

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

HAMAMATSU CORPORATION
Petitioner,

v.

SIONYX, LLC
Patent Owner.

Case IPR2016-01910
Patent 8,680,591 B2

Before GEORGIANNA W. BRADEN, MATTHEW R. CLEMENTS, and
MONICA S. ULLAGADDI, *Administrative Patent Judges*.

Opinion for the Board filed by *Administrative Patent Judge* ULLAGADDI.

Opinion Concurring filed by *Administrative Patent Judge* CLEMENTS.

ULLAGADDI, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

I. INTRODUCTION

A. Background

Hamamatsu Corporation (“Petitioner”) filed a Petition (Paper 2, “Pet.”) for *inter partes* review of claims 1–26 (the “challenged claims”) of U.S. Patent No. 8,680,591 B2 (Ex. 1001, “the ’591 patent”) supported by Dr. Souris’s Declaration (Ex. 1010). SiOnyx, LLC (“Patent Owner”) timely filed a Preliminary Response (Paper 21, “Prelim. Resp.”) supported by Mr. Guidash’s Declaration (Ex. 2001). We instituted trial on claims 1, 2, 4–18, 21, and 23–26 of the ’591 patent on certain grounds of unpatentability alleged in the Petition, but declined to institute trial on claims 3, 19, 20, and 22. Paper 22 (“Institution Decision” or “Inst. Dec.”).

After institution of trial, Patent Owner filed a Request for Rehearing. Paper 24 (“Rehearing Request” or “Reh’g. Req.”). In our Decision Granting-in-Part Patent Owner’s Request for Rehearing under 37 C.F.R. § 42.71 (Paper 28, “Decision on Rehearing” or “Reh’g. Dec.”), we granted-in-part Patent Owner’s request as to claims 9, 24, and 25 and modified our Institution Decision to deny institution of claims 9, 24, and 25 for anticipation under 35 U.S.C. § 102 by Nakashiba. Reh’g. Dec. 7. We also modified the analysis in our Institution Decision to reflect the same. *Id.*

Patent Owner responded to Petitioner’s challenges by filing a Patent Owner Response, along with Mr. Guidash’s Second Declaration (Ex. 2003). Paper 29 (“PO Resp.”). Petitioner timely filed a Reply, along with Dr. Souris’s Second Declaration (Ex. 1014). Paper 32 (“Reply”).

A hearing for IPR2016-01910 was held on October 4, 2017. The transcript of the hearing has been entered into the record. Paper 50 (“Tr.”).

We have jurisdiction under 35 U.S.C. § 6. This final written decision is issued pursuant to 35 U.S.C. § 318(a).

Based on the complete record now before us, we conclude Petitioner has shown, by a preponderance of the evidence, that claims 1, 2, 4–11, 13–18, 21, and 23–25 of the '591 patent are unpatentable. We further conclude that Petitioner has failed to show, by a preponderance of the evidence, that claims 12 and 26 are unpatentable.

B. Related Proceedings

The parties inform us that the '591 patent is at issue in the following proceeding: *SiOnyx LLC, et al. v. Hamamatsu Photonics K.K., et al.*, 1:2015-cv-13488 (D. Mass.), which was originally filed on October 1, 2015. Pet. 1; Paper 20, 1.

C. The '591 Patent

The '591 patent is entitled “Photosensitive Imaging Devices and Associated Methods” and discloses a photosensitive pixel device including a semiconductor substrate with a textured region coupled thereto. Ex. 1001, [54], [57]. The textured region interacts with electromagnetic radiation by “increasing the semiconductor substrate’s effective absorption wavelength as compared to a semiconductor substrate lacking a textured region.” *Id.* at [57]. In Figure 10, reproduced below, textured region 90 is depicted as being adjacent to semiconductor substrate 72. *See id.* at 16:26–41.

