

P.C.

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opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.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

MAILED

JAN 29 1996

PAT.&T.M. OFFICE
BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte SATOSHI ARIMOTO

Appeal No. 95-2469
Application 08/002,012¹

ON BRIEF

Before HAIRSTON, KRASS, and BARRETT, Administrative Patent Judges.

BARRETT, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal under 35 U.S.C. § 134 from the final rejection of claims 1, 2, 4, and 6-9. Claims 5 and 10-15 have been indicated to be allowable.

¹ Application for patent filed January 8, 1993, entitled "Semiconductor Laser with Superlattice Cladding Layer."

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The claimed invention is directed to a semiconductor laser structure which has a superlattice structure on one side of an active layer. The superlattice structure is "disordered" at at least one of the laser facets. The disordering weakens the light confinement of the superlattice structure which reduces the optical density at the laser facet, resulting in suppressing the catastrophic optical damage (COD) at the emitting facet.

Claim 1 is reproduced below.

1. A semiconductor laser device comprising:
 - a first conductivity type substrate;
 - a first conductivity type cladding layer disposed on said first conductivity type substrate;
 - an active layer consisting of a single layer disposed on said first conductivity type cladding layer;
 - a second conductivity type cladding layer disposed on said active layer, the semiconductor laser having opposed facets transverse to said active layer for reflecting and transmitting light; and
 - a semiconductor superlattice structure disposed between and contacting said active layer and said second conductivity type cladding layer, said superlattice structure being disordered at at least one of the facets.

THE REFERENCES

The examiner relies on the following U.S. patents:

Takahashi et al. (Takahashi)	4,750,183	June 7, 1988
Ueno	5,151,913	September 29, 1992

THE REJECTION

Claims 1, 2, 4, and 6-9 stand rejected under 35 U.S.C. § 103 as being unpatentable over Takahashi and Ueno. The examiner finds that Takahashi discloses a semiconductor laser having superlattice structures on both sides of an active layer, but does not show disordering the superlattice structure at at least one of the facets of the laser. The examiner finds that Ueno discloses a semiconductor laser having a superlattice active layer which is disordered in the vicinity of facets of the laser to realize high power output. The examiner concludes that "[s]ince high power output is also desirable for the Takahashi laser, and Ueno teaches a simplified way to achieve this (i.e. the disordering at the facets), it would have been obvious to the artisan to provide the disordering region at the facets of the Takahashi laser for advantageously providing a high power output laser" (Examiner's Answer, page 4).

OPINION

We reverse the rejection.

Appellant objectively summarizes the teaching of Takahashi and Ueno at pages 9-10 of the Brief. Appellant first argues that "[i]t would not be obvious to modify the Takahashi laser by including dopant impurity regions adjacent the facets, as in Ueno, because, in the Takahashi laser, those dopant impurity regions would not alter the energy band gap of the active layer"

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(Brief, page 10). This is a strong argument regarding motivation. Ueno disorders the superlattice active layer. The active layer in Takahashi is not a superlattice and the examiner does not challenge appellant's assertion that including dopant impurities will not affect the energy band gap of the active layer. Therefore, there is no apparent reason why one skilled in the art would disorder the region of the facet in Takahashi if it will not affect the active layer to provide the benefits of reduced light absorption.

The examiner states that "it would have been obvious to disorder at least one of the facets of Takahashi's semiconductor laser which includes the superlattice structure as suggested by Ueno and well known in the art (as admitted by applicant)" (Examiner's Answer, page 5). Ueno discloses disordering the superlattice active layer at the facet for the purpose of reducing light absorption by the active layer. Ueno does not suggest diffusing an impurity at the facet for all possible purposes. Consequently, the examiner errs in concluding that it would have been obvious from Ueno to disorder the facets of Takahashi, when what Ueno discloses is disordering the active layer. While the examiner's proposed modification does result in the claimed invention, such outcome is only achieved via hindsight as there is no express or implied suggestion for such modification in the two references.

Appellant further argues (Brief, pages 10-11):

The very purpose of Takahashi's light-confining superlattice layers is the confinement of light. Disordering any part of those superlattice layers would be contrary to their intended function. Thus, absent some clear teaching in the art that the light-confining superlattice layers in Takahashi's laser should be disordered, Takahashi teaches away from the invention. No teaching for disturbing Takahashi's light-confining superlattice layers can be found in Ueno because Ueno disorders parts of a superlattice active layer to alter the band gap of the active layer and, thereby, reduce light absorption. That teaching directed to reducing light lost through absorption does not suggest modification of superlattice light-confining layers because the light-confining layers confine light, they do not absorb light. While Ueno and the invention are directed to achieving the same result, reduction of localized heating, Ueno's laser and the claimed laser achieve those two results in two totally different ways, i.e., reduced light absorption and reduced power density by relaxed light confinement. One of these ways does not suggest the other.

We agree with appellant's arguments. Takahashi discloses that the superlattices sandwiching the active layer are optical guiding layers which "simultaneously achieve the complete confinement of light within the active layer and highly efficient injection of carrier from the optical guiding layers into the active layer" (column 5, lines 46-49). Disordering the superlattices will interfere with the light guiding properties and, accordingly, there must be some reason why one skilled in the art would seek to make this modification. Ueno discloses selectively diffusing an impurity at the facet to disorder the superlattice active layer to reduce light absorption, not to disorder a superlattice optical guiding layer to weaken light

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