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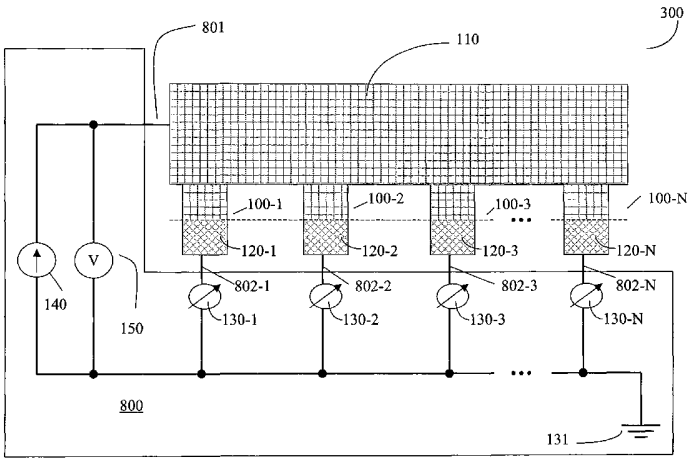
(54) Title: QUANTUM PROCESSING SYSTEM FOR A SUPERCONDUCTING PHASE QUBIT



(57) Abstract: A control system for an array of qubits is disclosed. The control system according to the present invention provides currents and voltages to qubits in the array of qubits in order to perform functions on the qubit. The functions that the control system can perform include read out, initialization, and entanglement. The state of a qubit can be determined by grounding the qubit, applying a current across the qubit, measuring the resulting potential drop across the qubit, and interpreting the potential drop as a state of the qubit. A qubit can be initialized by grounding the qubit and applying a current across the qubit in a selected direction for a time sufficient that the quantum state of the qubit can relax into the selected state. In some embodiments, the qubit can be initialized by grounding the qubit and applying a current across the qubit in a selected direction and then ramping the current to zero in order that the state of the qubit relaxes into the selected state. The states of two qubits can be entangled by coupling the two qubits through a switch. In some embodiments, the switch that is capable of grounding the qubits can also be utilized for entangling selected qubits.

WO 02/097725 A3

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G06N1/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G06N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

INSPEC, EPO-Internal, WPI Data, PAJ, IBM-TDB

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	BLAIS A ET AL: "Operation of universal gates in a solid-state quantum computer based on clean Josephson junctions between d-wave superconductors" PHYSICAL REVIEW A (ATOMIC, MOLECULAR, AND OPTICAL PHYSICS), APRIL 2000, APS THROUGH AIP, USA, vol. 61, no. 4, pages 042308/1-4, XP002231860 ISSN: 1050-2947	1-5, 8-10, 17-20, 25, 27-30, 32-36, 40,43-47
Y	the whole document	6,7

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[X] Further documents are listed in the continuation of box C.

[ ] Patent family members are listed in annex.

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

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Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Schenkels, P

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
Y	MAKHLIN Y ET AL: "Nano-electronic circuits as quantum bits" ISCAS 2000 GENEVA. 2000 IEEE INTERNATIONAL SYMPOSIUM ON CIRCUITS AND SYSTEMS. EMERGING TECHNOLOGIES FOR THE 21ST CENTURY, GENEVA, SWITZERLAND, 28-32 MARCH 2000, pages 241-244 vol.2, XP010502706 2000, Lausanne, Switzerland, Presses Polytech. Univ. Romandes, Switzerland ISBN: 0-7803-5482-6	6,7
A	the whole document	11,13, 21-24, 26,37, 41,42, 47-49

A	JONKER P ET AL: "On quantum and classical computing with arrays of superconducting persistent current qubits" PROCEEDINGS FIFTH IEEE INTERNATIONAL WORKSHOP ON COMPUTER ARCHITECTURES FOR MACHINE PERCEPTION, PROCEEDINGS FIFTH IEEE INTERNATIONAL WORKSHOP ON COMPUTER ARCHITECTURES FOR MACHINE PERCEPTION, PADOVA, ITALY, 11-13 SEPT. 2000, pages 69-78, XP002231861 2000, Los Alamitos, CA, USA, IEEE Comput. Soc, USA ISBN: 0-7695-0740-9 page 69, left-hand column, line 1 -page 71, right-hand column, line 26	1,19,32, 35,40, 44,46

A	BLATTER G ET AL: "Quantum computing with superconducting phase qubits" MESOSCOPIC SUPERCONDUCTIVITY (MS 2000), ATSUGI, JAPAN, 8-10 MARCH 2000, vol. 352, no. 1-4, pages 105-109, XP002231862 Physica C, April 2001, Elsevier, Netherlands ISSN: 0921-4534 the whole document	1,19,32, 35,40, 44,46

A	ORLANDO T P ET AL: "Superconducting persistent-current qubit" PHYSICAL REVIEW B (CONDENSED MATTER), 1 DEC. 1999, APS THROUGH AIP, USA, vol. 60, no. 22, pages 15398-15413, XP002231863 ISSN: 0163-1829 page 15398, left-hand column, line 1 -page 15410, left-hand column, line 24	1,19,32, 35,40, 44,46
