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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte TAKAHIRO UNNO and TAKUMA SHIBAYAMA

Appeal 2017-006083
Application 14/284,899
Technology Center 1700

Before JAMES C. HOUSEL, DONNA M. PRAISS, and SHELDON M. MCGEE, *Administrative Patent Judges*.

PRAISS, *Administrative Patent Judge*.

DECISION ON APPEAL[1]

Appellant[2] appeals under 35 U.S.C. § 134(a) from the Examiner's decision rejecting claim 1. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

The claimed invention relates to a sputtering target which contains MgO. Spec. 2. Claim 1 is illustrative and copied below from the Claims Appendix to the Appeal Brief (disputed limitations are italicized):

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[1] Our decision makes reference to the Specification filed May 22, 2014 ("Spec."), the Final Office Action entered Dec. 4, 2015 ("Final Act."), the Advisory Action entered Mar. 28, 2016 ("Adv. Act."), the Appeal Brief filed Aug. 8, 2016 ("Br."), the Examiner's Answer entered Dec. 19, 2016 ("Ans."), and the Reply Brief filed Feb. 20, 2017 ("Reply Br.").

[2] Appellant is the Applicant, Kojundo Chemical Laboratory Co., Ltd., which is also identified as the real party in interest. App. Br. 2.

> 1. A sputtering target for direct-current sputtering, comprising MgO which is a non-conductive oxide *and TiO* which is a conductive oxide and having conductivity as a whole,
>
> *wherein a thin film having a NaCl type crystal structure is deposited by sputtering and TiO content is 20 to 60 mol%.*

The Examiner rejects claim 1 under 35 U.S.C. § 103 (a) as unpatentable over Sano[3] in view of Brat.[4] Ans. 2–3; Final Act. 2–3.[5]

The Examiner determines that claim 1 would have been obvious to one of ordinary skill in the art at the time of the invention over the combination of Sano's MgO sputtering target containing TiN and 40–90 mol% MgO in view of Brat's teaching that TiO is an isomorph of TiN and has a face-centered cubic structure (FCC) comparable to sodium chloride (NaCl) for the reasons stated on pages 2–3 of the Answer.

Appellant argues that the Examiner erred because Brat does not teach that TiO should be substituted for TiN in Sano's MgO sputtering target, and therefore, the Examiner's hypothetical structure is based on Appellant's Specification. App. Br. 10, 14. Appellant further argues that Table 3 in Brat shows oxygen present in a maximum amount of 3.12%, which is short of the 20–60 mol% of TiO recited in claim 1. *Id.* at 10. According to Appellant, while Sano discloses that the electroconductive material is not limited to the disclosed electroconductive materials including TiN, Sano's paragraph 91 shows that other compounds having a cubic or hexagonal crystal system do not provide the same results as TiN. *Id.* at 7–8. Appellant contends that the

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[3] Sano et al., WO 2013/005690 A1, pub. Jan. 10, 2013 (citations herein are to the English counterpart US 2014/0144775 A1, pub. May 29, 2014, which Appellant does not contest) ("Sano").

[4] Brat et al., US 4,820,393, iss. Apr. 11, 1989 ("Brat").

[5] The Examiner entered Appellant's proposed amendment after the Final Office Action amending claim 1 and cancelling claims 2–4. Adv. Act.

claimed range of TiO content produces "significant advantages" in terms of the "misfit ratio" and attaining "the desired crystalline structure," namely the same crystal structure as MgO. *Id.* at 12–13.

The Examiner responds that Sano's paragraph 91 does not teach away from using TiO as an electroconductive material because it does not identify TiO as exhibiting the negative characteristics of other choice materials. Ans. 3. The Examiner finds that TiO is an electroconductive material and belongs to the cubic crystal system, and therefore, satisfies Sano's requirements for an acceptable electroconductive material. *Id.* The Examiner further responds that Brat is not relied upon as suggesting substitution of TiO for TiN, but, rather, for teaching that TiO has similar characteristics compared with TiN from which one skilled in the art would recognize TiO is a known element and interchangeable with TiN to obtain predictable results. *Id.* at 3–4. The Examiner additionally states that "there are no limitations directed to the concentration of TiO in the target." *Id.* at 4.

In the Reply Brief, Appellant asserts that the different results for TiO and TiN shown in the X-ray diffraction charts of Appellant's Figures 1 and 2, respectively, demonstrate that the results with TiO are not predictable from an MgO target containing TiN. Reply Br. 2–3. Appellant maintains that Brat does not teach that TiN should be substituted with TiO in view of Brat's goal to provide TiN targets and because the Examiner's reliance on "the five word description of TiO" indicates improper use of Appellant's own Specification for the rejection. *Id.* at 5–6. Appellant further asserts that the amount of oxygen present in Brat's sputter target (1) would not lead to the claimed amount of TiO in the target of 20–60 mol%, (2) would teach away from the claimed amount, and (3) even if combined with Sano, would be far less than required by the claim. *Id.* at 6–7. Appellant additionally

argues that the claim requires 20–60 mol% of TiO content in the target because such an interpretation of the claim (1) is supported by the Specification and (2) is recited clearly in original claim 2 which depended from claim 1. *Id.* at 7–8.

