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(54) Title: TUNABLE RESONATOR-RESONATOR COUPLING CIRCUIT AND QUANTUM COMPUTING APPARATUS COM-
PRISING THEREOF

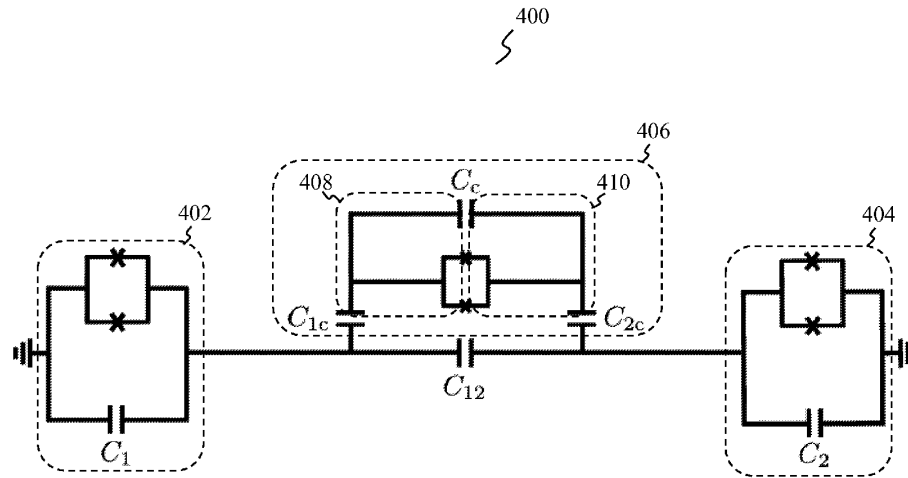


FIG. 4

(57) Abstract: The invention is generally related to the field of quantum computing and particularly to a tunable resonator resonator coupling circuit that provides both direct and indirect couplings between linear or nonlinear resonators. The indirect coupling is provided by using a tunable coupling element that comprises two ungrounded superconducting islands. Since the superconducting islands are ungrounded, it is possible to provide different signs of coupling frequencies for the resonators and the superconducting islands, which in turn allows the interaction between the first and second resonators to be controlled more efficiently. Moreover, the design, calibration, and operation of the circuit with such a tunable coupling element are significantly easier and simpler compared to the existing analogues, while providing the same or even better performance. A quantum computing apparatus using one or more such circuits is also provided.

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