

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.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. 12

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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Ex parte MAKIKO NAKAMURA, YASUHIRO FUKUDA,  
YASUYUKI TATARA, YUSUKE HARADA and HIROSHI ONODA

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Appeal No. 1999-0542  
Application 08/760,557

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ON BRIEF

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Before KRASS, JERRY SMITH and RUGGIERO, Administrative Patent Judges.

JERRY SMITH, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on the appeal under 35 U.S.C. § 134 from the examiner's rejection of claims 42-57, which constitute all the claims remaining in the application.

The disclosed invention pertains to a method for manufacturing a semiconductor device having a multi-layer

metalization.

Representative claim 42 is reproduced as follows:

42. Method for manufacturing a semiconductor device having multi-layer metalization, comprising:

- a) providing an aluminum alloy layer; and
- b) preventing a formation of a layer having a high resistance while, in a vacuum chamber, successively and without intervening interruption,
  - (i) forming a metal layer on and in direct contact with the aluminum alloy layer, and
  - (ii) forming a metal nitride layer on and in direct contact with the metal layer, the aluminum alloy layer and the metal nitride layer being conductively coupled together, whereby the metalization continues to conduct even if the aluminum alloy layer becomes non-conducting.

The examiner relies on the following references:

Yorikane et al. (Yorikane)	4,556,897	Dec. 03, 1985
Watanabe et al. (Watanabe)	4,816,424	Mar. 28, 1989
Us et al. (Us)	4,824,803	Apr. 25, 1989
Bost et al. (Bost)	5,231,053	July 27, 1993
Ishii et al. (Ishii)	5,313,100	May 17, 1994 (filed Apr. 20, 1992)
Kikkawa	5,345,108	Sep. 06, 1994 (filed Feb. 25, 1992)
Ong	5,371,042	Dec. 06, 1994 (filed June 16,



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in view of Watanabe or Nicolet, and further in view of Sumi.

Rather than repeat the arguments of appellants or the examiner, we make reference to the brief and the answer for the respective details thereof.

#### OPINION

We have carefully considered the subject matter on appeal, the rejections advanced by the examiner and the evidence of obviousness relied upon by the examiner as support for the rejections. We have, likewise, reviewed and taken into consideration, in reaching our decision, the appellants' arguments set forth in the brief along with the examiner's rationale in support of the rejections and arguments in rebuttal set forth in the examiner's answer.

It is our view, after consideration of the record before us, that the evidence relied upon and the level of skill in the particular art would not have suggested to one of ordinary skill in the art the obviousness of the invention as set forth in claims 43-57. Accordingly, we reverse.

In rejecting claims under 35 U.S.C. § 103, it is incumbent upon the examiner to establish a factual basis to support the legal conclusion of obviousness. See In re Fine,

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837 F.2d 1071, 1073, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). In so doing, the examiner is expected to make the factual determinations set forth in Graham v. John Deere Co., 383 U.S. 1, 17, 148 USPQ 459, 467 (1966), and to provide a reason why one having ordinary skill in the pertinent art would have been led to modify the prior art or to combine prior art references to arrive at the claimed invention. Such reason must stem from some teaching, suggestion or implication in the prior art as a whole

or knowledge generally available to one having ordinary skill in the art. Uniroyal, Inc. v. Rudkin-Wiley Corp., 837 F.2d 1044, 1051, 5 USPQ2d 1434, 1438 (Fed. Cir.), cert. denied, 488 U.S. 825 (1988); Ashland Oil, Inc. v. Delta Resins & Refractories, Inc., 776 F.2d 281, 293, 227 USPQ 657, 664 (Fed. Cir. 1985), cert. denied, 475 U.S. 1017 (1986); ACS Hosp. Sys., Inc. v. Montefiore Hosp., 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984). These showings by the examiner are an essential part of complying with the burden of presenting a prima facie case of obviousness. Note In re Oetiker, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992). If that

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burden is met, the burden then shifts to the applicant to overcome the prima facie case with argument and/or evidence. Obviousness is then determined on the basis of the evidence as a whole and the relative persuasiveness of the arguments. See Id.; In re Hedges, 783 F.2d 1038, 1039, 228 USPQ 685, 686 (Fed. Cir. 1986); In re Piasecki, 745 F.2d 1468, 1472, 223 USPQ 785, 788 (Fed. Cir. 1984); and In re Rinehart, 531 F.2d 1048, 1052, 189 USPQ 143, 147 (CCPA 1976). Only those arguments actually made by appellants have been considered in this decision. Arguments which appellants could have made but chose not to make in the brief have not been considered [see 37 CFR § 1.192(a)].

With respect to the first rejection listed above, the examiner cites Yorikane as teaching a multi-layer metalization made up of an aluminum layer covered by a composition of titanium and titanium nitride. The examiner finds that Yorikane teaches the claimed invention except for the vacuum chamber. The examiner cites Us as teaching a multi-layer metalization in which the layers are conductively connected together. Kikkawa is cited as teaching a contact having

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titanium nitride applied over an aluminum alloy. Ishii teaches a multi-layer metalization contact having titanium nitride over tungsten which is over an aluminum alloy. The examiner finds that these teachings suggest the obviousness of the claimed multi-layer metalization of titanium nitride over titanium which is over an aluminum alloy. The examiner cites Ong to meet the vacuum chamber aspects of the claimed invention. Finally, the examiner cites Watanabe and Nicolet as teaching the interchangeability of refractory metals and metal nitrides [answer, pages 6-11].

