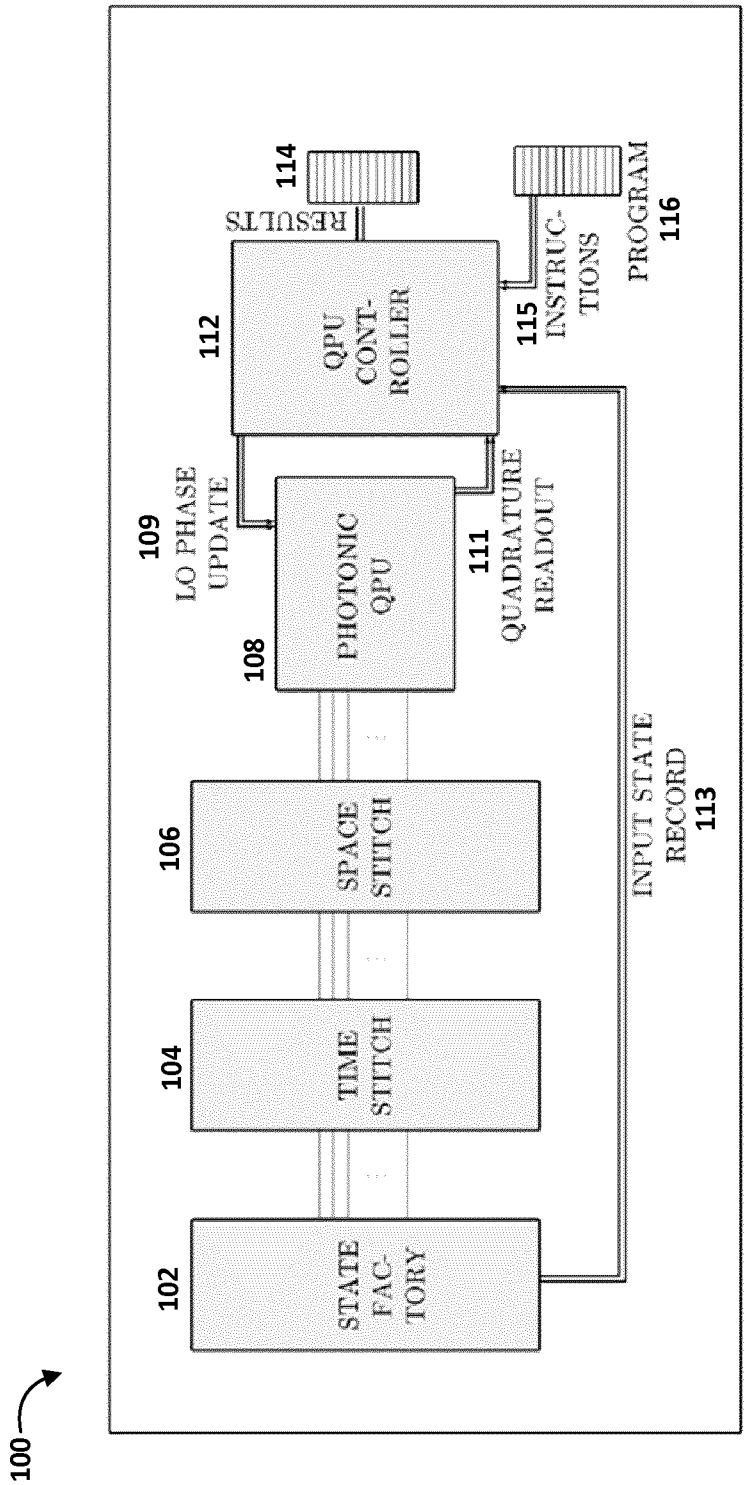

100
102
STATE FAC-TORY
104
TIME STITCH
106
SPACE STITCH
108
PHOTONIC QPU
109
LO PHASE UPDATE
111
QUADRATURE READOUT
112
QPU CONT-ROLLER
113
INPUT STATE RECORD
114
RESULTS
115
INSTRUC-TIONS
116
PROGRAM

