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RADER FISHMAN & GRAUER PLLC
LION BUILDING
1233 20TH STREET N.W., SUITE 501
WASHINGTON, DC 20036

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HUBER, ROBERT T	

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte NOBUYA SATO and KAZUNARI SAITOU

Appeal 2012-001276
Application 11/896,682
Technology Center 2800

Before ADRIENE LEPIANE HANLON, CATHERINE Q. TIMM, and JAMES C. HOUSEL, *Administrative Patent Judges*.

TIMM, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF CASE

Appellants seek review of the Examiner's decision to reject claims 13-36.[1] We have jurisdiction under 35 U.S.C. §§ 6(b) and 134.

We AFFIRM.

The claims are directed to a semiconductor light-emitting device (*see, e.g.*, Claim 25) and method of manufacturing the same (*see, e.g.*, Claim 13).

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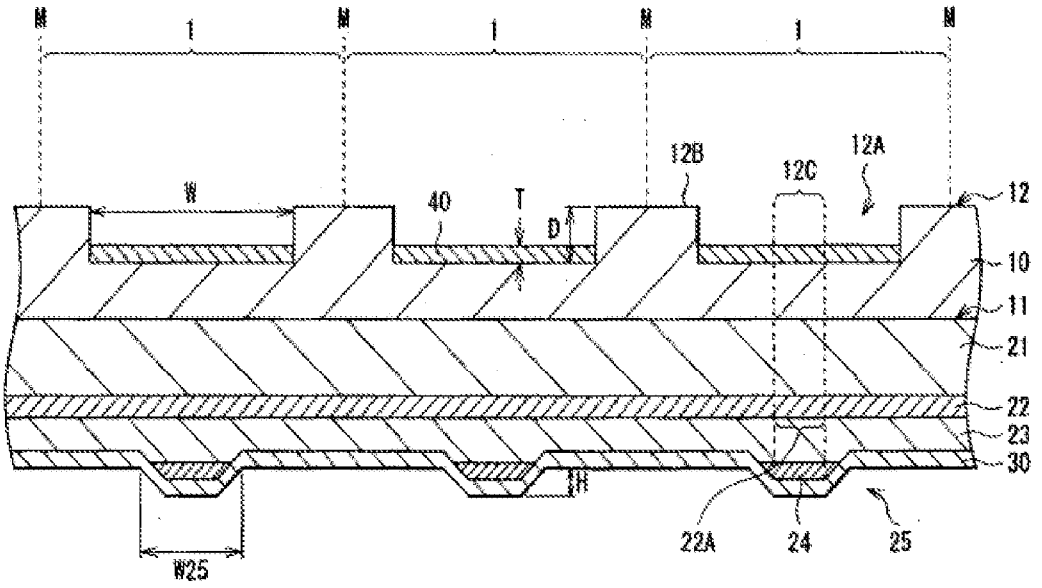
[1] Claim 9 has been canceled (*see* Communication filed July 15, 2011 indicating entry of the amendment filed May 31, 2011).

One embodiment of the device, which is a laser diode, is depicted in Appellants' Figure 1. Figure 1 is reproduced below:



Sectional view of an embodiment of a laser diode formed according to Appellants' invention

The laser diode of Figure 1 includes a substrate 10 with surface 11 and surface 12.

Forming the device involves laminating a number of layers onto surface 11 of substrate 10, i.e., an n-type cladding layer 21, an active layer 22, a p-type cladding layer 23, and a p-side contact layer (Spec. 6). The p-type cladding layer 23 and p-side contact layer are etched to partially remove them and create p-side contact layer 24 and a thin strip-shaped projection section (ridge) 25 (Spec. 7). A p-side electrode 30 is then formed over the resulting etched surface along with an insulating layer (not shown) (*id.*).

On the opposite surface of the substrate, i.e., surface 12, Appellants form recessed sections 12A (*id.*). Second electrodes 40 are formed within recessed sections 12A (*id.*)

The width W of the recessed section 12A is larger than the width W25 of the projection section 25 as shown in the leftmost chip region 1 of Figure 1 (Spec. 8).