Appellants make a substantial number of arguments in an attempt to point out errors in the examiner's rejection. For purposes of this appeal, we will focus only on the following four features of the claimed invention:

- 1) preventing a formation of a layer having a high resistance; while
- 2) in a vacuum chamber, successively and without intervening interruption;
- 3) the aluminum alloy layer and the metal nitride layer being conductively connected together; and
- 4) the metallization continues to conduct even if the aluminum alloy layer becomes non-conducting.

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Each of the independent claims recites these four features in some form. It is basically appellants' position that regardless of whether the applied prior art suggests a multi-layer metalization made up of the specific claimed components [they argue it does not], there is no teaching or suggestion in the applied prior art that the four features noted above be present.

The examiner's findings with respect to these four features basically rely on a belief by the examiner that these four features are either necessarily or inherently present in the multi-layer metalizations of the prior art or would have been obvious within the meaning of 35 U.S.C. § 103.

Appellants dispute these findings and argue that there is no teaching or suggestion within the applied prior art of these claimed features. We agree with appellants' arguments for essentially the reasons set forth in the appeal brief.

The evidence on this record does not establish a prima facie case of obviousness. The four features of the claimed invention noted above are not taught or suggested by the applied prior art. Appellants' specification notes that a layer having a high resistance can result from forming a

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nitride on an aluminum alloy. The examiner ignores this fact and simply assumes that the applied prior art would not permit such a condition. The claims require a successive and uninterrupted application of layers in a vacuum chamber, but the applied prior art does not address this feature. The claimed invention requires that the nitride layer and the aluminum alloy layer be conductively coupled together. Although the examiner simply asserts that a nitride layer and a metal layer of the applied prior art would meet this feature, we are unable to find any specific teaching in the applied prior art that supports this assertion. Finally, the claimed invention requires that the metalization continue to conduct even if the aluminum alloy layer becomes non-conducting. The examiner simply asserts that the multi-layer metalizations of the prior art would have this property, but we are unable to find any evidence on this record which supports this position.

Although the examiner has noted similarities between the applied prior art and the claimed invention, and similarities between the problems solved by the applied prior art and the claimed invention, the examiner has failed to

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provide evidence to support the rejection before us. Instead, the examiner has shifted the burden to appellants to demonstrate that the applied prior art does not have the properties of the claimed invention. We do not believe the applied prior art is sufficient to shift the burden of persuasion to appellants.

For these reasons, we do not sustain the examiner's first rejection noted above. With respect to the second rejection noted above, we find that Sumi does not overcome the deficiencies of the applied prior art discussed above. Therefore, we also do not sustain the examiner's second rejection.

With respect to the third rejection listed above, the examiner cites Bost as teaching a multi-layer metalization made up of an aluminum layer, a titanium layer and a titanium nitride layer. The examiner finds that Bost teaches the claimed invention except for the vacuum chamber. As noted above, the examiner cites Ong to meet the vacuum chamber aspects of the claimed invention. The examiner cites Watanabe and Nicolet as teaching the interchangeability of refractory metals and metal nitrides [answer, pages 11-15].

In addition to the arguments regarding the four features discussed above, appellants note that Bost teaches a multi-layer metalization in which a titanium nitride layer is on a titanium layer which is on another titanium nitride layer which is on the aluminum alloy layer. Thus, appellants argue that the metal layer is not on the aluminum alloy layer, but instead, is on a metal nitride layer. Appellants also argue that Bost teaches away from placing a titanium layer directly on an aluminum alloy layer as claimed.

The examiner responds that the use of the phrase "formed on" in the claims does not preclude the presence of intervening layers.

Once again, we agree with the position of appellants for reasons noted by appellants in the appeal brief as well as our discussion above. There is no teaching or suggestion in Bost that any of the four features discussed above is necessary or inherent in the Bost multi-layer metalization. We also agree with appellants that Bost clearly teaches away from forming a titanium layer directly on an aluminum alloy layer because of the unwanted diffusion of titanium into the aluminum layer in Bost. Appellants' invention recites this

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relationship despite this possible effect. Bost places a titanium nitride layer directly on the aluminum alloy layer even though appellants' specification indicates that this is to be avoided by the invention. Thus, the multi-layer metalization of Bost does not suggest the method set forth in appellants' claims.

For these reasons, we do not sustain the examiner's third rejection noted above. With respect to the fourth rejection noted above, we again find that Sumi does not overcome the deficiencies of the applied prior art discussed above. Therefore, we also do not sustain the examiner's fourth rejection.

In conclusion, we have not sustained any of the examiner's rejections of the claims on appeal. Therefore, the decision of the examiner rejecting claims 42-57 is reversed.

REVERSED

ERROL A. KRASS )  
Administrative Patent Judge )  
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JERRY SMITH	)	BOARD OF PATENT
Administrative Patent Judge	)	APPEALS AND
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JOSEPH F. RUGGIERO	)	
Administrative Patent Judge	)	

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Steven M. Rabin  
Suite 1111  
1725 K Street, NW  
Washington, DC 20006