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Chuang et al.

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(54) **IMAGE SENSOR, AN INSPECTION SYSTEM AND A METHOD OF INSPECTING AN ARTICLE**

(71) Applicant: **KLA-Tencor Corporation**, Milpitas, CA (US)

(72) Inventors: **Yung-Ho Alex Chuang**, Cupertino, CA (US); **Jingjing Zhang**, San Jose, CA (US); **John Fielden**, Los Altos, CA (US)

(73) Assignee: **KLA-Tencor Corporation**, Milpitas, CA (US)

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(58) **Field of Classification Search**
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See application file for complete search history.

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Primary Examiner — Kiho Kim

(74) *Attorney, Agent, or Firm* — Bever, Hoffman & Harms, LLP

(57) **ABSTRACT**

A high sensitivity image sensor comprises an epitaxial layer of silicon that is intrinsic or lightly p doped (such as a doping level less than about 10^{13} cm^{-3}). CMOS or CCD circuits are fabricated on the front-side of the epitaxial layer. Epitaxial p and n type layers are grown on the backside of the epitaxial layer. A pure boron layer is deposited on the n-type epitaxial layer. Some boron is driven a few nm into the n-type epitaxial layer from the backside during the boron deposition process. An anti-reflection coating may be applied to the pure boron layer. During operation of the sensor a negative bias voltage of several tens to a few hundred volts is applied to the boron layer to accelerate photo-electrons away from the backside surface and create additional electrons by an avalanche effect. Grounded p-wells protect active circuits as needed from the reversed biased epitaxial layer.

19 Claims, 10 Drawing Sheets