Claim 13, including reference numerals from Figure 1 to illustrate the claimed invention, is reproduced below:

> 13. A method of manufacturing a semiconductor light-emitting device, the method comprising the steps of:
>
> forming a first electrode [30] on a projection section [ridge 25], said projection section [25] being a contact layer [24] on a first conductivity type cladding layer[23];
>
> forming a second electrode [40] in a recessed section [12A] of a substrate [10], the width [W] of said recessed section [12A] being larger than the width [W25] of said projection section [25].

(Claims App'x at Br. 35.)

The Examiner rejects claims 13-18, 20-30, and 32-36 under 35 U.S.C. § 102(b) as anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as obvious over Romano;[2] and rejects claims 19 and 31 under 35 U.S.C. § 103(a) as obvious over Romano in view of Kwak.[3]

We review the rejections in accordance with Appellants' grouping of the claims.

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[2] Romano et al., US 6,744,072 B2, patented June 1, 2004.
[3] Kwak et al., US 6,657,237 B2, patented Dec. 2, 2003.

OPINION

A. Rejection of Claims 13-18, 20-30, and 32-36 as Anticipated or Obvious

1. Claims 13, 15-18, 25, and 27-30

Appellants state that claims 13, 15-18, 25, and 27-30 stand or fall together[4] (Br. 14). We select claim 13 as representative for resolving the issues on appeal for this group of claims.

The issue is: Have Appellants identified a reversible error in the Examiner's finding that Romano describes or suggests in accordance with either § 102 or § 103 a device with "the width of said recessed section being larger than the width of said projection section" as required by claim 13?

To support the finding that Romano describes the required relative widths, the Examiner cites to Figures 10, 14, and 15 of Romano (Ans. 7 and Ans. 17-19). Most illuminating is an annotated Figure 14 of Romano the Examiner reproduces in the Answer (Ans. 19). The Examiner's annotated Figure 14 is reproduced below:

[4] Appellants include claim 31, but that claim is subject to a different rejection.

