

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.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. 93

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte SHUNPEI YAMAZAKI and YUJIRO NAGATA

Appeal No. 2000-1642
Application No. 08/104,264

HEARD: May 18, 2004

Before HAIRSTON, GROSS, and BLANKENSHIP, Administrative Patent Judges.

BLANKENSHIP, 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 81-90, 92, and 96-98, which are all the claims remaining in the application.

We reverse.

BACKGROUND

The invention is directed to a thin film transistor. Representative claim 81 is reproduced below.

81. A thin film transistor comprising:

a pair of source and drain regions;

a channel region between said source and drain regions; and

a gate electrode adjacent to said channel region with a gate insulating film interposed therebetween,

said channel region comprising an amorphous silicon semiconductor material doped with a recombination center neutralizer selected from the group consisting of H, a halogen and a combination thereof;

said pair of source and drain regions comprising a non-single crystal semiconductor material doped with a recombination center neutralizer selected from the group consisting of H, a halogen and a combination thereof, and having an impurity conductivity type to form junctions in contact with said channel region,

wherein at least a portion of said gate insulating film which is in direct contact with said channel region comprises a nitride.

The examiner relies on the following references:

Ovshinsky et al. (Ovshinsky)	4,605,941	Aug. 12, 1986
	(effective filing date on or before Oct. 10, 1980)	
Yamazaki (Yamazaki '330)	55-11330	Jan. 26, 1980
(Japanese Kokai Patent Application) ¹		

¹ With English translation provided by the USPTO, dated Jul. 2000.

Appeal No. 2000-1642
Application No. 08/104,264

Yamazaki (Yamazaki '663) 55-50663 Apr. 12, 1980
(Japanese Kokai Patent Application)²

A. Madan et al. (Madan), Investigation Of The Density Of Localized States In a-Si Using The Field Effect Technique, Journal of Non-Crystalline Solids 20, pp. 239-257 (1976).

LeComber et al. (LeComber), Amorphous-Silicon Field-Effect Device and Possible Application, Electronics Letters Vol. 15 No. 6, pp. 179-181 (Mar. 15, 1979).

Matsumura et al. (Matsumura), a-Si FET IC integrated on a glass substrate (with English translation (5 pages)), National Convention Record, The Institute of Electronics and Communication Engineers of Japan, p. 2-287 et seq. (Mar. 1980).

Claims 81-90, 92, and 96-98 stand rejected under 35 U.S.C. § 103 as being unpatentable over Matsumura, Yamazaki '330, LeComber, Ovshinsky, Madan, and Yamazaki '663.

We refer to the Final Rejection (Paper No. 53) and the Examiner's Answer (Paper No. 61) for a statement of the examiner's position and to the Brief (Paper No. 58) and the Reply Brief (Paper No. 63) for appellants' position with respect to the claims which stand rejected.

OPINION

This case turns on substantially the same issues that were before this panel of the board in an earlier appeal in a related application (Appeal No. 1999-1466, Application No. 08/371,486). In that appeal we were persuaded by the appellants that

² With English translation provided by the USPTO, dated Jul. 2000.

Appeal No. 2000-1642
Application No. 08/104,264

the disclosures of the applied references did not support the teachings attributed to them by the rejection. We reach the same conclusion in this case.

The instant rejection relies on LeComber (and, secondarily, on Madan) for suggestion of a gate insulating film that comprises a nitride. The rejection relies on Matsumura for the general teaching related to the claimed source, drain, and channel regions. However, Matsumura, as appellants note (Brief at 11), teaches silicon oxide gate insulating films.

Appellants argue that the transistor of LeComber utilizes a Schottky junction that is “entirely different” from the transistor structure disclosed by Matsumura. Further, appellants allege that LeComber does not discuss any advantages associated with the use of a silicon nitride gate insulating layer so as to motivate the artisan to make the combination that is contemplated by the rejection. (Brief at 13.) With regard to Madan, appellants argue that the reference teaches that quartz or Si_3N_4 is superior to thin soda glass, but discloses no advantages of silicon nitride with respect to silicon oxide. (Brief at 10-11.)