FIG. 1

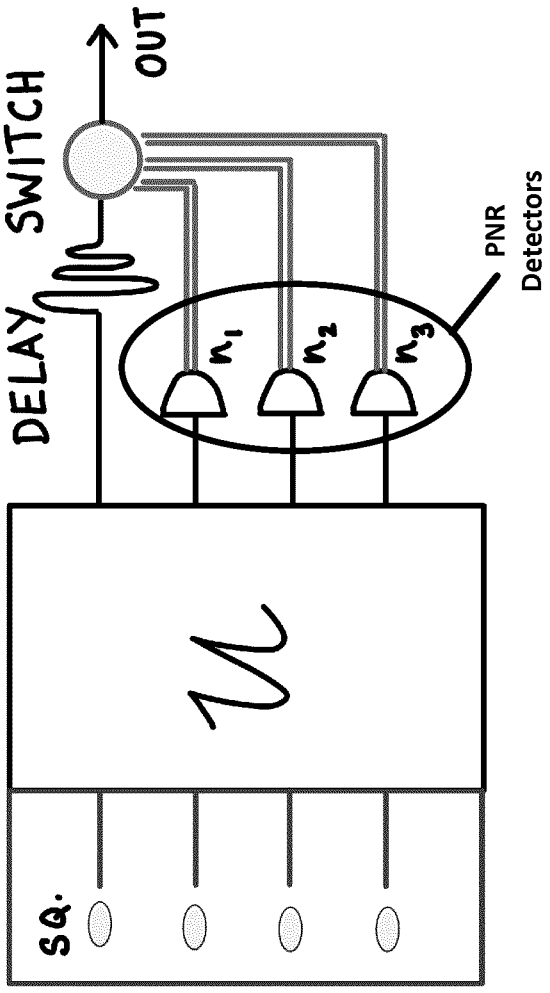


FIG. 2A

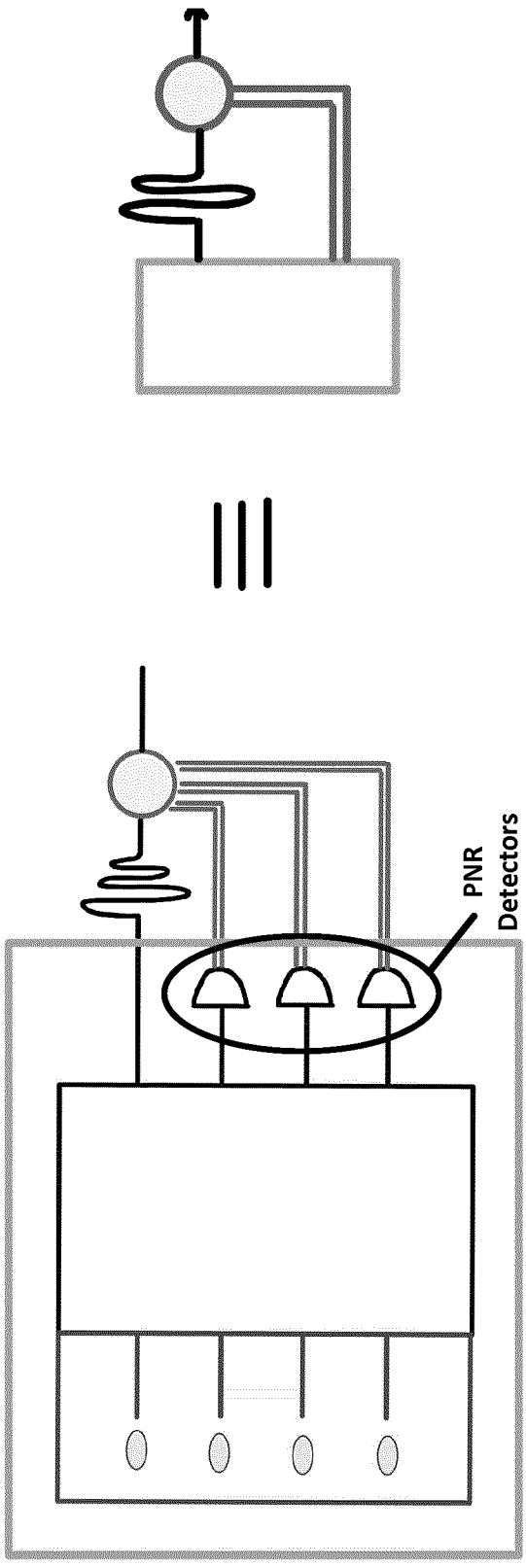


FIG. 2B

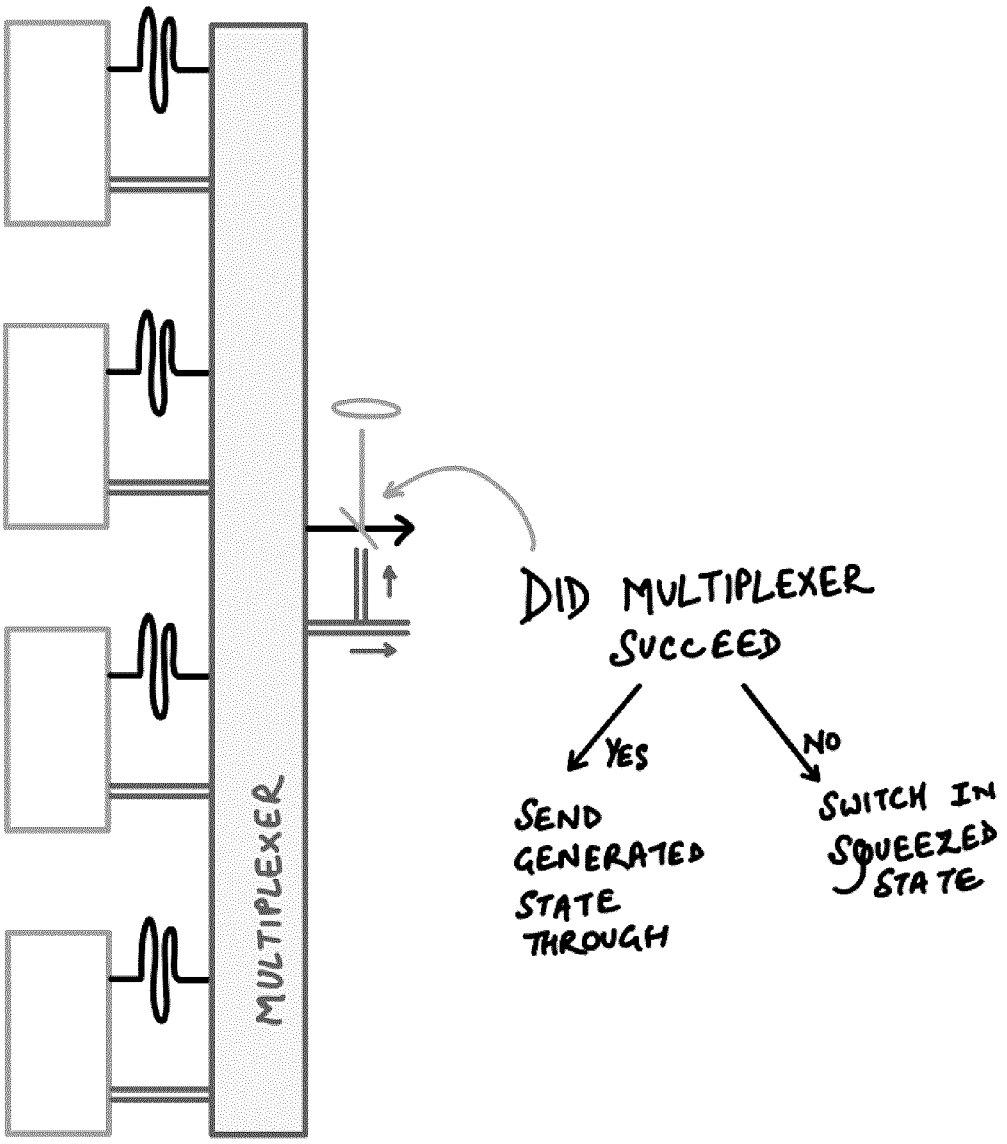

