

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board

Paper No. 18

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte PING-CHIH CHANG,
ALBERT G. BACA, NEIN-YI LI,
HONG Q. HOU and CAROL I. H. ASHBY

Appeal No. 2004-0682
Application 09/547,152

ON BRIEF

Before GARRIS, DELMENDO, and PAWLIKOWSKI, Administrative Patent Judges.

PAWLIKOWSKI, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal under 35 U.S.C. § 134 from the examiner's final rejection of claims 1-4, 7, 8, 15-17, and 19-24.

Claim 1 is representative of the subject matter on appeal and is set forth below:

1. An NPN double-heterojunction bipolar transistor formed on a gallium arsenide (GaAs) substrate and comprising:

(a) a base region further comprising a layer of p-type-doped indium gallium arsenide nitride (InGaAsN);

(b) an emitter region located on one side of the base region and further comprising a layer of a first n-type-doped semiconductor having a bandgap energy greater than the bandgap energy of the InGaAsN base region;

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(c) a collector region located on the other side of the base region and further comprising a layer of a second n-type-doped semiconductor having a bandgap energy greater than or equal to the bandgap energy of the InGaAsN base region; and

(d) electrode forming separate electrical connections to each of the collector, emitter and base regions of the transistor.

We use the answer of Paper No. 16, mailed June 4, 2003.

The examiner relies upon the following art references as evidence of unpatentability:

Liu et al. (Liu)	6,031,256	Feb. 29, 2000
Yagura et al. (Yagura)	6,188,137	Feb. 13, 2001
Matsuno et al. (Matsuno) (Japanese)	JP40505095	Mar. 26, 1993

Xin et al. (Xin), "Annealing behavior of p-type $\text{Ga}_{0.892}\text{In}_{0.108}\text{N}_x\text{As}_{1-x}$ ($0 \leq x \leq 0.24$) Grown by gas-source molecular beam epitaxy," Applied Physics Letters, Vol. 75, No. 10, pages 1416-1418 (July 1999).

Claims 1-4, 7, 8, 19, 21, and 22 stand rejected under 35 U.S.C. § 103 as being unpatentable over Liu in view of Xin.

Claims 15, 16, 17, and 20 stand rejected under 35 U.S.C. § 103 as being unpatentable over Liu and Xin and further in view of Yagura.

Claims 23 and 24 stand rejected under 35 U.S.C. § 103 as being unpatentable over Liu and Xin and further in view of Matsuno.

OPINION

For the reasons set forth in the brief, and below, we reverse each of the rejections.

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- I. The rejection of claims 1-4, 7, 8, 19, 21, and 22 under 35 U.S.C. § 103 as being unpatentable over Liu in view of Xin.

Beginning on page 5 of the answer, the examiner's basic position in this rejection is set forth. The examiner relies on Liu for disclosing an NPN double-heterojunction bipolar transistor comprising a base region 22, an emitter region 24, and a collector region 16. The examiner states that Liu does not disclose a layer of a p-doped indium gallium arsenide nitride on a gallium arsenide substrate. The examiner relies upon Xin for teaching a layer of a p-doped indium gallium arsenide nitride on a gallium arsenide substrate. The examiner concludes that it would have been obvious to modify Liu by having a layer of p-doped indium gallium arsenide nitride for the purpose of lowering the bandgap, reducing the strain and obtaining a better thermal stability.

We observe on page 10 of the answer, that the examiner's position with regard to the above-mentioned summary, changes in that the examiner's comments present a new rationale regarding this rejection, i.e., that Xin alone basically meets all the limitations of the claimed invention and that Liu teaches about emitter and collector compositions. Because this presents an issue of potentially a new ground of rejection, we do not address this aspect of the examiner's answer.

Beginning on page 6 of the brief, appellants point out that the teachings of Xin is a teaching of substituting a gallium indium arsenide material on a gallium arsenide substrate with a gallium indium nitride arsenide material on the gallium arsenide substrate. On page 7 of the brief, appellants point out that Xin does not teach the substitute indium gallium arsenide for any other semiconductor material including gallium arsenide. We

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agree. We observe at the bottom of page 8 and at the top of page 9 of the answer, that the examiner rebuts and states that the teaching in Xin suggest a substitute gallium indium nitride arsenide for gallium arsenide in order to reduce the bandgap and the strain as taught by Xin. However, on page 9 of the brief, appellants point out that reducing the strain would not be a motivating factor for one skilled in the art because no strain is disclosed as being present in the base layer 22 of Liu. Appellants point out that the gallium arsenide base layer 22 in Liu is formed from exactly the same material as the emitter layer 24 and the substrate 12 so that strain would not be expected to be present in the device of Liu and there would be no need to reduce strain since it is non-existent. On page 9 of the answer, the examiner rebuts and states that the substitution of gallium indium nitride arsenide for gallium arsenide may result in some increase in strain but the benefit of reducing the bandgap and lowering the turn of voltage would off set such strain. Hence, we find that the examiner has changed his position from his position originally set forth in the rejection on page 5 wherein the examiner states that it would have been obvious to modify Liu by having a layer of p-doped indium gallium arsenide nitride for the purpose of lower the bandgap, reducing the strain and obtaining a better thermal stability. Because of this uncertainty in the examiner's assertions, we determine the examiner has not met his burden of setting forth a prima facie case of obviousness.

Accordingly, in view of the above, we reverse the rejection of claims 1-4, 7, 8, 19, 21, and 22 under 35 U.S.C. § 103 as being obvious over Liu in view of Xin.

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We also reverse the other two art rejections, because the reference of Yagura and Matsuno do not cure the deficiencies of the combination of Liu in view of Xin.

II. Conclusion

Each of the rejections is reversed.

REVERSED

Bradley R. Garris)	
Administrative Patent Judge)	
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Romulo H. Delmendo)	BOARD OF PATENT
Administrative Patent Judge)	APPEALS AND
)	INTERFERENCES
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)	
Beverly A. Pawlikowski)	
Administrative Patent Judge)	

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