The examiner responds that both silicon oxide and silicon nitride gate insulating films in field effect transistor devices were well known at the time of invention, and that their practice in thin film transistor devices would not have been unobvious. Further, Madan is deemed as appearing to suggest that nitride is superior, or, in any event, the teachings of LeComber and Madan show the obviousness of nitride as a gate insulating film. (Answer at 5-6.)

Our findings with respect to the disclosures of LeComber, Madan, and Matsumura, and the conclusions we draw therefrom, are unchanged from our opinion in the earlier appeal. The pertinent part of our earlier opinion is reproduced below.

The abstract of LeComber discusses the characteristics of an insulated-gate field-effect transistor made from amorphous silicon. The description of the structure shown in Figure 1, at pages 179 and 180 of LeComber, is limited to discussion of an IGFET. We find no suggestion that the silicon nitride film used in the IGFET is also recommended, or even suitable, for a device having the type of junctions in the Matsumura device.

We agree with appellants that the teaching of LeComber would not have been considered by the artisan as applicable to the type of device disclosed by Matsumura, and thus would not have suggested modification of the device... [T]he references disclose different structures, and LeComber does not discuss the reference's teachings as applied to other environments. Nor has the examiner supplied evidence (i.e., explanatory or supporting references) in support of the assertion, or provided a convincing rationale as to why LeComber, taken with Matsumura, would have rendered obvious the proposed modification.

....

We find...that the description of Figures 1(a) and 1(b), on pages 241 and 242 of Madan, refers to "field electrode" F and to A_1 , A_2 as "surface electrodes for current measurement." Absent additional evidence or a convincing rationale from the examiner as to why the disclosure of Madan would be applicable to the structures disclosed by Matsumura, including the source and drain regions with the associated boundaries, we agree with appellants that the teachings of Madan would not have been seen as applicable to a thin film transistor device as disclosed by Matsumura.

Even if, as the rejection implies, Madan's disclosure of quartz and silicon nitride may have suggested the interchangeability of silicon dioxide and silicon nitride, any suggestion of interchangeability would not necessarily go beyond the specific application disclosed by Madan. Madan compares quartz and silicon nitride to thin soda glass used in

Appeal No. 2000-1642
Application No. 08/104,264

earlier experiments (page 242). There is no express suggestion that quartz and silicon nitride may be used interchangeably in the semiconductor arts in general, nor express suggestion for use in the specific type of device disclosed by Matsumura. Since the evidence before us does not support the examiner's findings with respect to the disclosure of Madan, we agree with appellants that Madan would not have suggested substituting the silicon dioxide gate insulator of Matsumura with a gate insulator of silicon nitride.

We are thus persuaded by appellants that a prima facie case for unpatentability of the claimed subject matter as a whole has not been established on this record. We do not sustain the rejection of claims 81-90, 92, and 96-98 under 35 U.S.C. § 103 as being unpatentable over Matsumura, Yamazaki '330, LeComber, Ovshinsky, Madan, and Yamazaki '663.

Appeal No. 2000-1642
Application No. 08/104,264

CONCLUSION

The rejection of claims 81-90, 92, and 96-98 under 35 U.S.C. § 103 is reversed.

REVERSED

KENNETH W. HAIRSTON
Administrative Patent Judge

ANITA PELLMAN GROSS
Administrative Patent Judge

HOWARD B. BLANKENSHIP
Administrative Patent Judge

)
)
)
)
)
) BOARD OF PATENT
) APPEALS
) AND
) INTERFERENCES
)
)
)
)

Appeal No. 2000-1642
Application No. 08/104,264

ERIC ROBINSON
PMB 955
21010 SOUTHBANK ST.
POTOMAC FALLS , VA 20165