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(54) **INGAASN/GAAS HETEROJUNCTION FOR MULTI-JUNCTION SOLAR CELLS**

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(58) **Field of Search** 257/431, 461; 136/252

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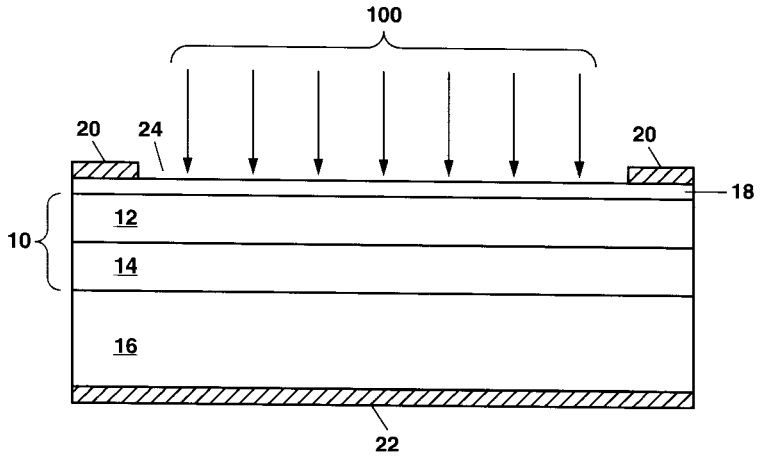
(57) **ABSTRACT**

An InGaAsN/GaAs semiconductor p-n heterojunction is disclosed for use in forming a 0.95–1.2 eV bandgap photodetector with application for use in high-efficiency multi-junction solar cells. The InGaAsN/GaAs p-n heterojunction is formed by epitaxially growing on a gallium arsenide (GaAs) or germanium (Ge) substrate an n-type indium gallium arsenide nitride (InGaAsN) layer having a semiconductor alloy composition $In_xGa_{1-x}As_{1-y}N_y$ with $0<x\leqq 0.2$ and $0<y\leqq 0.04$ and a p-type GaAs layer, with the InGaAsN and GaAs layers being lattice-matched to the substrate. The InGaAsN/GaAs p-n heterojunction can be epitaxially grown by either molecular beam epitaxy (MBE) or metalorganic chemical vapor deposition (MOCVD). The InGaAsN/GaAs p-n heterojunction provides a high open-circuit voltage of up to 0.62 volts and an internal quantum efficiency of >70%.

24 Claims, 5 Drawing Sheets