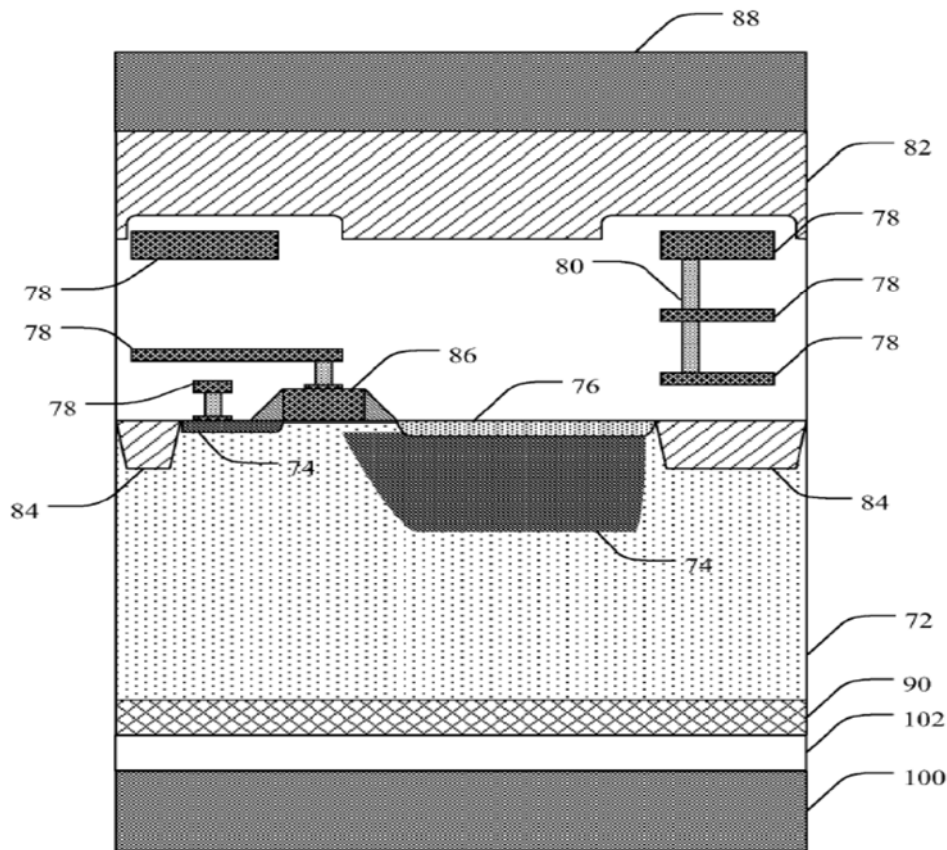


Figure 10 of the '591 patent is a schematic view of a photosensitive pixel device.

As shown in Figure 10, additional carrier support substrate 100 is coupled to the photosensitive pixel device on an opposing side from carrier support substrate 88. *Id.* at 16:26–28. Reflective layer 102 is disposed between textured region 90 and additional carrier support substrate 100. *See id.* at 16:32–33. The '591 patent discloses that “the configuration of the textured region can function to direct or focus electromagnetic radiation” into or away from the semiconductor substrate. *Id.* at 15:11–16. The '591 patent further discloses that the “location of the textured region can be used to provide enhancement and/or filtering of the incoming electromagnetic radiation.” *Id.* at 14:41–43.

The photosensitive pixel device further includes metal regions 78, at least one via 80, passivation layer 82, trench isolation 84, and electrical transfer element

86. *Id.* at 15:55–57. The '591 patent discloses that “[t]rench isolation elements can maintain pixel to pixel uniformity by reducing optical and electrical crosstalk.”
Id. at 15:57–59.

D. Illustrative Claims

As noted above, Petitioner challenges claims 1–26 of the '591 patent, of which claims 1, 13, and 23 are independent. Independent claims 1 and 23 are reproduced below.

1. A photosensitive imager device, comprising:
 - a semiconductor substrate having a substantially planar surface and multiple doped regions forming a least one junction;
 - a textured region coupled to the semiconductor substrate on a surface opposite the substantially planar surface and positioned to interact with electromagnetic radiation;
 - integrated circuitry formed at the substantially planar surface; and
 - an electrical transfer element coupled to the semiconductor substrate and operable to transfer an electrical signal from the at least one junction.

Ex. 1001, 18:33–45.

23. A photosensitive imager device, comprising:
 - a semiconductor substrate having a substantially planar surface and multiple doped regions forming a least one junction;
 - a textured region coupled to the semiconductor substrate on a surface opposite the substantially planar surface and positioned to interact with electromagnetic radiation; and
 - at least 4 transistors formed at the substantially planar surface with at least one of the transistors electrically coupled to the at least one junction.

Id. at 20:24–34.

E. The Instituted Grounds of Unpatentability

We instituted trial based on the following grounds and evidence of record:

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