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CANTOR COLBURN LLP 20 Church Street 22nd Floor Hartford, CT 06103			KHATRI, PRASHANT J	
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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte DOH WON JUNG, HEE JUNG PARK,
KIMOON LEE, YOON CHUL SON, WOJIN LEE,
and YOUNGJIN CHO

Appeal 2018-002628
Application 14/539,408
Technology Center 1700

Before BRADLEY R. GARRIS, ROMULO H. DELMENDO, and BRIAN
D. RANGE, *Administrative Patent Judges*.

RANGE, *Administrative Patent Judge*.

DECISION ON APPEAL

SUMMARY

Appellant¹ appeals under 35 U.S.C. § 134(a) from the Examiner's decision rejecting claims 1, 7, 8, 10, 11, and 14–16. We have jurisdiction under 35 U.S.C. § 6(b).

We REVERSE.

¹ Appellant is the Applicant, SAMSUNG ELECTRONICS CO. LTD., which according to the Appeal Brief, is also the real party in interest. Appeal Br. 2.

STATEMENT OF THE CASE²

Appellant describes the invention as relating to a transparent conductor. Spec. 1:12. In particular, Appellant explains that the conductor may be nanosheets. *Id.* 3:21–22. Claim 1, reproduced below with emphasis added to certain key recitations and formatting added for readability, is illustrative of the claimed subject matter:

1. A transparent conductor comprising:
a compound comprising a Group 5 transition metal and boron, wherein the compound has a layered structure,
the compound is represented by the following Chemical Formula 1:

Chemical Formula 1



wherein, in Chemical Formula 1,

M is vanadium, niobium, tantalum, or a combination thereof,

B is boron, and

x and y are stoichiometric ratios of M and B,

the compound comprises V_2B_3 , Nb_2B_3 , Ta_2B_3 , V_3B_4 , Nb_3B_4 , Ta_3B_4 , VB , NbB , TaB , V_5B_6 , Nb_5B_6 , Ta_5B_6 , or a combination thereof,

wherein the compound is in a form of a plurality of exfoliated nanosheets having a thickness of less than or equal to about 10 nanometers,

wherein the nanosheets contact one another and provide an electrical connection,

² In this Decision, we refer to the Final Office Action dated April 26, 2017 (“Final Act.”), the Appeal Brief filed September 26, 2017 (“Appeal Br.”), the Examiner’s Answer dated November 13, 2017 (“Ans.”), and the Reply Brief filed January 11, 2018 (“Reply Br.”).

ANALYSIS

The Examiner has the initial burden of establishing a *prima facie* case of obviousness based on an inherent or explicit disclosure of the claimed subject matter under 35 U.S.C. § 103. *In re Oetiker*, 977 F.2d 1443, 1445 (Fed. Cir. 1992) (“[T]he examiner bears the initial burden, on review of the prior art or on any other ground, of presenting a *prima facie* case of unpatentability.”). To establish a *prima facie* case of obviousness, the Examiner must show that each and every limitation of the claim is described or suggested by the prior art or would have been obvious based on the knowledge of those of ordinary skill in the art or the inferences and creative steps a person of ordinary skill in the art would have employed. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007); *In re Fine*, 837 F.2d 1071, 1074 (Fed. Cir. 1988).

The Examiner rejects claim 1 under 35 U.S.C. § 103 as unpatentable over Salguero in view of Brewer. Final Act. 2; Ans. 3. The Examiner finds that Salguero discloses metal boride nanoparticles in the form of nanosheets. Ans. 3 (citing, for example, Salguero ¶¶ 29, 40). The Examiner finds that Salguero is silent as to the claimed compounds (i.e., claim 1’s recitation “the compound comprises V_2B_3 , Nb_2B_3 , Ta_2B_3 , V_3B_4 , Nb_3B_4 , Ta_3B_4 , VB , NbB , TaB , V_5B_6 , Nb_5B_6 , Ta_5B_6 , or a combination thereof”). *Id.*

The Examiner finds that Brewer discloses boride compounds including, for example, NbB and Nb_3B_4 . *Id.* at 4. The Examiner determines:

Given that there are finite number of crystal structures formed and compositions that are stoichiometric with respect boride compositions disclosed by Brewer and Salguero explicitly recites that other crystal structures can be used, along with explicitly reciting that

interlayer ionic interactions are weaker than covalent bonds between in boron atoms in the boron sheets, it would have been obvious to one of ordinary skill in the art to use the structures disclosed by Brewer as the metal borides of Salguero to produce the claimed structure.

Id.

Appellant argues that the Examiner has not adequately established that there is reason to combine the teachings of Salguero with Brewer. Appeal Br. 6. In particular, Appellant argues that Salguero does not teach that all types of metal boride can be successfully exfoliated (i.e., formed into claim 1's recited nanosheet structure). *Id.* Appellant emphasizes that Salguero discloses that metal diborides (i.e., compounds having two elemental boron atoms) result in nanosheets but other metal borides provide different morphologies (e.g., nanoparticles and nanorods). Reply Br. 2. As evidence, Appellant cites paragraph 44 of Saguero which suggests that Suegero's process using metal boride starting materials other than metal diboride will lead to a shape other than a nanosheet:

These reactions **with metal diboride** starting materials provide nanosheets, whereas the same reactions with other metal borides (e.g., LaB₆) provide differing nanosized morphologies (e.g., nanoparticles and nanorods).

Saguero ¶ 44 (emphasis added). Consistent with paragraph 44 of Saguero, each example of Saguero that is identified as a nanosheet results from a diboride. *Id.* at ¶¶ 46–51. Example D uses LaB₆ but results in nanoparticles. *Id.* at ¶ 51.

On the present record, we agree with Appellant that the Examiner has not adequately established why a person of ordinary skill in the art would have had reason to believe one of the compounds disclosed by Brewer and encompassed by claim 1 could make a nanosheet as taught by Salguero with

a reasonable expectation of success. Salguero's indication that "other metal borides" (non-diborides) provide different nanosized morphologies weighs against a person of ordinary skill in the art having a reasonable expectation of success in achieving nanosheets with the Salguero process and Brewer's other borides. Reply Br. 3.

We, therefore, do not sustain the Examiner's rejection of claim 1. We also do not sustain the Examiner's rejection of the other claims on appeal because the Examiner's treatment of the other claims does not cure the error addressed above.

DECISION

For the above reasons, we reverse the Examiner's rejections of claims 1, 7, 8, 10, 11, and 14–16.

REVERSED