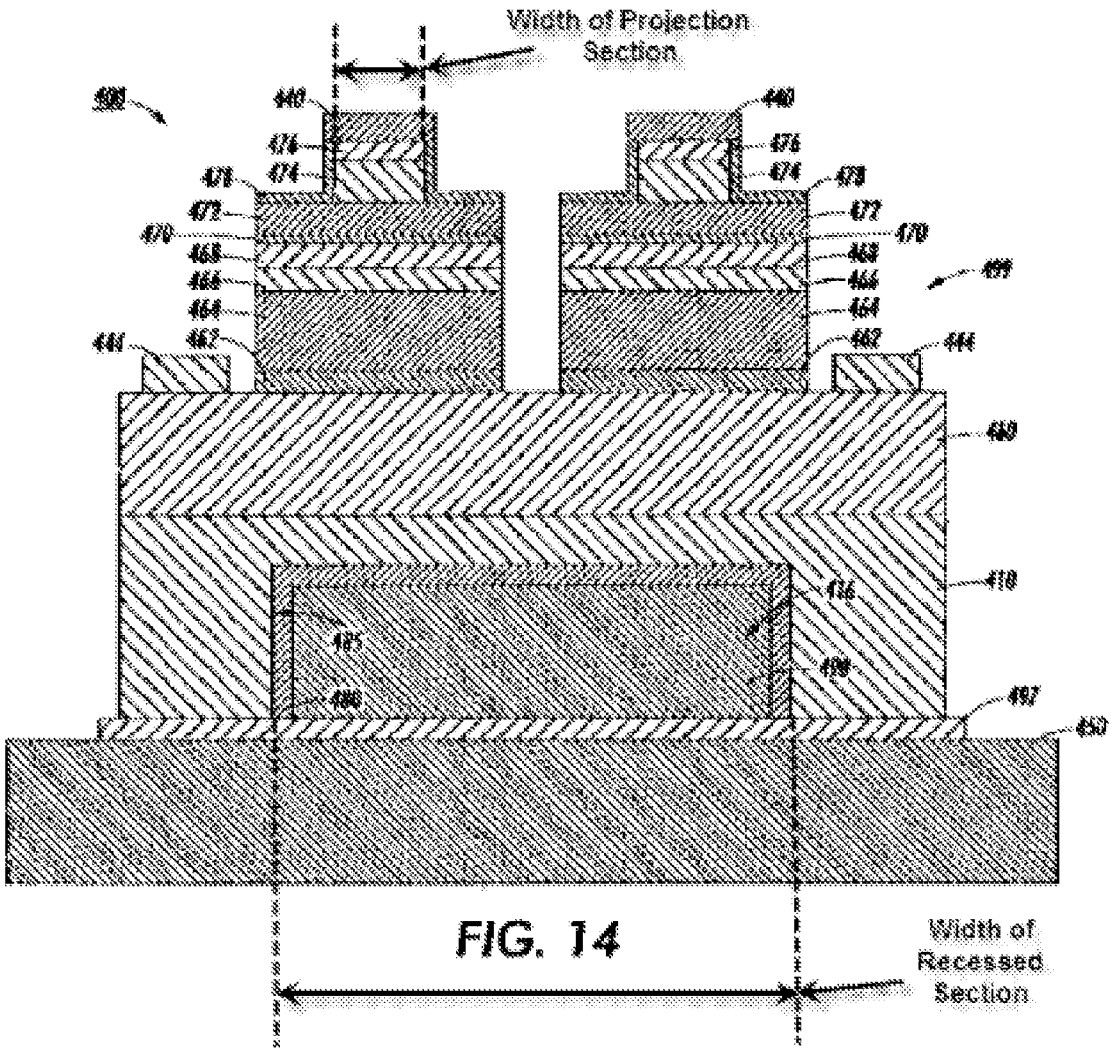

FIG. 14

Cross-sectional view of an embodiment of Romano's light-emitting device as annotated by the Examiner

Annotated Figure 14 indicates that Figure 14 depicts a recessed section (cavity 416) that is wider than a projection section (layers 474 and 476).[5] The Examiner further finds a suggestion within Romano "to have the

[5] The Examiner also cited to Figure 15 and the reference numerals therein to support the rejection. We confine our discussion to Figure 14 because the Examiner's annotated Figure 14 illustrates the finding with regard to the width of the elements at issue. Figure 15 illustrates the use of seed layer 580 as an electrode (n-contact) as further found by the Examiner (Ans. 7), a

width [of the] recessed section larger than the width of the projection section in order to maximize the heat dissipation from [the] device" (Ans. 17-18, citing Romano, col. 10, ll. 46-50 and ll. 62-65).

Appellants contend that the Examiner erred in relying upon the drawings of Romano to support the rejection because the drawings are not disclosed by Romano as drawn to scale and Romano contains no express or inherent disclosure of the proportional width relationship, nor any disclosure of an intent for forming the device with such a width difference (Br. 16-23; Reply Br. 6-14). Appellants further contend that the Examiner is improperly relying upon Appellants' own Specification to support the obviousness rejection rather than any disclosure within Romano (Br. 23-26; Reply Br. 15-16).

It is well settled that "[a]bsent any written description in the specification of quantitative values, arguments based on measurement of a drawing are of little value." *In re Wright*, 569 F.2d 1124, 1127 (CCPA 1977). Precise proportions should not be read into patent drawings when the patent does not expressly provide such proportions. *Nystrom v. TREX Co., Inc.*, 424 F.3d 1136, 1149 (Fed. Cir. 2005). But while patent drawings are not working drawings drawn to scale, things patent drawings show clearly are not to be disregarded. *In re Mraz*, 455 F.2d 1069, 1072 (CCPA 1972); *In re Heinrich*, 268 F.2d 753, 755 (CCPA 1959). In fact, "[d]escription for the purposes of anticipation can be by drawings alone as well as by words." *In re Bager*, 47 F.2d 951, 953 (CCPA 1931).

The question here is whether Romano "describes" within the meaning of 35 U.S.C. § 102 or suggests, as that term is used in the context of

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finding not disputed in the portion of the Brief directed to the rejection of claims 13, 15-18, 25, and 27-30 (Br. 14-25).

obviousness under 35 U.S.C. § 103, the claimed relative widths. To answer that question, we look to the drawings, but consider them in light of the disclosure as a whole to determine what Romano would have disclosed and suggested to one of ordinary skill in the art.