MULTIPLEXER
DID MULTIPLEXER SUCCEED
YES
NO
SEND GENERATED STATE THROUGH
SWITCH IN SQUEEZED STATE

FIG. 2C

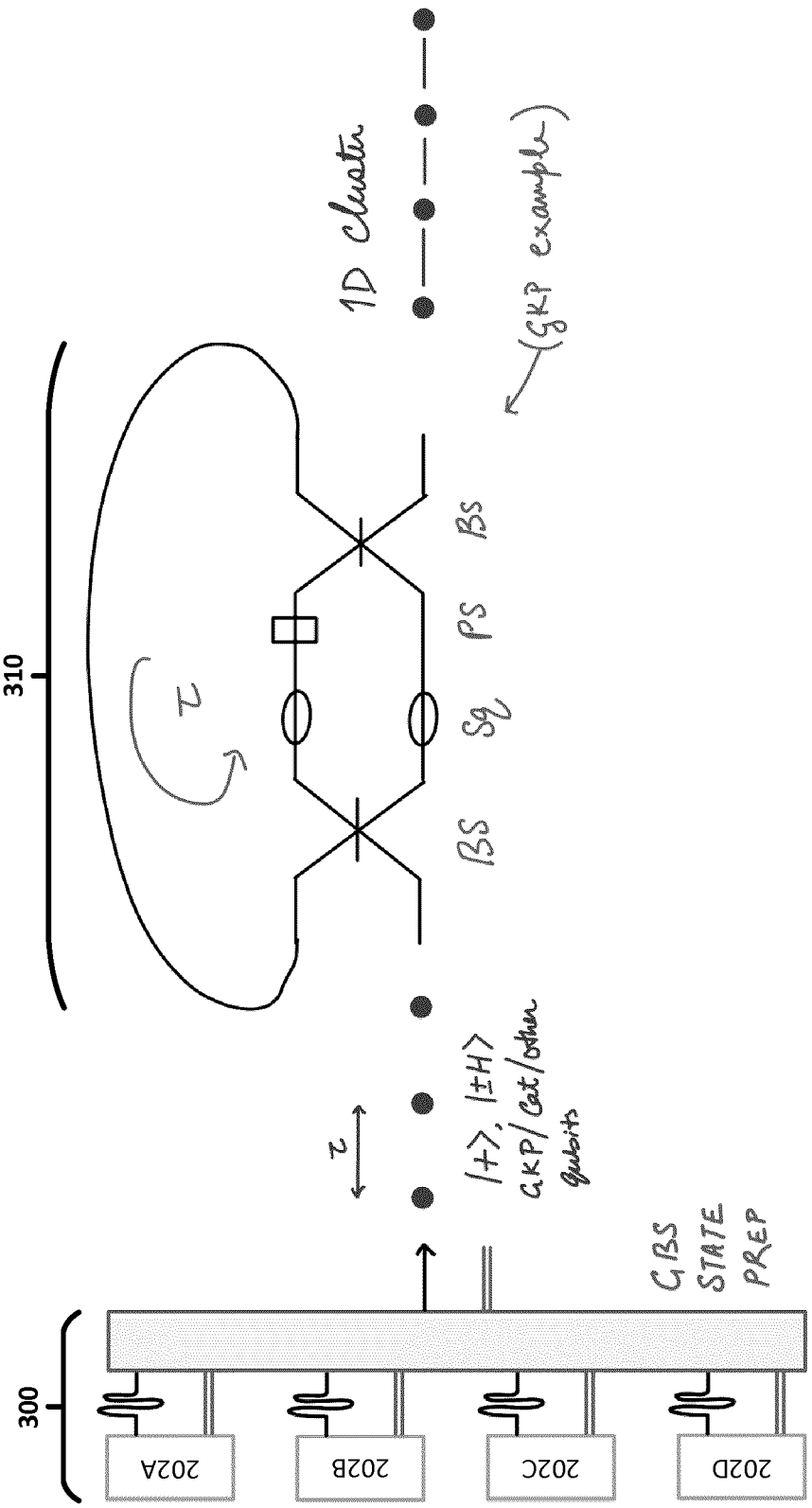

300
202A
202B
202C
202D
GBS STATE PREP
|+>, |±H>
GKP/cat/other qubits
z
310
BS
Sq
PS
BS
z
1D cluster
(GKP example)

