

THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

The opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.

Paper No. 29

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte NORIYUKI IWAMURO

Appeal No. 95-4159
Application 08/151,055¹

ON BRIEF

Before HAIRSTON, JERRY SMITH and TORCZON, Administrative Patent Judges.

JERRY SMITH, Administrative Patent Judge.

DECISION ON APPEAL

¹ Application for patent filed November 12, 1993. According to appellant, the application is a continuation of 07/829,262, filed February 3, 1992.

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This is a decision on the appeal under 35 U.S.C. § 134 from the examiner's rejection of claims 1-3, 6 and 7. Claims 4 and 5 stand withdrawn from consideration by the examiner as being directed to a nonelected invention.

The claimed invention pertains to the structure of a semiconductor element, particularly an insulated gate bipolar transistor (IGBT).

Representative claim 1 is reproduced as follows:

1. A semiconductor element, comprising:

a substrate of first conductivity type having an impurity concentration of not less than $4.0 \times 10^{13}/\text{cm}^3$, said substrate being produced from a single silicon crystal prepared by a zone melting method and substantially free of lifetime killers;

a first diffused region of second conductivity type in a first surface of the substrate;

a second diffused region of first conductivity type in the first region such that a channel region is formed between the second region and the substrate through the first region;

an insulating film on the first surface of the substrate over the channel region;

a gate electrode on the insulating film;

a source electrode on the first surface of the substrate in contact with the first and second regions;

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arguments set forth in the brief along with the examiner's rationale in support of the rejection and arguments in rebuttal set forth in the examiner's answer.

It is our view, after consideration of the record before us, that the collective evidence relied upon and the level of skill in the particular art would not have suggested to one of ordinary skill in the art the obviousness of the invention as set forth in claims 1-3, 6 and 7. Accordingly, we reverse.

In rejecting claims under 35 U.S.C. § 103, it is incumbent upon the examiner to establish a factual basis to support the legal conclusion of obviousness. See In re Fine, 837 F.2d 1071, 1073, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). In so doing, the examiner is expected to make the factual determinations set forth in Graham v. John Deere Co., 383 U.S. 1, 17, 148 USPQ 459, 467 (1966), and to provide a reason why one having ordinary skill in the pertinent art would have been led to modify the prior art or to combine prior art references to arrive at the claimed invention. Such reason must stem from some teaching, suggestion or implication in the prior art as a whole or knowledge generally available to one having

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ordinary skill in the art. Uniroyal Inc. v. Rudkin-Wiley Corp., 837 F.2d 1044, 1051, 5 USPQ2d 1434, 1438 (Fed. Cir.), cert. denied, 488 U.S. 825 (1988); Ashland Oil, Inc. v. Delta Resins & Refractories, Inc., 776 F.2d 281, 293, 227 USPQ 657, 664 (Fed. Cir. 1985), cert. denied, 475 U.S. 1017 (1986); ACS Hospital Systems, Inc. v. Montefiore Hospital, 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984). These showings by the examiner are an essential part of complying with the burden of presenting a prima facie case of obviousness. Note In re Oetiker, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992).

We consider first the rejection as it applies to independent claim 1 and claims 2, 6 and 7 which depend therefrom. These claims stand or fall together [brief, page 5]. The examiner has read claim 1 on Fay, and concludes that Fay only lacks the teaching of the third diffused region on the backside of the substrate [final rejection, pages 2-3]. The examiner cites Laska as a teaching that it was conventional to form a third region of an IGBT by doping the backside of a silicon substrate to form the emitter of the device [Id., page 3]. The examiner concludes that the

collective teachings of Fay and Laska would have suggested the invention as recited in claim 1.

Appellant argues that there is no motivation to combine the teachings of Fay with Laska [brief, pages 6-7]. According to appellant, the IGBTs of Fay and Laska operate so differently that the artisan would not selectively pick and choose elements from the two devices to arrive at the claimed invention. The examiner responds that appellant's arguments are not commensurate in scope with the invention of claim 1.