The Examiner here is not attempting to use the drawings of Romano to establish precise dimensions, but is citing the drawings for showing generalized proportions. While we agree with Appellants that the drawings are not disclosed by Romano as being to scale, the drawings are drawn with a sufficient detail and precision to allow some findings and conclusions with regard to the relative size of the depicted structures. Moreover, Romano's written description supports those findings and conclusions.

Romano is concerned with dissipating the heat generated in semiconductor devices such as light emitting diodes and lasers (Romano, col. 1, ll. 12-59). Romano discloses that, in light emitting diodes and lasers, heat is generated in the p- and n-contacts and that heat must usually flow through the substrate to reach the external heat sink (col. 1, ll. 33-37). However, the substrates used in such devices have poor thermal conductivity (*id.*). In the prior art, the solution had been to thin the substrate and mount it to a heat sink to reduce the heating problem, however, one can only reduce the thickness of the substrate so much before cracking the substrate (col. 1, l. 62 to col. 2, l. 9). Instead of thinning the substrate, Romano creates a cavity in the substrate and fills the cavity with a thermally conductive material (col. 2, ll. 50-62; col. 5, ll. 7-22). Romano's solution provides substrates with increased thermal conductivity, but the structural integrity of thick substrates (col. 2, ll. 18-25). It is against this backdrop that Romano provides drawings of embodiments of a substrate with a cavity filled with a conductive substance and semiconductor devices including the cavity.

Romano's drawings depict substrates with cavities of various depth and extent (Figs. 1-3).

Romano further depicts devices including multiple p-contacts situated on the substrate and over the cavity filled with conductive material (*see, e.g.*, Figs. 7-9). In explaining Figure 9, Romano states that the cavity 216 has a length and width larger than that of the p-contacts 240 situated above it (col. 7, ll. 17-24).

Romano's Figures 10-14 show the progressive steps of forming a semiconductor device with a filled cavity 416. All of the figures depict the various layers and structures within the device with different thicknesses. It is, therefore, reasonable to believe that Romano intended to convey relative differences in thickness even if not exactly to scale. Figures 11-14, like Figure 9, include multiple p-contacts (440) over cavity 416. Therefore, it is reasonable to believe that, like the p-contacts of Figure 9, the p-contacts 440 of Figures 10-14 are intended to be of smaller width than the width of the cavity 416.

Figures 10-14 depict layers 474 and 476, the layers the Examiner finds constitute a projection section, as extending to a lesser width than the p-contacts 440.

Figure 15 shows another embodiment of a semiconductor device, but with analogous structures depicted in the same manner as in Figure 14. Multiple p-contacts (540) are again shown over the filled cavity (516).

A preponderance of the evidence supports the Examiner's finding that Romano's drawings were intended to depict a semiconductor device with a recessed section (cavity 416 of Fig. 14; cavity 516 of Fig. 15) of width larger than the width of a projected section (layers 474 and 476 of Fig. 14; layers

574 and 576 of Fig. 15). This finding supports the Examiner's anticipation rejection.

The Examiner's finding of a reason or suggestion to provide the recessed section with a width larger than the width of the projection section "in order to maximize the heat dissipation from device, as discussed in Romano," (Ans. 20) supports the obviousness rejection. This finding of a reason or suggestion flows directly from the teachings of Romano. Moreover, Appellants do not convincingly argue against the Examiner's reasoning (Reply Br. 14-15).

Appellants have not convinced us of a reversible error in either the Examiner's anticipation rejection or the Examiner's obviousness rejection.

2. Rejection of Claims 14 and 26

Appellants present separate arguments directed to the rejection of claims 14 and 26. We select claim 14 as representative to resolve the issue on appeal.

Claim 14 depends from claim 13 and further requires that "the depth of said recessed section is larger than the total thickness of said first electrode and said projection section."

The Examiner finds that the drawings of Romano indicate that the depth of the recess section (cavity 416 in Fig. 14) is larger than the total thickness of the first electrode (440) and the projection section (layers 474 and 476) (Ans. 8 and 20). The Examiner further finds a reason to so size the structures "in order to maximize the heat dissipation from device, as discussed in Romano, while maintaining structural stability of the substrate layer 410." (Ans. 20, citations omitted.)

Appellants contend that Romano fails to disclose, teach, or suggest the cavity depth versus thickness requirement (Br. 27; Reply Br. 17).

