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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL
AND APPEAL BOARD

Ex parte DANIEL MCGLYNN,
PAUL R. SHARPS, ARTHUR COMFELD,
and MARK STAN

Appeal 2011-012648
Application 12/417,367
Technology Center 1700

Before RICHARD E. SCHAFER, BEVERLY A. FRANKLIN, and MICHAEL P. COLAIANNI, *Administrative Patent Judges*.

COLAIANNI, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellants appeal under 35 U.S.C. § 134 the final rejection of claims 1, and 5-20[1]. We have jurisdiction over the appeal pursuant to 35 U.S.C. § 6(b).

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[1] Appellants' amendment cancelling claims 2 and 4 filed pursuant to § 41.33(b)(1) apparently was admitted by the Examiner as claims 2 and 4 were deleted from the statement of rejections.

We AFFIRM-IN-PART.

Appellants' invention is said to be directed to a system for generating electrical power from solar radiation that uses III-V compound semiconductor solar cells in conjunction with reflector concentrators which are connected in an array for unitary movement to track the sun (Spec. para. [0003]; Fig. 1).

Claims 1, 8, and 14 are illustrative:

1. A solar cell assembly comprising
a solar cell including a thin flexible film semiconductor body formed from III-V compound semiconductors including:
a first solar subcell having a first band gap,
a second solar subcell disposed over the first subcell and having a second band gap smaller than the first band gap,
a grading interlayer composed of InGaAlAs and disposed over the second subcell in said body and having a third band gap greater than the second band gap, and
a third solar subcell over said interlayer in the body and being lattice mismatched with respect to the second subcell and having a fourth band gap smaller than the third band gap; and
a non-planar support for mounting the solar cell, wherein the solar cell is shaped to conform to a non-planar surface of the non-planar support.

8. A solar cell assembly comprising
a solar cell including a thin flexible film semiconductor body composed of III-V compound semiconductor layers including:
a first solar subcell having a first band gap;
a second solar subcell disposed over the first subcell and having a second band gap smaller than the first band gap;
a grading interlayer composed of InGaAlAs and disposed adjacent the second subcell in the body and having a third band gap greater than the second band gap; and
a third solar subject disposed over the adjacent the interlayer in the body and being lattice mismatched with respect to the second subcell and having a fourth band gap smaller than the third band gap;

a concentrator arranged with respect to the solar cell so that the rays of the incoming sunlight are directed to the surface of the solar cell; and

a heat spreader mounted to a back side of the solar cell and including a plurality of metal heat dissipating elements extending away from the solar cell.

14. A solar cell assembly comprising

a solar cell including a thin flexible film semiconductor body including:

a first solar subcell having a first band gap;

a second solar subcell disposed over the first subcell and having a second band gap smaller than the first band gap;

a grading interlayer composed of InGaA1As and disposed over the second subcell having a third band gap larger than the second band gap, and

a third solar subcell disposed over the second solar subcell such th at the third solar subcell is lattice mismatched with respect to the second subcell and the third subcell has a fourth band gap smaller than the third bandgap; and

an arrangement for mounting the solar cell including a metal heat spreader making direct contact with the solar cell.

Appellants appeal the following rejections:

1. Claims 1 and 5 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Mlavsky (US 3,976,508, issued Aug. 24, 1976) in view of Wanlass (US 2006/0144435 A1, pub. Jul. 6, 2006), and King (US 2005/0274411 A1, pub. Dec. 15, 2005).
2. Claim 6 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Mlavsky in view of Wanlass, King, and Dean (US 3,999,283, issued Dec. 28, 1876).
3. Claim 7 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Mlavsky in view of Wanlass, King, and Lamb (US 5,374,317, issued Dec. 20, 1994).

4. Claims 8-12 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Lamb in view of Wanlass, King, and Dean.
5. Claims 14-18 are rejected under 35 U.S.C. § 103(a) as being unpatentable over either the combination of Lamb in view of Wanlass, King, and Dean or Wanlass in view of King and Dean.
6. Claim 13 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Lamb in view of Wanlass, King, Dean, and Iles (US 6,951,819 B2, issued Oct. 4, 2005).
7. Claim 19 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Wanlass in view of Dean, King, and Iles, or Lamb in view of Wanlass, King, Dean, and Iles.
8. Claim 20 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Wanlass in view of Dean, King, and Gee (US 2004/0261839 A1, pub. Dec. 30, 2004).

