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(54) **Title:** QUANTUM PROCESSING ELEMENT AND QUANTUM PROCESSING SYSTEM

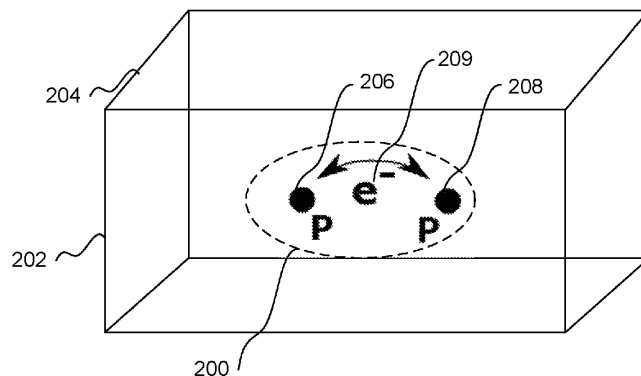


Fig. 2

(57) **Abstract:** A quantum processing system and method of operating the same are disclosed. The system includes a first qubit comprising a first unpaired electron bound to a first pair of donor clusters embedded in a semiconductor substrate at a distance from the semiconductor surface, each donor cluster in the first pair of donor clusters including at least one donor atom. The system further includes a second qubit comprising a second unpaired electron bound to a second pair of donor clusters embedded in the semiconductor substrate at a distance from the semiconductor surface, each donor cluster in the second pair of donor clusters including at least one donor atom. In addition, a microwave resonator is located between the first qubit and the second qubit, wherein a first end of the microwave resonator is coupled to the first qubit and a second end of the microwave resonator is coupled to the second qubit. A photon of the microwave resonator couples the first qubit and the second qubit.

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