We have evaluated Appellant's arguments and find them unpersuasive of reversible error by the Examiner. Even if we accept that claim 1 conveys that "TiO content is 20 to 60 mol%" refers to the sputtering target in the preamble of the claim and not the "thin film" that immediately precedes the reference to TiO content, the Examiner relies upon the disclosure in Sano, not Brat, for the amount of electroconductive material in the target for sputtering. Final Act. 2; Ans. 2; Sano ¶ 14. Thus, Appellant's distinctions over Brat regarding the ratio of MgO to electroconductive material are not persuasive because they do not address the Examiner's rejection.

Appellant's focus on Sano's disclosure of preferred examples not including TiO and Sano's comparative examples not providing the same results even though they are also cubic crystal or hexagonal crystal systems (App. Br. 7–8) does not negate Sano's broader teaching that the electroconductive material is not limited, which Appellant acknowledges (*id.* at 7). In a determination of obviousness, a reference may be relied upon for all that it would have reasonably suggested to one having ordinary skill in the art. *Merck & Co. v. Biocraft Labs.*, 874 F.2d 804, 807 (Fed. Cir. 1989) ("That the [prior art] patent discloses a multitude of effective combinations does not render any particular formulation less obvious."). Moreover, "a reference is not limited to the disclosure of specific working examples." *In re Mills*, 470 F.2d 649, 651 (CCPA 1972) (citation omitted). Nor do Sano's comparative examples teach away from using TiO as the electroconductive material because they do not include TiO or even a conductive oxide. *See In*

re Haruna, 249 F.3d 1327, 1335 (Fed. Cir. 2001) ("A reference may be said to teach away when a person of ordinary skill, upon reading the reference, . . . would be led in a direction divergent from the path that was taken by the applicant."); *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004) (explaining "[t]he prior art's mere disclosure of more than one alternative does not constitute a teaching away from any of these alternatives because such disclosure does not criticize, discredit, or otherwise discourage the solution claimed."). Likewise, the fact that Brat does not include examples of a sputtering agent containing TiO instead of TiN, significant amounts of oxygen, or the composition of Sano (40–90 mol% ratio of MgO) does not teach away from the combination of MgO and an electroconductive material such as TiO in the ratio taught by Sano as Appellant argues (App. Br. 10).

Appellant's argument that the Examiner has not shown a reasonable expectation of success from the combination of Sano and Brat is not persuasive of error because the Examiner has provided sufficient support (1) that a sputtering target comprising MgO and an electroconductive material was known as evidenced by Sano, (2) that TiN specifically was known and exemplified by Sano as a sputtering target together with MgO in a ratio of 40–90% MgO, and (3) that it was known that TiO is isomorphic with TiN as exemplified by Brat. Ans. 2. The Examiner's findings are supported by the preponderance of the evidence cited in this Appeal record and Appellant does not dispute these findings. "The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results." *KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. 398, 416 (2007). Because Sano generally teaches electroconductive materials in combination with MgO in a ratio of 40–90 mol% MgO for a sputtering target, a skilled artisan would have had a reasonable expectation of success

using a known electroconductive material for sputtering targets, and particularly an isomorph of an electroconductive material exemplified by Sano, in the proportions disclosed by Sano absent evidence of surprising or unexpected results. Appellant has not directed us to any evidence of surprising or unexpected results in this Appeal record.

Appellant's evidence that TiO produces different X-ray diffraction results compared to TiN (Reply Br. 2–3) and that Sano discloses examples of electroconductive material that were not suitable as a target for DC sputtering (App. Br. 8) is not persuasive of error because "obviousness cannot be avoided simply by a showing of some degree of unpredictability in the art so long as there was a reasonable probability of success." *Pfizer, Inc. v. Apotex, Inc.*, 480 F.3d 1348, 1364 (Fed. Cir. 2007). "Obviousness does not require absolute predictability of success. . . . [A]ll that is required is a reasonable expectation of success." *In re O'Farrell*, 853 F.2d 894, 903–04 (Fed. Cir. 1988). Even if the crystalline structure of the thin film produced by the sputtering target is a limitation of the claimed sputtering target as Appellant argues (App. Br. 13), the structure recited in claim 1, "a NaCl type crystal structure," would have been expected from the combination of Sano and Brat because Brat discloses that TiN has a face-centered cubic structure comparable to sodium chloride (NaCl) and that TiO is isomorphic with TiN (Final Act. 2–3; Ans. 2–3; Brat 5:26–29).

In sum, the Examiner has provided the record with a preponderance of evidence that the sputtering target of claim 1 would have been obvious in view of the combined teachings of Sano and Brat.

We affirm the Examiner's decision to reject claim 1 for the reasons stated above and in the Answer, including the Response to Argument section.

Conclusion

The decision of the Examiner to reject claim 1 is 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).

AFFIRMED