Appellants arguments focus on claim 1 of rejection (1) and claim 8 of rejection (4) and claim 14 of rejection (5) (App. Br. 4-9). Appellants rely on arguments made regarding the independent claims 1, 8 or 14 from which dependent claims under rejections (2), (3), and (6) to (8) depend (App. Br. 8-10). Accordingly, the claims under rejections (2), (3), and (6) to (8) will stand or fall with our analysis of the independent claims.

We note that Appellants do not address the following provisional obviousness-type double patenting rejections of the Examiner:

9. Claims 8-20 over claims 1-51 of copending Application 12/218,558 in view of Lamb and Dean.

10. Claims 8-20 over claims 1-59 of copending Application 12/218,582 in view of Lamb and Dean.
11. Claims 8-20 over claims 1-20 of copending Application 12/258,190 (abandoned July 5, 2012) in view of Lamb and Dean.
12. Claims 8-20 over claims 1-46 of copending Application 11/860,142 in view of Lamb and Dean.
13. Claims 8-20 over claims 1-22 of copending Application 11/860,183 in view of Lamb and Dean.
14. Claims 8-20 over claims 1-34 of copending Application 12/123,864 in view of Lamb and Dean.
15. Claims 8-20 over claims 1-38 of copending Application 12/023, 772 (abandoned August 22, 2012) in view of Lamb and Dean.
16. Claims 8-20 over claims 1-34 of copending Application 12/102,550 (abandoned November 5, 2012) in view of Lamb and Dean.
17. Claims 8-20 over claims 1, 3-17, 39, and 40 of copending Application 12/047,842 (abandoned August 17, 2011) in view of Lamb and Dean.
18. Claims 8-20 over claims 11-19, 21 and 23 of copending Application 11/500,053 (abandoned January 29, 2013).
19. Claims 8-20 over claims 1, 2, 4, 5, and 21-27 of copending Application 12/549, 340 (abandoned April 24, 2012).

Appellants state that they will address the provisional rejections as needed once a claim is allowed (Reply Br. 1). On this record, we summarily affirm the Examiner's provisional obviousness-type double patenting rejections (9), (10), and (12) to (14). The Examiner's obviousness-type

double patenting rejections (11) and (15) to (19) are moot as the copending Applications have been abandoned.

REJECTION (1): Claim 1

ISSUE

Did the Examiner reversibly err in finding that Mlavsky's ohmic contact layer 182 is "non-planar support for mounting the solar cell, wherein the solar cell is shaped to conform to a non-planar surface of the non-planar support" as recited in claim 1? We decide this issue in the affirmative.

FINDINGS OF FACT & ANALYSIS

The Examiner finds that Mlavsky teaches a non-planar support 182 for the solar cell 180 as shown in Figure 11 (Ans. 5, 46).

Appellants argue that Mlavsky teaches a tubular or cylindrical solar cell that is self-supporting and does not need any supporting substrate (App. Br. 7). Appellants argue that Mlavsky's ohmic contact layer 182 is part of the solar cell and not a "non-planar support for mounting the solar cell" (Reply Br. 4). Appellants argue that the claim requires a non-planar support for mounting the solar cell which requires that the solar cell be shaped to conform to the non-planar support which is not met by Mlavsky's ohmic contact layer 182 (App. Br. 7; Reply Br. 4).

The preponderance of the evidence favors Appellants' argument of nonobviousness. Claim 1 expressly requires that the solar cell is mounted on the non-planar support. The Specification's Figure 4 embodiment shows a tube center 402 that is configured to support similarly shaped solar cell 406 (Spec. para. [0048]). We construe claim 1 as directed to that embodiment

and thus a non-planar support for mounting the solar cell is required by the claims.

The Examiner's finding that Mlavsky's ohmic contact layer 182 is a non-planar support is without factual support. Rather, the column 14, lines 23-52 disclosure of Mlavsky refers to the structure of the solar cell itself. The ohmic contact layer 182 is an electrode on the solar cell and does not function as a support onto which the solar cell is mounted.

