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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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*Ex parte* JING-CHENG LIN, CHENG-LIN HUANG, WINSTON SHUE  
and MONG-SONG LIANG

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Appeal 2010-008537  
Application 11/174,189  
Technology Center 2800

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Before CARL W. WHITEHEAD, JR., ERIC S. FRAHM and ANDREW J.  
DILLON, *Administrative Patent Judges*.

WHITEHEAD, JR., *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Appellants are appealing claims 33-42, 45-51 and 54. Appeal Brief 5.  
We have jurisdiction under 35 U.S.C. § 6(b) (2012).

We affirm.

*Introduction*

The invention is directed to a semiconductor device having a copper interface wherein the layer has a first seed layer of copper alloy and a second seed layer of copper provided over an opening in a dielectric layer. Specification 5.

*Illustrative Claim*

33. An apparatus having an interconnect without a typical barrier layer, comprising:  
a layer of dielectric provided over a semiconductor substrate and having an opening therein;  
an interface layer deposited over inside surfaces of the opening, the interface layer replacing the typical barrier layer and comprising:  
at least one first seed layer comprising copper alloy deposited directly on the inside surfaces of the opening in the layer of dielectric;  
at least one second seed layer comprising copper deposited directly on the at least one first seed layer; and  
an interconnect that includes copper provided over the seed layers.

*Rejections on Appeal*

Claims 33-42, 45-51 and 54 stand rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. Answer 3-4.

Claims 33-42 and 45 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Ding (U.S. Patent Number 6,387,805 B2; issued May 14, 2002) and Havemann (U.S. Patent Number 6,130,156; issued October 10, 2000). Answer 4-6.

Claims 46-51 and 54 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Ding, Havemann and Huang (U.S. Patent Number 6,974,766 B1; issued December 13, 2005). Answer 6-8.

*Issues on Appeal*

Is the limitation “typical barrier layer” recited in claim 33 indefinite for failing to point out the metes and bounds of the claim as the Examiner finds?

Do Ding and Havemann, either alone or in combination, disclose a copper interconnect like the one set forth in claim 33?

ANALYSIS

*35 U.S.C. § 112, second paragraph rejection*

Appellants argue that:

[T]he § 112, second paragraph rejection is clear error because (1) the present application’s specification defines “a typical barrier layer” making it clear what is considered

a “typical barrier layer”; (2) one of ordinary skill in the art would understand what is meant by “a typical barrier layer”; and (3) since the “interface layer” replaces a “typical barrier layer,” the apparatuses of claims 33 and 46 are clearly “without a typical barrier layer.”

Appeal Brief 11.

We find Appellants’ arguments to be persuasive. The “typical barrier layer” limitation is merely a broad term that is subject to a reasonably broad interpretation; however, the broadness of the limitation does not blur the metes and bounds of the claim as Examiner finds. *See* Answer 3-4. Therefore, we reverse the Examiner’s rejection of claims 33-42, 45-51 and 54 under 35 U.S.C. § 112, second paragraph.

*35 U.S.C. § 103 rejection*

We have reviewed the Examiner’s rejections in light of Appellants’ arguments that the Examiner has erred in regard to the obviousness rejection. We disagree with Appellants’ conclusions. We concur with the findings and reasons set forth by the Examiner in the action from which this appeal is taken and the reasons set forth by the Examiner in the Answer in response to Appellants’ Appeal Brief. However, we highlight and address specific findings and arguments for emphasis as follows.

Appellants argue that the Examiner’s proposed modification of Ding’s interconnect structure ““by adding a second seed layer comprising copper directly on the doped first seed layer 60 comprising copper alloy”” as taught by Havemann to “provide a single copper seed layer that eliminates the need for two separate interface layers” is improper because “one of ordinary skill in the art would not have found a reason to make the claimed modification.”

Appeal Brief 14-15 (*quoting* Final Rejection 3-4). Appellants contend that “Ding eliminates the need for the separate barrier and wetting layers, disclosing at column 6, lines 53-55, that ‘[t]he single copper alloy seed layer 60 thus provides both a barrier layer at the silica interface and an adhesion/wetting layer at the copper interface.’” Appeal Brief 15.