Appellants further contend that the Examiner is relying upon personal conclusions instead of evidence with regard to the finding of a suggestion of maximizing heat dissipation while maintaining structural stability (Reply Br. 21).

As correctly pointed out by Appellants, Romano discloses thicknesses for the layers of the projection section (layers 474 and 476 in Fig. 14; layers 574 and 576 in Fig. 15). Romano discloses a thickness of about 0.5 to 1 μm for layer 474 and about 0.1 μm for layer 476 (col. 8, ll. 52-57). Generally consistent with the thickness disclosure, Figure 14 shows a relatively thicker layer 474 in relation to layer 476. This provides evidence that Romano's drawings, while not to scale, depicts thicknesses generally consistent with proportions intended to be present in the device.

Appellants contend that Romano is silent as to the thickness of the electrode (440 in Fig. 14; 540 in Fig. 15) and the depth of the cavity (416 in Fig. 14; 516 in Fig. 15) (Br. 26). It is reasonable to believe, based upon the differences in the thicknesses between the structures of the drawings, that the thickness of the electrode 440 is on the order of the thickness of the layers 474 and 476, and that the depth of the cavity is relatively large in comparison (*see* Figs. 14 and 15). Moreover, the written description of Romano provides support for the Examiner's finding of a suggestion to maximize the heat dissipation by making the cavity as large as possible while maintaining the thickness of the substrate to provide structural integrity (*see* col. 2, ll. 17-25 and ll. 37-62).

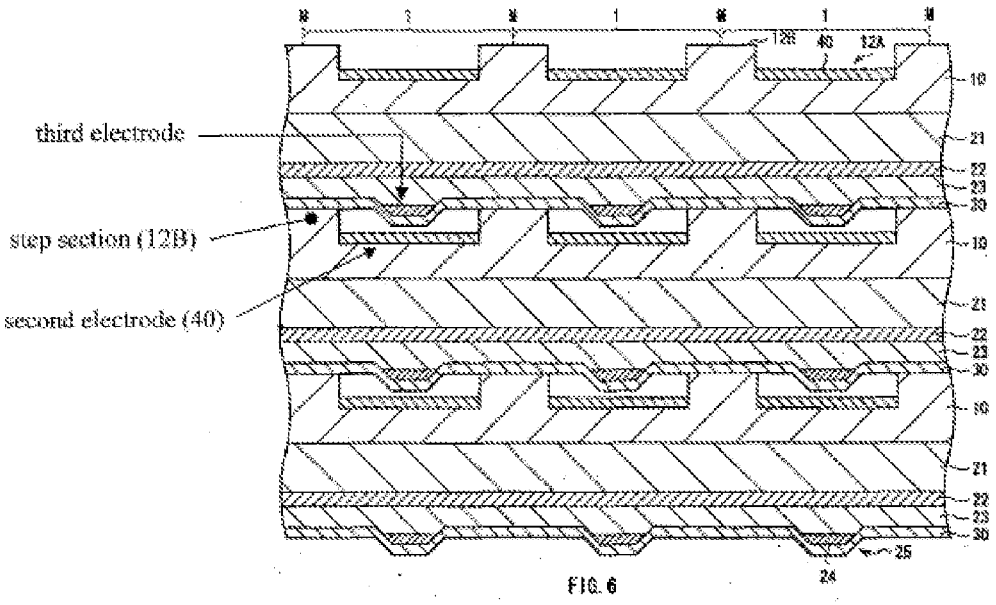
Appellants have not convinced us of a reversible error in the Examiner's rejection of claims 14 and 26.

3. Rejection of Claims 20-24 and 32-36

Appellants present separate arguments directed to the rejection of claims 20-24 and 32-36. We select claim 20 as representative to resolve the issue on appeal.

Claim 20 depends from claim 13 and further requires forming a third electrode on another projection section, a step section separating said third electrode from said second electrode.