FIG. 3A

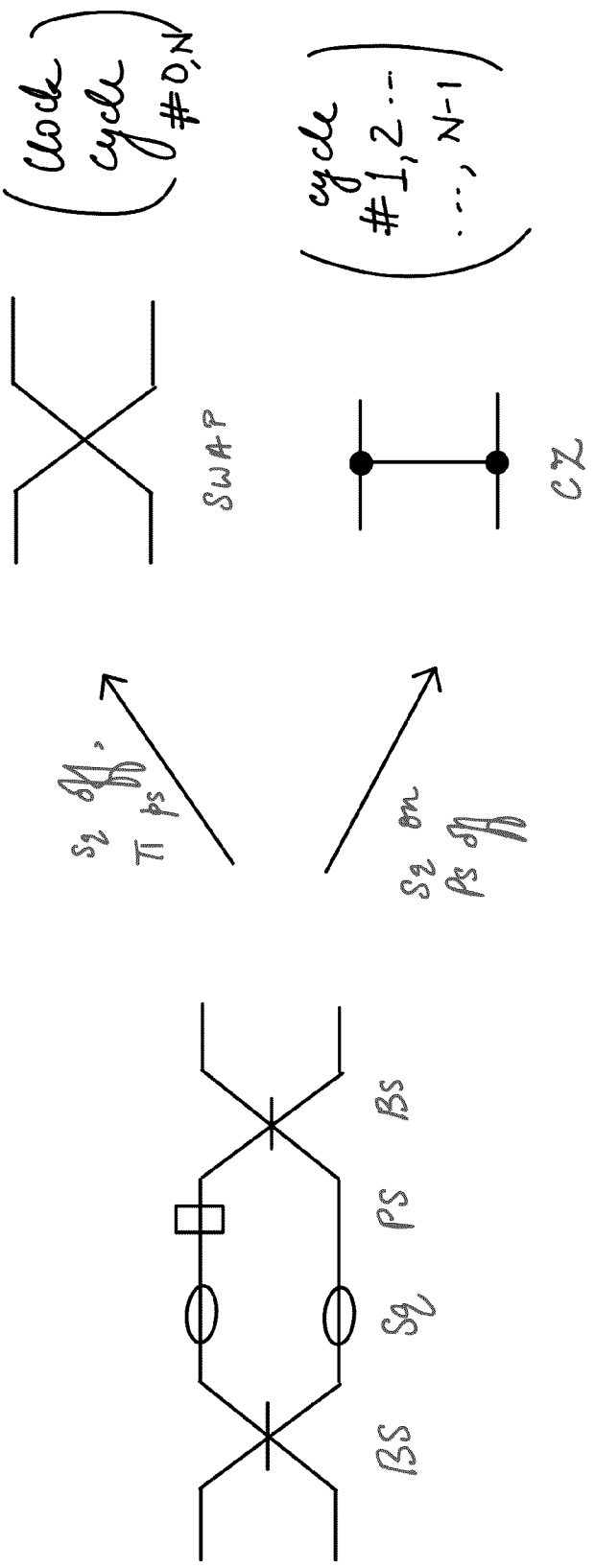


FIG. 3B

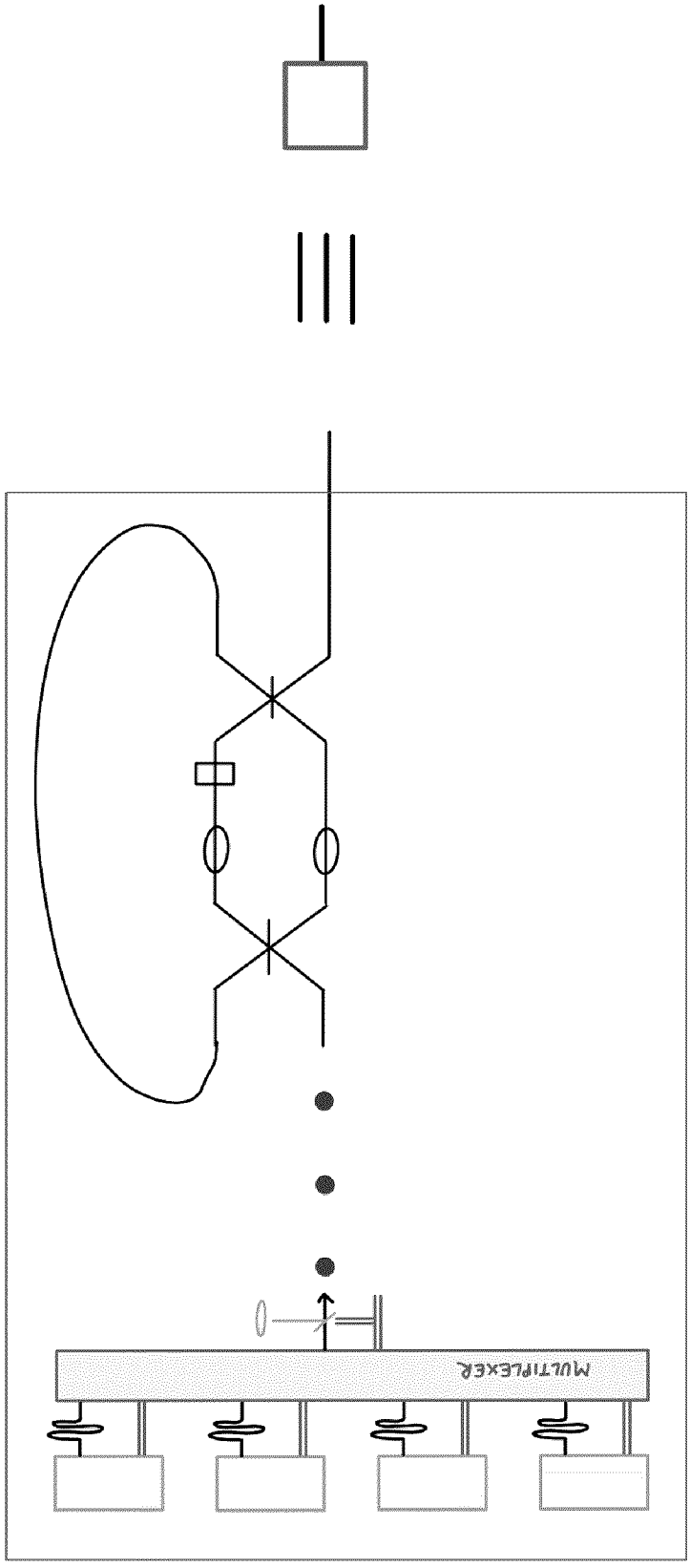


FIG. 3C

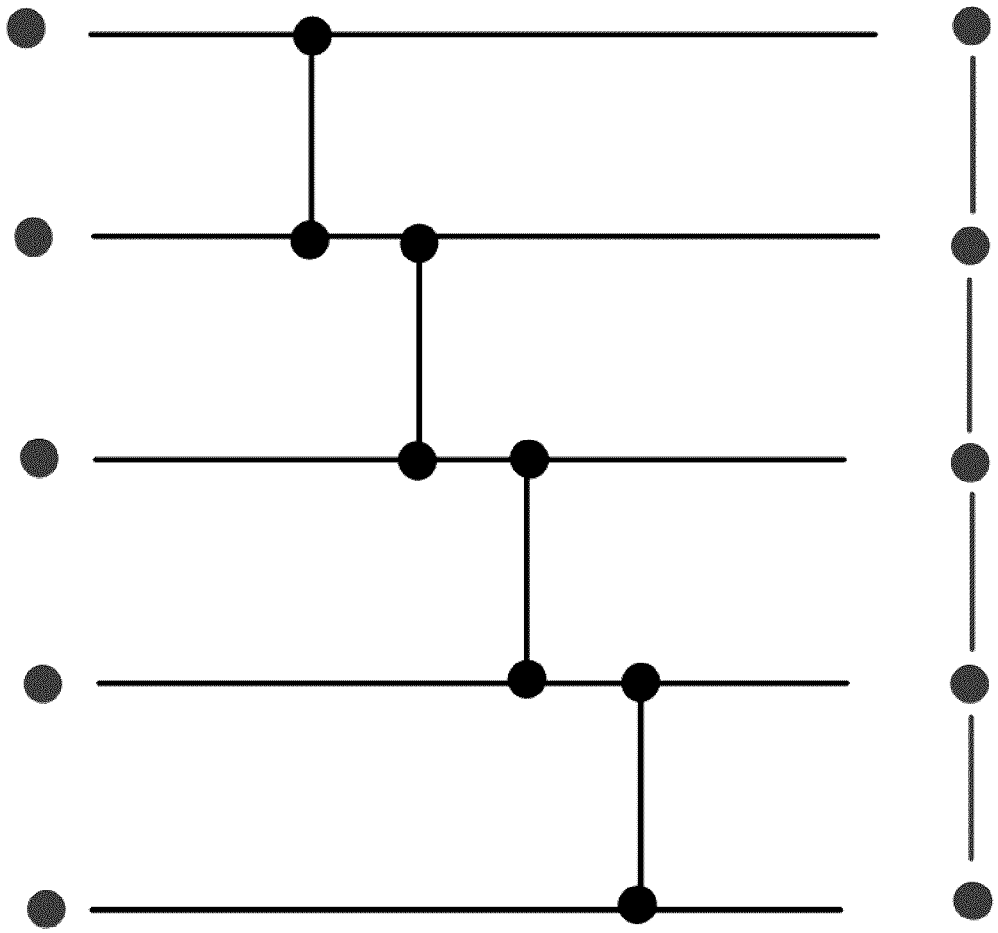