The Examiner finds:

**First**, Appellant just simply asserts that by adding a second seed layer comprising copper directly on the doped first seed layer 60 comprising copper alloy would destroy the function of Ding’s copper alloy seed layer 60, however, Appellant has failed to provide the reasons to support that why the function of Ding’s copper alloy seed layer 60 would be destroyed. In the other words, Appellant has failed to provide the reasons to support that why Ding’s copper alloy seed layer 60 would not function as “a barrier layer at the silica interface and an adhesion/wetting layer at the copper interface” (see Ding at column 6, lines 53-55) after adding a second copper seed layer directly on the first doped copper seed layer 60. It is noted that KSR teaches that when combining elements from different references, it is important to determine whether the element is performing “the same function it had been known to perform.” KSR at 1740. It is clear that adding a second copper seed layer directly on the first doped copper seed layer 60 of Ding would not change the function of Ding’s copper alloy seed layer 60 as asserted by Appellant, but rather, Ding’s copper alloy seed layer 60 would provide “the same function it had been known to perform.”

**Second**, it is noted that the arguments of attorney cannot take the place of evidence in the record. *In re Schulze*, 346 F. 2d 600, 602, 145 USPQ 716, 718 (CCPA 1965); *in re Geisler*, 116 F. 3d 1465, 43 USPQ2d 1362

(Fed. Cir. 1997). Attorney statements are not evidence and must be supported by an appropriate affidavit or declaration. See MPEP § 716.01(c). In this case, the Examiner recognizes that there is no different between the single copper alloy seed layer 60 of Ding and the single copper alloy seed layer 18 shown in Fig. 5 of Applicant's drawing because they both are used for eliminating a conventional barrier layer and a seed layer. Specifically, Appellant states on page 12 of specification, at second paragraph that:

**The layer that interfaces** between the created copper interconnect 22, Fig. 5, and the surrounding layers of dielectrics 14 and 16 **replaces the conventional barrier/seed layer**, and performs the conventional function of barrier layer over which a seed layer is deposited. [Emphasis added]

Therefore, Appellant has failed to provide the evidence(s) to prove that why adding a second copper seed layer directly on the first doped copper seed layer 60 of Ding would change the function of Ding's copper alloy seed layer 60, and why adding a second copper seed layer directly on the first doped copper seed layer 18 of Applicant shown in Fig. 5 would not change the function of Applicant's copper alloy seed layer 18.

Answer 12-14.

We agree with the Examiner's findings, and further, we find that the Examiner's motivation for incorporating a second seed layer comprising copper directly on Ding's copper alloy seed layer 60 in order to provide the interconnect having high conductivity because, as is well known, the non-doped copper seed layer would provide more adhesion (i.e., seed layer) than the doped copper alloy layer (as taught by Havemann, column 5, lines 3-8) and would provide more conductivity than the doped copper alloy layer

(Answer 5) satisfies the test for obviousness by setting forth articulated reasoning with some rational underpinning to support the Examiner's legal conclusion of obviousness. *See In re Kahn*, 441 F.3d 977, 987-88 (Fed. Cir. 2006), *In re Young*, 927 F.2d 588, 591 (Fed. Cir. 1991) and *In re Keller*, 642 F.2d 413, 425 (CCPA 1981). Therefore, we are not convinced of Examiner's error, and we sustain the Examiner's rejection of claim 33 for the reasons stated above, as well as claims 34-42 and 45, not separately argued.

We also sustain the Examiner's rejection of independent claim 46 not separately argued for the same reasons stated above. *See* Appeal Brief 26. For the above reasons, we are also affirming the rejections of dependent claims 47-51 and 54, whose merits are not separately argued. *In re Nielson*, 816 F.2d 1567, 1572 (Fed. Cir. 1987).

#### DECISION

The indefiniteness rejection of claims 33-42, 45-51 and 54 is reversed.

The obviousness rejections of claims 33-42, 45-51 and 54 are affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv). *See* 37 C.F.R. § 41.50(f).

#### AFFIRMED

peb