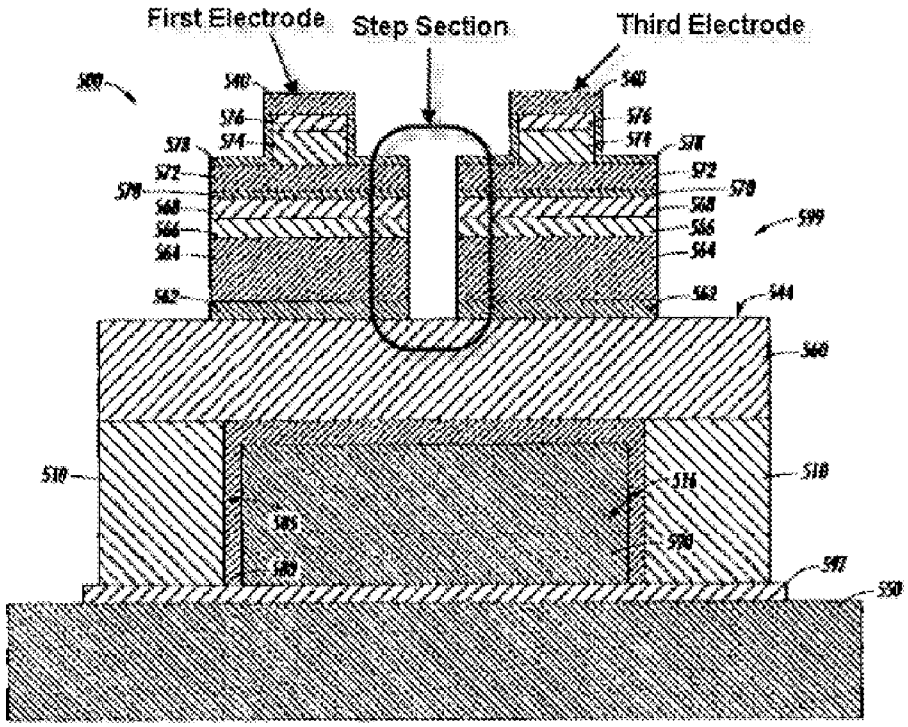
The structure of claim 20 results, according to Appellants' Specification, when one stacks one device onto another as shown in Appellants' Figure 6. Appellants' annotated Figure 6 presented in the Brief is helpful in understanding what Appellants intend to claim:



Sectional view of stacked laser diode bars

The Examiner finds that Romano teaches a third electrode (440 in Fig. 14; 540 in Fig. 15) formed on another projection section as shown on the right side of Figure 15. According to the Examiner, the space separating the first electrode (440/540) on the left side from the third electrode on the right side (440/540) is a "step section separating said third electrode from

said second electrode" (Ans. 10). The Examiner annotates Romano's Figure 15 to illustrate (Final Rej. 9; Ans. 10). Annotated Figure 15 is reproduced below:



Annotated cross-sectional view of Romano's laser device of Figure 15

Appellants first state that "[t]here is no concession of the seed layer (480)(580) of Romano being the second electrode." (Br. 29.) However, Appellants do not call into question any of the specific factual findings of the Examiner (*compare* Ans. 21 *with* Br. 29 and Reply Br. 18-21). Therefore, Appellants have not identified a reversible error in this finding.

Appellants further contend that Romano fails to depict the step section separating the third element from the seed layer (480)(580) (Br. 30). However, Appellants' Brief does not explain why the space relied upon by the Examiner fails to meet the requirements of the claimed step section (*id.*).

In the Reply Brief, Appellants appear to attempt to support their argument on the basis of claim interpretation (Reply Br. 19-20). Appellants reproduce a portion of the Specification discussing their Figure 6 emphasizing particular elements (*id.*). However, the portion of the Specification reproduced by Appellants describes the interrelationship of various structures including several structures not required by claim 20. The portion of the Specification reads:

> Thus, in the embodiment, the recessed section 12A with the depth D which is larger than the thickness T of the n-side ***electrode 40*** is arranged on the second surface 12 of the substrate 10, and the n-side electrode 40 is formed inside the recessed section 12A, so in the case where the LD bars are stacked, the ***step section 12B acts as a spacer*** to prevent contact between the p-side electrode 30 and the n-side electrode 40, thereby fusion bonding between electrodes or damage to the electrodes can be prevented. Moreover, unlike related arts, when the LD bars are stacked, it is not necessary to insert a silicon (Si) chip between the LD bars, so manufacturing steps can be simplified, and workability can be improved. Further, the recessed section 12A for forming the n-side electrode 40 is arranged on the second surface 12 of the substrate 10, so an influence to laser characteristics due to arranging the recessed section 12A can be reduced to a very small level.

(Reply Br. 19-20, quoting Spec. para. bridging 11-12.) For instance, the Specification is discussing the structure of two stacked devices, in which the third electrode (upper 30) is within the device stacked onto the device containing the second electrode (lower 40). Claim 20 does not require such stacked electrodes; the third electrode may be formed on any other projection section. Moreover, "a step section" as recited in the claim can be any section resembling a step that separates the third electrode from said second electrode by any distance. The space between the rightmost p-

contact of Romano provides at least some distance between the rightmost p-contact and the underlying seed layer.

While we agree with Appellants that Romano's structure is different from that discussed in Appellants' Specification, Appellants have not convinced us that claim 20 is narrowly enough crafted in order to differentiate the claimed method from what is disclosed or suggested by Romano.

"[A]lthough the specification often describes very specific embodiments of the invention, we have repeatedly warned against confining the claims to those embodiments." *Phillips v. AWH Corp.*, 415 F.3d 1303, 1323 (Fed. Cir. 2005)(en banc). And during examination unless the Specification provides a definition or disclaims the broader meaning one of ordinary skill in the art would give the term, we apply a broad interpretation consistent with the ordinary meaning of the term in the art. *See In re Icon Health & Fitness, Inc.*, 496 F.3d 1374, 1379 (Fed. Cir. 2007) ("[T]he PTO must give claims their broadest reasonable construction consistent with the specification. . . . Therefore, we look to the specification to see if it provides a definition for claim terms, but otherwise apply a broad interpretation."); *In re Bigio*, 381 F.3d 1320, 1324-25 (Fed. Cir. 2004) (Absent claim language carrying a narrow meaning, we only limit the claim based on the specification when those sources expressly disclaim the broader definition.)

Appellants have not identified a reversible error in the Examiner's rejection of claims 20-24 and 32-36.

B. The Rejection of Claims 19 and 31

The Examiner rejected claims 19 and 31 as obvious over the combination of Romano and Kwak.

Appellants note that claim 19 depends from claim 13 and claim 31 depends from claim 25, and contend that "Kwak ***fails*** to disclose, teach, or suggest *the width of said recessed section being larger than the width of said projection section* as is present within claims 13 and 25 on appeal." (Br. 31.) In response, the Examiner points out that Kwak was not relied upon to reject claims 13 and 25 (Ans. 22). Appellants counter that the Examiner failed to respond to Appellants' arguments concerning the teachings of Kwak with regard to relative width (Reply Br. 22-23).

"On appeal to the Board, an applicant can overcome a rejection by showing insufficient evidence of *prima facie* obviousness or by rebutting the *prima facie* case with evidence of secondary indicia of nonobviousness." *In re Kahn*, 441 F.3d 977, 985-86 (Fed. Cir. 2006) (emphasis omitted).

Because the Examiner's rejection was not predicated on any finding that Kwak taught the relative widths recited in claims 13 and 25, there was no need for the Examiner to respond to arguments directed to Kwak's teachings, or lack of teachings, with regard to the relative widths. Those arguments do not point to any error in the Examiner's rejection.

In order to overcome the Examiner's rejection, Appellants must identify what the Examiner did wrong, i.e., identify a reversible error in the examiner's rejection. *In re Jung*, 637 F.3d 1356, 1365-66 (Fed. Cir. 2011); *Ex parte Frye*, 94 USPQ2d 1072 (BPAI 2010).

The Examiner does not rely upon Kwak to teach the relative widths required by claims 13 and 25, but relies upon Romano as teaching or suggesting this structure. As we discussed above with respect to the rejection of representative claim 13, Appellants have not persuaded us that the Examiner reversibly erred in finding that Romano teaches or suggests the relative width requirement recited in claims 13 and 25. Appellants'

arguments, which are directed to the teachings of Kwak, do not address the rejection of claims 19 and 31 advanced by the Examiner. Therefore, Appellants have not identified a reversible error in the Examiner's rejection of claims 19 and 31.

CONCLUSION

We sustain the Examiner's rejections.

DECISION

The Examiner's decision is affirmed.

TIME PERIOD FOR RESPONSE

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

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