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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte FLORIN UDREA, GIANLUCA CAMUSO,
ALICE PEI-SHAN HSIEH, CHIU NG, YI TANG,
RAJEEV KRISHNA VYTILA, and CANHUA LI

Appeal 2018-005035
Application 15/073,937
Technology Center 2800

Before JEFFREY T. SMITH, BRIAN D. RANGE, and LILAN REN,
Administrative Patent Judges.

REN, *Administrative Patent Judge.*

DECISION ON APPEAL

STATEMENT OF THE CASE

Appellants¹ appeal under 35 U.S.C. § 134(a) from a rejection of claims 1–7, 9, 11–17, 19, 21, and 22. We have jurisdiction under 35 U.S.C. § 6(b).

We affirm.

CLAIMED SUBJECT MATTER

The claims are directed to a bipolar semiconductor device having localized enhancement regions. Claim 1, reproduced below, is illustrative of the claimed subject matter:

1. A bipolar semiconductor device comprising a plurality of unit cells, each of said plurality of unit cells comprising:
 - a drift region having a first conductivity type situated over an anode layer having a second conductivity type opposite said first conductivity type;
 - a first control trench extending through an inversion region having said second conductivity type, and further extending into said drift region, said first control trench adjacent to cathode diffusions;
 - first and second depletion trenches, each having a depletion electrode;
 - said first depletion trench being situated between said second depletion trench and said first control trench;
 - an enhancement region having said first conductivity type localized in said drift region between said first and second depletion trenches, so that said enhancement region is not situated adjacent said first control trench or between said first depletion trench and said first control trench.

Claims Appendix (App. Br. 15).

¹ The real parties in interest are identified as “INFINEON TECHNOLOGIES AMERICAS CORP.” Appeal Brief of November 17, 2017 (“App. Br.”), 2. In this opinion, we also refer to the Final Action of June 20, 2017 (“Final Act.”), the Examiner’s Answer of February 26, 2018 (“Ans.”), and the Reply Brief of April 13, 2018.

REFERENCES

The prior art relied upon by the Examiner in rejecting the claims on appeal is:

Takahashi US 6,781,199 B2 Aug. 24, 2004

REJECTIONS

The Examiner rejects claims 1–7, 11–17, 21, and 22 under 35 U.S.C. § 102(a)(1) as anticipated by Takahashi. Final Act. 2.

The Examiner rejects claims 9 and 19 under 35 U.S.C. § 103(a) as being unpatentable over Takahashi. Final Act. 5.

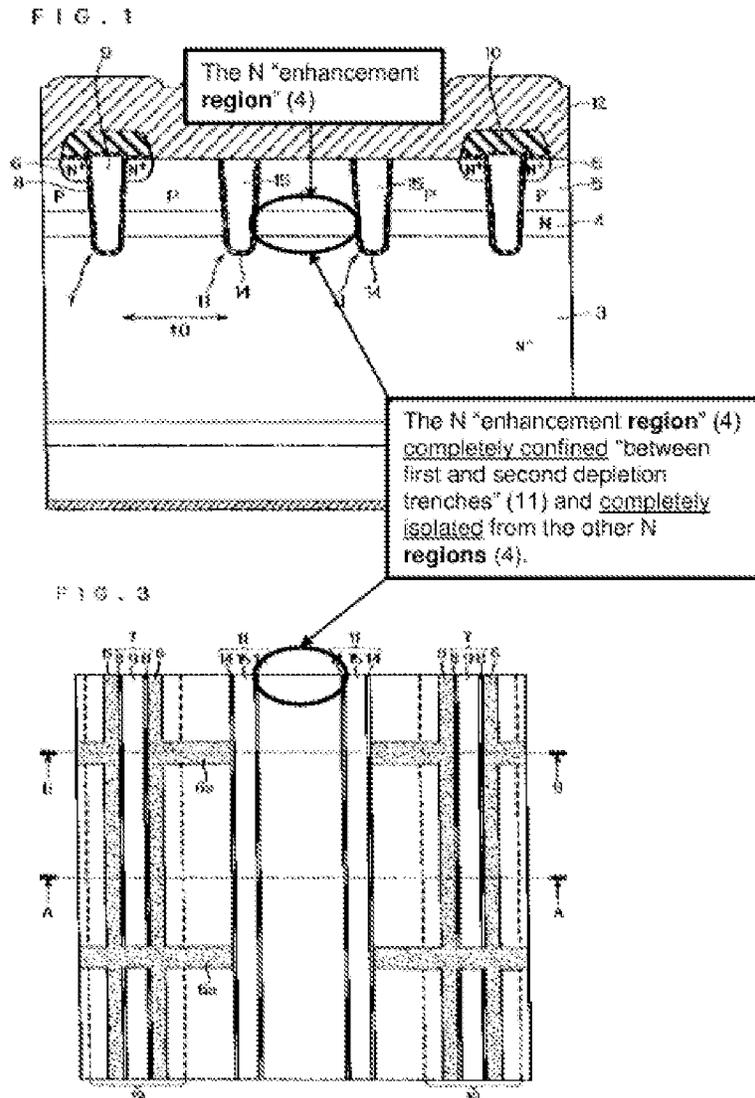
OPINION

Claims 1 and 11

Appellants argue that the Examiner reversibly erred in finding Takahashi discloses “an enhancement region having said first conductivity type localized in said drift region between said first and second depletion trenches, so that said enhancement region is not situated adjacent said first control trench or between said first depletion trench and said first control trench” as recited in claim 1. App. Br. 5. More specifically, Appellants argue that Figure 1 of Takahashi shows N layer 4 covering the entire N layer 3 and is adjacent to trench 7. *Id.*

