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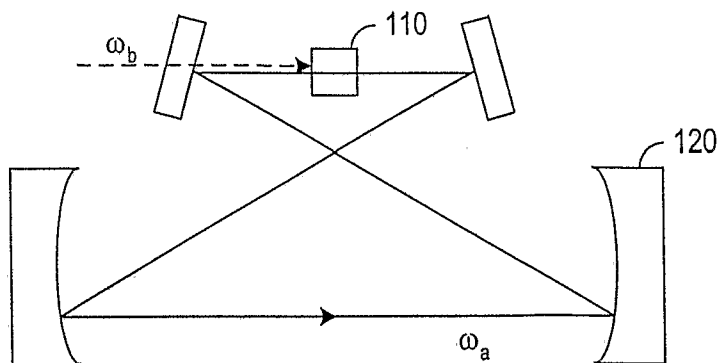
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(54) Title: QUANTUM INFORMATION PROCESSING USING ELECTROMAGNETICALLY INDUCED TRANSPARENCY

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(57) Abstract: Quantum information processing structures and methods use photons and four-level matter systems in electromagnetically induced transparency (EIT) arrangements for one and two-qubit quantum gates, two-photon phase shifters, and Bell state measurement devices. For efficient coupling of the matter systems to the photons while decoupling the matter systems from the phonon bath, molecular cages or molecular tethers keep atoms/molecules within the electromagnetic field of the photon, e.g., in the evanescent field surrounding the core of an optical fiber carrying the photons.

To reduce decoherence caused by

spontaneous emissions, the matter systems can be embedded in photonic bandgap crystals or the matter systems can be selected to include metastable energy levels.