As the Examiner has failed to establish a prima facie case of obviousness, we reverse the Examiner's § 103(a) rejection of claims 1, and 5-7 over Mlavsky in view of Wanlass and King.

REJECTIONS (4) & (5): Claims 8 and 14

ISSUE

Did the Examiner reversibly err in concluding that the combined teachings of Wanlass and King[2] would have rendered obvious the use of a grading interlayer composed of InGaAlAs as recited in claims 8 and 14? We decide this issue in the negative.

FINDINGS OF FACT AND ANALYSES

Appellants contend that Wanlass teaches that the phosphorus imparts certain properties to the semiconductor material such that it would not have been obvious to substitute King's phosphorus-less AlGaInAs buffer layer for

[2] We limit our discussion to Wanlass and King because Appellants' arguments focus solely on the teachings of Wanlass and King (App. Br. 5-7, 9). Appellants do not specifically contest the Examiner's findings or reasons for combining the teachings of Lamb and Dean with Wanlass and King. *Id*.

Wanlass' layer (Reply Br. 3). Appellants argue that while King teaches an InGaAlAs semiconductor layer as relied upon the Examiner, there are many combinations of the elements that compose the InGaAlAs layer and there is no teaching of the particularly claimed relative band gaps of solar cell layers (App. Br. 5). Appellants contend that Wanlass teaches away from using King's aluminum-containing semiconductor material because Wanlass discloses that aluminum getters oxygen and water which are detrimental to the solar cell performance (App. Br. 6-7; Reply Br. 2-3). Appellants argue that the Examiner's reason for combining King's semiconductor layer with Lamb and Wanlass are based on generic advantages of a graded layer and are not tied directly to the AlGaInAs layer of King (Reply Br. 3).

We have fully considered Appellants' arguments and we find that the preponderance of the evidence favors the Examiner's conclusion of obviousness. The Examiner's rejection may be found on pages 10-15 and 41-44 of the Answer. The Examiner finds that one of ordinary skill in the art would have understood from Wanlass' teachings that the lattice parameters and band gap may be changed by varying the amount of each element composing the layer (Ans. 42). Appellants do not respond to this analysis of the Examiner. *See* Reply Br. 1-4.

Based on this uncontested finding of the Examiner, we agree that it would have been obvious to manipulate the amount of each element used to make the semiconductor layer to arrive at one having the band gap as recited in claims 8 and 14. Indeed, the Examiner relies on Wanlass to teach a solar cell having the semiconductor layers arranged with the lattice constant and band gaps as recited in claims 8 and 14 (Ans. 11). Accordingly, contrary to Appellants' argument, the Examiner reasonably determines based on the

teachings of Lamb, King and Wanlass that one of ordinary skill would have modified King's AlGaInAs layer to have the desired lattice constant and band gap to comport with Wanlass's solar cell structure. Appellants' argument that King's AlGaInAs layer does not necessarily have the desired band gap or lattice constant fails to address the Examiner's optimization of a result-effective variable position.

Appellants' argument that Wanlass' teaching to use only phosphorus-containing semiconductor materials and that aluminum-containing semiconductor materials are not desired amounts to a teaching away from King's InGaAlAs material is not persuasive. While Wanlass exemplifies using phosphorus-containing materials and teaches properties attributable to the use of phosphorus, Wanlass further discloses that the exemplified embodiments are not exclusive subcell materials (Wanlass para. [0028]). Wanlass' teachings regarding aluminum-containing semiconductor materials do not amount to a teaching away. As the Examiner finds, Wanlass discloses a mere preference for aluminum-free materials and exemplifies using aluminum-containing semiconductor material (Ans. 42).

Appellants' argument that Examiner's reason for combining King's AlGaInAs layer is based on too general of a teaching is not persuasive. Rather, King discloses in paragraph 20 the advantages of using a graded layer which is followed in the subsequent paragraph by a description of the suitable embodiments employing a graded layer (King, paras. [0020]-[0021]). King's paragraph [0021] discloses a graded layer of AlGaInAs which would reasonably be understood from King's disclosure as possessing and imparting the desired properties to the solar cell.

On this record and for the above reasons, we affirm the Examiner's § 103 rejections of claims 8-20.

DECISION

The Examiner's decision is affirmed-in-part.

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

ORDER

AFFIRMED-IN-PART

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