claim are generally given their ordinary and accustomed meaning, unless it appears from the specification or the file history that they were used differently by the inventor. *Carroll Touch, Inc. v. Electro Mechanical Sys., Inc.*, 15 F.3d 1573, 1577, 27 USPQ2d 1836, 1840 (Fed. Cir. 1993). Although an inventor is indeed free to define the specific terms used to describe his or her invention, this must be done with reasonable clarity, deliberateness, and precision. *In re Paulsen*, 30 F.3d 1475, 1480, 31 USPQ2d 1671, 1674 (Fed. Cir. 1994). Our reviewing court states in *In re Zletz*, 893 F.2d 319, 321, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989) that “claims must be interpreted as broadly as their terms reasonably allow.”

We note that the Appellant’s specification states that “the function of the barrier layer is to act as a barrier to gold atoms and to prevent diffusion thereof into the channel semiconductor device, especially the lateral diffusion in an HFET between source and drain underneath the gate.” Specification, page 6, lines 1-4. Thus, we find that the barrier layer is a material layer that inhibits diffusion of gold at operating conditions.

The Examiner argues that, even though Calawa does not explicitly disclose a barrier layer, this feature is an inherent teaching of Calawa's device with a Ge layer acting as a barrier layer between palladium and gold layers. Examiner's Answer, page 4, lines 9-15. The Examiner further states that Calawa's ohmic contact structure includes palladium, germanium and gold layers (Pd/Ge/Au), where germanium clearly acts as a barrier layer between the palladium and the gold layers. Examiner's Answer, page 6, lines 8-14.

Upon careful review of Calawa, we fail to find that Calawa teaches "Pd/barrier/Au layers" as recited in Appellant's claims 1, 7 and 13. Appellant has shown that it is standard in the semiconductor metallization art for germanium to be used as a dopant in the Pd/Ge/Au structure of Calawa. Thus, the germanium in the Pd/Ge/Au ohmic contacts of Calawa is a dopant and not a barrier. Therefore, we find that Calawa fails to teach all of the limitations of claims 1, 7 and 13, and thus the claims are not anticipated by Calawa.

Now, we turn to the rejection of claims 1-5, 7-11 and 13-16 under 35 U.S.C. § 103. The Examiner bears the initial burden of establishing a *prima facie* case of obviousness. *In re Oetiker*, 977 F.2d 1443, 1445, 24 USPQ 1443, 1444 (Fed. Cir. 1992). *See also In re Piasecki*, 745 F.2d 1468, 1472, 223 USPQ 785, 788 (Fed. Cir. 1984). The Examiner can satisfy this burden by showing that some objective teaching in the prior art or knowledge generally available to one of ordinary skill in the art suggests the claimed subject matter. *In re Fine*, 837 F.2d 1071, 1074, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). Only if this initial burden is met does the burden of coming forward with evidence or

argument shift to the Appellants. *Oetiker*, 977 F.2d at 1445, 24 USPQ at 1444. *See also Piasecki*, 745 F.2d at 1472, 223 USPQ at 788.

An obviousness analysis commences with a review and consideration of all the pertinent evidence and arguments. “In reviewing the [E]xaminer’s decision on appeal, the Board must necessarily weigh all of the evidence and arguments.” *In re Oetiker*, 977 F.2d at 1445, 24 USPQ2d at 1444. “[T]he Board must not only assure that the requisite findings are made, based on evidence of record, but must also explain the reasoning by which the findings are deemed to support the agency’s conclusion.” *In re Lee*, Slip OP 00-1158 page 9. With these principles in mind, we commence review of the pertinent evidence and arguments of Appellant and Examiner.

The Appellant argues that it is improper to combine the device of Calawa of an n-type material with the device of Hatano of a p-type material. Appeal Brief, page 4, lines 6-18. Appellant further argues that the Calawa and Hatano references are not properly combinable because Calawa’s base is n-type semiconductor material and Hatano’s base is p-type semiconductor material and ohmic contacts between n-type and p-type semiconductor materials are not interchangeable. Reply Brief, page 3, lines 9-12

In reviewing Hatano, we find that Hatano teaches a semiconductor laser with a p-type base and Pd/Ti/Pt/Au laminate electrode. Hatano, column 21, lines 24-30. The Appellant’s semiconductor device comprises an electron conducting region and an ohmic contact of a palladium layer, a barrier layer, and a gold layer on top. Specification, page 4, lines 8-14. Appeal Brief, page 14, lines 23-25. Hatano teaches a Pd/barrier/Au layer for a p-type material. However, for an n-type material, Hatano does not teach

Pd/barrier/Au, but instead teaches away to an electrode consisting of an alloy or a laminate comprising metal(s) selected from Si and Cr, and metal(s) selected from Ti and Au.

In Hatano, the teaching of a Pd/Ti/Pt/Au electrode is for a p-type base semiconductor device. It would be improper to use the teaching of metallization composition for a p-type semiconductor material such as in Hatano and transfer such teaching to implement for the metallization composition of an n-type semiconductor material as in Calawa. Furthermore, Hatano specifically teaches away from using such a Ti/Pt composition for an electrode formed on an n-type layer:

As for the electrode, it is also possible, if the electrode is to be formed on the p-type layer, to employ an electrode consisting of an alloy or a laminate comprising a metal or metals selected from Pt, Pd, In, Mg and Ti, and a metal or metals selected from Ni and Au. On the other hand, if the electrode is to be formed on the n-type layer, it is possible to employ an electrode consisting of an alloy or a laminate comprising a metal or metals selected from Si and Cr, and a metal or metal is selected Ti and Au.

Hatano, column 17, lines 43-51.

Therefore, we find that Calawa in view of Hatano does not teach or suggest Appellant's claim limitation of "Pd/barrier/Au layers" as recited in claims 1, 7 and 13. In view of the foregoing, we conclude that the Examiner has failed to establish a *prima*

facie case of obviousness with respect to claims 1-5, 7-11 and 13-16. In summary, we reverse the Examiner's rejection of claims 1-5, 7-11 and 13-16 under 35 U.S.C. § 103(a) as unpatentable over Calawa and Hatano.

REVERSED

ERROL A. KRASS)	
Administrative Patent Judge)	
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)	
MICHAEL R. FLEMING)	BOARD OF PATENT
Administrative Patent Judge)	
)	APPEALS AND
)	
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