Although the examiner is correct to note that arguments of nonobviousness must be commensurate in scope with the claimed invention, the examiner must still consider the propriety of combining prior art teachings based on what would have been suggested to the artisan who has this prior art before him. The Fay IGBT has a buffer layer which makes it a punch-through (PT) type device. Laska discloses a non-punch-through (NPT) IGBT which is designed to have operating characteristics similar to a PT IGBT. While PT IGBTs and NPT IGBTs operate to achieve similar results, they achieve these results in an entirely different manner. Laska notes that an NPT IGBT is fabricated using no life-time-killing steps

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whereas the typical PT IGBT has life-time-killers in the substrate.

Although the examiner proposes to use Laska to teach nothing more than the fact that the P- and/or P+ layers of Fay could be created by using a doping technique, this position ignores specific language of claim 1 which Fay cannot meet. The examiner reads the substrate of claim 1 on layers 13 and 14 of Fay which are epitaxially grown layers of N-doped silicon. The examiner asserts that one can look to the average concentration of layers 13 and 14 and consider it as a single substrate layer of that concentration. However, replacing layers 13 and 14 in Fay with a single layer having the average concentration would destroy the Fay device. The heavily doped layer 13 is necessary in Fay to provide a buffer layer between the N-type epitaxial layer and the lightly doped P-type layer so the device can operate as a PT IGBT.

Claim 1 also recites that the substrate is "produced from a single silicon crystal prepared by a zone melting method and substantially free of lifetime killers." We fail to see how the epitaxially grown layers of Fay can meet this recitation. As noted above, the PT IGBT of Fay would be

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expected to have lifetime killers in order to operate as a PT device. Although the examiner attempts to dismiss features of claim 1 as being directed to the process of making the product, the presence or absence of lifetime killers in the device is a structural distinction which is known to affect the performance of the device. Therefore, Fay's epitaxial layers 13 and 14 cannot simply be equated with a single substrate having the properties recited in claim 1.

Appellant also argues that the collective teachings of Fay and Laska do not teach or suggest that a third diffused region of at least 2 microns should be implanted on the backside of the substrate [brief, pages 7-9]. It is the examiner's position that since the P-type collector region of Fay is thicker than 5 microns, if the P-type region of Fay were created by diffusion as taught by Laska, then this diffused P-type region would also have a thickness greater than 5 microns. Appellant notes that Laska discloses no dimensions for his third diffused region, and the Laska teachings of an NPT IGBT would not have been combined with the Fay PT IGBT for determining dimensions of layers in two disparate devices such as this. We agree with appellant.

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While we do not disagree with the examiner that the P-type collector region of Fay can be achieved by a diffusion process, we agree with appellant that the dimensions of the Fay PT IGBT device cannot simply be interchanged with the Laska NPT IGBT device. The examiner cannot simply combine selected teachings from disparate devices to support the position that the combined teachings would have been obvious to the artisan.

For all the reasons discussed above, we do not sustain the rejection of claims 1, 2, 6 and 7.

With respect to independent claim 3, it is significantly broader than independent claim 1. Nevertheless, claim 3 recites the same substrate limitations that we considered in claim 1 as well as a diffused region in the substrate having a depth of at least 2 microns. Since we find the same deficiencies in combining the teachings of Fay with Laska that we discussed above, we again fail to see how the invention as recited in claim 3 is suggested by the applied prior art. Therefore, we do not sustain the rejection of claim 3.

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In summary, we have not sustained the examiner's rejection of the claims under 35 U.S.C. § 103. Therefore, the decision of the examiner rejecting claims 1-3, 6 and 7 is reversed.

REVERSED

KENNETH W. HAIRSTON)
Administrative Patent Judge))
JERRY SMITH)
Administrative Patent Judge) BOARD OF PATENT
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