The Examiner, on the other hand, finds that Takahashi describes the recited “enhancement region” as illustrated by the region in between the middle trenches 11 of Figure 1. Ans. 2–3. This particular region is illustrated in Figure 1 of Takahashi, annotated by the Examiner which is reproduced below. Further citing Figure 3 of Takahashi (annotated by the

Examiner which is reproduced below) the Examiner finds that this particular region, confined within the middle trenches 11, is physically isolated from the remaining parts of N layer 4. *Id.* at 4. Takahashi provides that Figure 3 illustrates partial region 6a which extends perpendicularly to the direction of the formation of trench 7. Takahashi 14:1–3. Partial region 6a “is completely covered with an interlayer insulating film 19.” *Id.* at 14:6–7.



Figures 1 and 3 of Takahashi (annotated by the Examiner Ans. 3).

Appellants respond that the Examiner reversibly erred by finding that the region circled (hereinafter the “circled region”) in the above annotated figures does not disclose the apparatus recited because the circled region is outside of the first trench 7 in Takahashi. App. Br. 9; Reply Br. 2–3. Appellants, however, do not adequately explain why this argument supports patentability as claim 1 does not exclude the first control trench from being outside of the enhancement region. We further note that Figure 1 of Appellants’ own specification illustrates first control trench 120 to be outside of enhancement region 140. Spec., Fig. 1.²

Lastly, Appellants’ argument that Takahashi teaches away from claim 1 (App. Br. 11–12) is irrelevant to the anticipation rejection. “A reference is no less anticipatory if, after disclosing the invention, the reference then disparages it. Thus, the question whether a reference ‘teaches away’ from the invention is inapplicable to an anticipation analysis.” *Celeritas Techs. Ltd. v. Rockwell Int’l Corp.*, 150 F.3d 1354, 1361 (Fed. Cir. 1998) (citation omitted). We accordingly sustain the anticipation rejection of claim 1 as well as claim 11 as Appellants do not present separate arguments. *See* App. Br. 12.

With regard to the remaining claims, namely, claims 2–7, 12–17, 21, and 22, Appellants do not present arguments separate from those for claims 1 and 11 (*see* App. Br. 12, 14), and the anticipation rejection of claims 2–7, 12–17, 21, and 22 is sustained.

Dependent Claims 9 and 19

The dispositive issue on appeal for the obviousness rejection of dependent claims 9 and 19 is whether the combined prior art teaches or

² Application No. 15/073,937 or “Spec.”

suggests “a third depletion trench adjacent to said first and second depletion trenches, wherein said second depletion trench is situated between said third depletion trench and said first depletion trench, wherein said enhancement region is localized in said drift region between said first, second, and third depletion trenches.” App. Br. 13 (emphasis omitted).

Appellants argue that the Examiner reversibly erred in combining the embodiments in Figures 1 and 32 of Takahashi because the embodiment in Figure 32 lacks a hole trapping layer illustrated in Figure 1. App. Br. 13–14. Appellants argue that the presence or absence of such a hole trapping layer would negatively impact the operability of the apparatus. *Id.* at 14.

“[W]hen a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007) (citing *United States v. Adams*, 383 U.S. 39, 50–51 (1966)).

In this case, the open-ended apparatus claims neither recite nor preclude a hole trapping layer and Appellants have not directed us to evidence in showing that the Examiner reversibly erred in finding that a skilled artisan would have combined the known prior art components to arrive at the recited structure. *See Invitrogen Corp. v. Biocrest Mfg., L.P.*, 327 F.3d 1364, 1368 (Fed. Cir. 2003) (“The transition ‘comprising’ in a method claim indicates that the claim is open-ended and allows for additional steps.”). “Combining the teachings of references does not involve an ability to combine their specific structures.” *In re Nievelt*, 482 F.2d 965, 968 (CCPA 1973) (emphasis omitted). As to any purported negative impact on operability, Appellants have not directed us to evidence supporting the

argument and such “[a]ttorneys’ argument is no substitute for evidence.”

Johnston v. IVAC Corp., 885 F.2d 1574, 1581 (Fed. Cir. 1989).

Furthermore, Appellants do not argue that the Examiner’s proposed apparatus would be inoperable – only that it would be less than optimal, according to Appellants. App. Br. 14. It is, of course, well-established that a finding of obviousness does not require superior or equal performance compared with the prior art. *See In re Mouttet*, 686 F.3d 1322, 1334 (Fed. Cir. 2012) (“[J]ust because better alternatives exist in the prior art does not mean that an inferior combination is inapt for obviousness purposes.”). We sustain the obviousness rejection of dependent claims 9 and 19.

DECISION

The Examiner’s decision 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). *See* 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED