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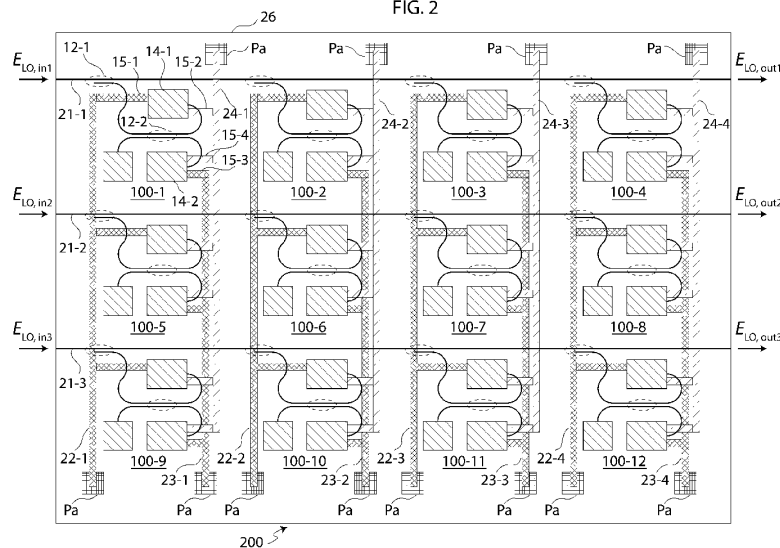
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FIG. 2



(57) Abstract: The present invention relates to a coherent detection array and methods of multiplexing for signal readout of the coherent detection array. The coherent detection array may be implemented on a photonic integrated circuit (PIC). It may comprise a plurality of coherent detection units coupling with connecting waveguides and electrical conducting paths, wherein the electrical conducting paths may manifest as readout channels for multiplexing electrical signals. The detection units may be configured to include free-space-to-waveguide couplers, optical couplers, and photodetectors. The coherent detection array enables multiplexing methods that may leverage extra degrees of freedom of the coherent detection array. These methods may include those enabled by the local oscillator and those related to the properties and responses of the components of the PIC-based detection array.

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