

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opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.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. 16

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte HERBERT GORONKIN
SAIED N. TEHRANI and
JUN SHEN

Appeal No. 96-1512
Application 08/297,279¹

ON BRIEF

Before URYNOWICZ, KRASS and JERRY SMITH, Administrative Patent Judges.

JERRY SMITH, Administrative Patent Judge.

DECISION ON APPEAL

¹ Application for patent filed August 29, 1994.

Appeal No. 96-1512
Application 08/297,279

This is a decision on the appeal under 35 U.S.C. § 134 from the examiner's rejection of claims 1-22, which constitute all the claims in the application.

The disclosed invention pertains to a complementary heterojunction semiconductor device. More specifically, the invention is directed to the interconnection of first and second resonant interband tunneling transistors (RITTs). The gates of the first and second RITTs are made from different semiconductor materials. The first gate material has a valence band having an energy greater than a conduction band of the second gate material.

Representative claim 1 is reproduced as follows:

1. A complementary heterojunction semiconductor device, comprising:

a first resonant interband tunneling transistor having a first gate of a first compound semiconductor type, a drain coupled to said first gate, and a common output coupled to said first gate; and

a second resonant interband tunneling transistor having a second gate of a second compound semiconductor type, said second gate coupled to said common output, and a source coupled to said second gate, wherein said first compound semiconductor type has a valence band having an energy greater than a conduction band of said second compound semiconductor type when said complementary heterojunction semiconductor device is in an unbiased state.

The examiner relies on the following references:

Aoki et al. (Aoki)	4,768,076	Aug. 30, 1988
Söderström et al. (Söderström)	5,113,231	May 12, 1992

Appeal No. 96-1512
Application 08/297,279

Zhu et al. (Zhu) 5,142,349 Aug. 25, 1992

Claims 1-22 stand rejected under 35 U.S.C. § 103. As evidence of obviousness the examiner offers the collective teachings of Zhu, Söderström and Aoki.

Rather than repeat the arguments of appellants or the examiner, we make reference to the brief and the answer for the respective details thereof.

OPINION

We have carefully considered the subject matter on appeal, the rejection advanced by the examiner and the evidence of obviousness relied upon by the examiner as support for the rejection. We have, likewise, reviewed and taken into consideration, in reaching our decision, the appellants' 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 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 1-22. Accordingly, we reverse.

Appeal No. 96-1512
Application 08/297,279

We consider first the rejection of independent claim 1 under 35 U.S.C. § 103 as being unpatentable over the collective teachings of Zhu, Söderström and Aoki. 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 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

Appeal No. 96-1512
Application 08/297,279

obviousness. Note In re Oetiker, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992).

Zhu is directed to a complementary heterojunction field effect transistor (HFET). The Zhu HFET is designed to have a P-channel quantum well and an N-channel quantum well separated by a barrier layer. Zhu teaches that "[t]he particular materials for P-channel quantum well 12 and N-channel quantum well 14 are chosen because P-channel quantum well 12 must have a valence band energy greater than conduction band energy of N-channel quantum well 14" [column 3, lines 6-10]. The examiner relies on this relationship between the P-channel and the N-channel materials in Zhu to meet the similar relationship of the gate materials recited in claim 1.

Söderström is directed to a resonant interband tunneling device in which the lateral layers of compound semiconductor material and barrier layers are shown [Figures 16 and 19]. The examiner states that "[t]he variation of embodiments as shown by Soderstrom in combination with Zhu's more general structure would have been obvious to a skilled artisan in order to achieve proper integration" [answer, page 3]. The examiner does not further elaborate on this point. Aoki is cited to show the connection of transistors and biases to implement an inverter operation.

Appeal No. 96-1512
Application 08/297,279

Appellants argue that the collective teachings of the applied prior art do not support the examiner's conclusion. Specifically, appellants argue that claim 1 is directed to the interconnection of two RITTs having a specific relationship between the gate materials and that none of the applied references suggests the interconnection as specifically recited in claim 1 [brief, pages 3-5].

Based upon the evidence of record provided in this case, we agree with appellants that the examiner's conclusion of obviousness has not been properly established. The examiner has essentially equated the relationship between Zhu's P-channel and N-channel materials with the claimed relationship between the gate materials of a first and second RITT as recited in claim 1. The applied prior art only establishes that it was known that different compound semiconductor materials had different energy bands which would permit tunneling to occur in a semiconductor device. This prior art, however, does not suggest that two RITTs should be interconnected as recited in claim 1 with the gate materials as specifically claimed. We do not agree with the examiner's finding that the FET teachings of Zhu are teachings of the interconnection of two RITTs [answer, page 5].

Appeal No. 96-1512
Application 08/297,279

For all the reasons discussed above, we do not sustain the rejection of independent claim 1 based on the evidence of record in this case. Accordingly, we also do not sustain the rejection of dependent claims 2-15. Since independent claim 21 is similar in scope to claim 1, we do not sustain the rejection of claim 21 or dependent claim 22.

Independent claim 16 recites the specific interconnection of layers between a first heterojunction transistor and a second heterojunction transistor. Appellants argue that the examiner has failed to establish a prima facie case of obviousness for the structure specifically recited in claim 16 [brief, pages 5-6]. We agree. The examiner has not indicated how each of the recitations of independent claim 16 is suggested by the teachings of the applied prior art. The examiner's conclusion of obviousness must be supported by appropriate factual findings which have not been made here. Therefore, we do not sustain the rejection of independent claim 16 or dependent claims 17-20.

In conclusion, we have not sustained the examiner's rejection of any of the claims under 35 U.S.C. § 103. Therefore, the decision of the examiner rejecting claims 1-22 is reversed.

REVERSED

Appeal No. 96-1512
Application 08/297,279

)	
STANLEY M. URYNOWICZ, JR.)	
Administrative Patent Judge)	
)	
)	
)	BOARD OF PATENT
ERROL A. KRASS)	
Administrative Patent Judge)	APPEALS AND
)	
)	INTERFERENCES
)	
JERRY SMITH)	
Administrative Patent Judge)	

sd

Vincent B. Ingrassia
MOTOROLA, INC.
Suite R3108, P. O. Box 10219
Intellectual Property Dept.
Scottsdale, AZ 85271-0219