Atty. Docket No. MIT-001-RX1

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE PATENT OF:	:	
Joseph BERNSTEIN et al.	:	PATENT NO.: 6,057,221
SERIAL NO.: 08/825,808	:	ISSUE DATE: May 2, 2000
FILING DATE: April 3, 1997	:	CONTROL NO.:
ASSIGNEES:	:	

MASSACHUSETTS INSTITUTE OF TECHNOLOGY;
THE UNIVERSITY OF MARYLAND

FOR: LASER-INDUCED CUTTING OF METAL INTERCONNECT

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By: /Judy Ryan/
Judy Ryan

REQUEST FOR *EX PARTE* REEXAMINATION UNDER 35 U.S.C. 302 AND 37 C.F.R. 1.510

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SIR:

Reexamination of the above-identified patent is respectfully requested in view of the following statements and the accompanying Amendment.

Identification of Claims for Which Reexamination is Requested

In accordance with 37 C.F.R. 1.510, reexamination of Claims 1-4 and 6-21 of U.S. Patent No. 6,057,221 (hereinafter the "'221 patent") is requested in view of the following references:

U.S. Patents:

- Lee et al., U.S. Patent No. 5,608,257 (hereinafter "Lee");
- Lou et al., U.S. Patent No. 5,729,042 (hereinafter "Lou");
- McClure et al., U.S. Patent No. 4,826,785 (hereinafter "McClure");
- Nishimura et al., U.S. Patent No. 5,872,389 (hereinafter "Nishimura").

Foreign Patent Publications and Non-Patent Literature Documents:

- Koyou, Japan Pat. Appl. Publ. No. 8-213465, published Aug. 20, 1996, and corresponding Non-Patent Literature Document (hereinafter "NPL"), Cite No. 1 (hereinafter "Koyou");
- Matsumoto, Japan Pat. Appl. Publ. No. 6-104338, published Apr. 15, 1994, and corresponding NPL, Cite No. 3 (hereinafter "Matsumoto"); and
- Wada et al., Japan Pat. Appl. Publ. No. 6-244285, published Sep. 2, 1994, and corresponding NPL, Cite No. 2 (hereinafter "Wada").

Reexamination of the Claims in the '221 patent based on the above-cited references is requested as follows:

1. Reexamination of Claims 1-2, 6-9, 11, 13-16, and 19-21 is requested in view of Nishimura.

2. Reexamination of Claims 1 and 6-8 is requested in view of Wada.

3. Reexamination of Claim 1 is requested in view of Matsumoto.

4. Reexamination of Claim 1 is requested in view of Lee.

5. Reexamination of Claims 1, 3-4 and 11 is requested in view of Koyou.

6. Reexamination of Claims 10, 17-18 and 21 is requested in view of Nishimura and Koyou.

7. Reexamination of Claims 10, 16 and 21 is requested in view of Nishimura and Wada.

8. Reexamination of Claims 12-13 and 19 is requested in view of Wada and McClure.

9. Reexamination of Claims 12-15 and 19 is requested in view of Wada and Lou.

10. Reexamination of Claim 12 is requested in view of Nishimura and McClure.

11. Reexamination of Claim 12 is requested in view of Nishimura and Lou.

12. Reexamination of Claims 17-18 is requested in view of Koyou and McClure.

13. Reexamination of Claims 17-18 is requested in view of Koyou and Lou.

14. Reexamination of Claim 21 is requested in view of Wada, McClure and Koyou.

15. Reexamination of Claim 21 is requested in view of Wada, Lou and Koyou.

For the reasons given herein, Claims 3-4, 11, 14-15 and 17-18 of the '221 patent are enforceable and/or patentable; Claims 6-8, 13 and 21 as amended are enforceable and/or patentable; and new Claims 22-29 are enforceable and/or patentable.

Statement Pointing Out Each Substantial New Question of Patentability

Each of the references listed above is believed to raise a substantial new question of patentability (hereinafter "SNQ") as to claims of the '221 patent as detailed in this Statement. Except for Lee, none of the references cited above were of record in the prior concluded examination of the '221 patent.

Prosecution History Summary

The application for the '221 patent (U.S. Pat. Appl. No. 08/825,808; hereinafter, the "'808 application") was filed on April 3, 1997. On April 14, 1999, the Examiner issued a Restriction Requirement requiring restriction to one of the following two groups: Group I (Claims 20-41) drawn to a method of making a semiconductor device; and Group II (Claims 1-19) drawn to a semiconductor device. In response, Patentees elected Group I (Claims 20-41), drawn to a method of making a semiconductor device.

Claim 20, the sole independent claim remaining after Patentees' election, recited (at the time of the election) a method for cutting a link between interconnected circuits comprising the steps of directing a laser upon an electrically-conductive cut-link pad conductively bonded between a first electrically-conductive line and a second electrically-conductive line on a substrate, the cut-link pad having substantially less thermal resistance per unit length than each of the first and second lines, and maintaining the laser upon the cut-link pad until the laser infuses sufficient energy into the cut-link pad to break the conductive link across the pad between the pair of electrically conductive lines.

On June 3, 1999, the Examiner issued an Office Action related to the remaining pending claims (hereinafter the "Office Action"). In the Office Action, the Examiner rejected Claims 20-24, 32-33 and 36-38 under 35 U.S.C. § 102(e) as being anticipated by Lee, and objected to Claims 25-31, 34-35 and 39-41 as being dependent upon a rejected base claim (Claim 20). In the Office Action, the Examiner indicated that although the structure of the fuse disclosed by Lee is

not identical to that disclosed in the '808 application, "claim 1 as worded reads on Lee et al because the invention of Lee is directed towards a fuse absorbing a greater amount of the laser energy than the surrounding elements, similar to claim 1 as worded" (Office Action, p. 3, first paragraph). At the time of the Office Action, Claim 20 was drawn to a method of cutting a link between interconnected circuits, and recited limitations similar to the limitations of Claim 1, drawn to an electrical interconnect.

Additionally, the Examiner indicated that while there was prior art disclosing "the use of a cut-link pad having greater thermal conductivity than the conductive lines," Claims 31 and 41 were distinguishable over these prior art references (Office Action, p. 5, first full paragraph). Specifically, the Examiner noted that Sur, Jr. et al. (U.S. Pat. No. 5,882,998) "teaches the use of a thin silicide layer in the fuse region, but here the fuse is cut by an electrical current, which is different than the instant invention which uses a laser" (Office Action, p. 5, first full paragraph). Shiozaki et al. (U.S. Pat. No. 4,682,204) "teaches that the fuse has an increased heat capacity…. However, the structure used in Shiozaki et al is a composite, made up of an oxide with grooves and a polysilicon layer disposed inside of the grooves to alter the heat capacity. This differs from the instant invention in that the instant invention discloses the use of a single, continuous material" (Office Action, p. 5, first full paragraph). While Patentees agree that the claims of the '221 patent are distinguished from Shiozaki et al., Patentees do not necessarily agree with the characterization of the Examiner with regard to the use of a single, continuous material (for example, the claims of the '221 patent use the open-ended transitional term "comprising," meaning that additional materials can be present in the cut-link pad).

As to Claims 34 and 35, the Examiner noted that although Coffey et al. (U.S. Pat. No. 5,070,392; hereinafter Coffey) "discusses the use of a silicon nitride layer disposed upon the link, [ ] there is a portion of the silicon nitride layer which is removed to allow for laser cutting [citation omitted]. The technique of Coffey et al is different from the instant invention in that in the instant invention, the silicon nitride layer is maintained over the cut-link" (Office Action, p. 5, second full paragraph).

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