FIG. 4

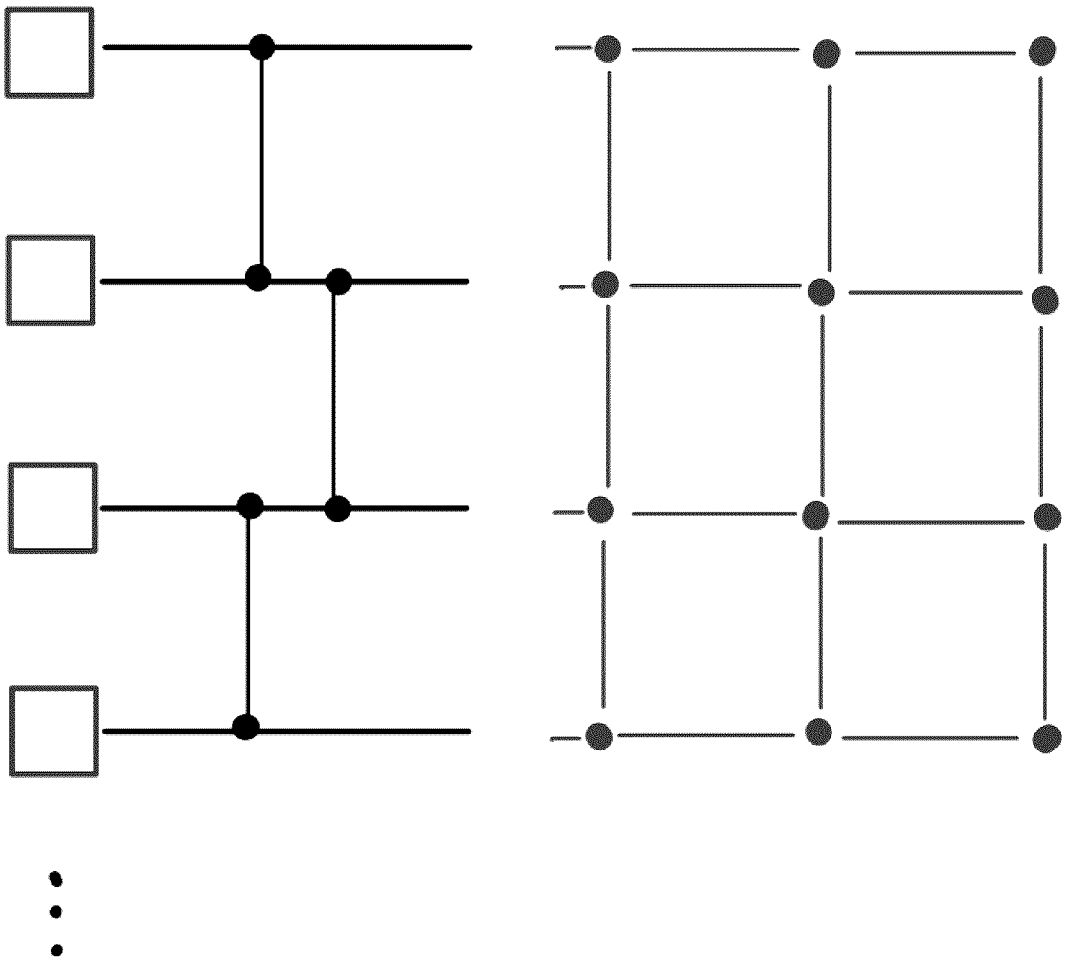


FIG. 5A

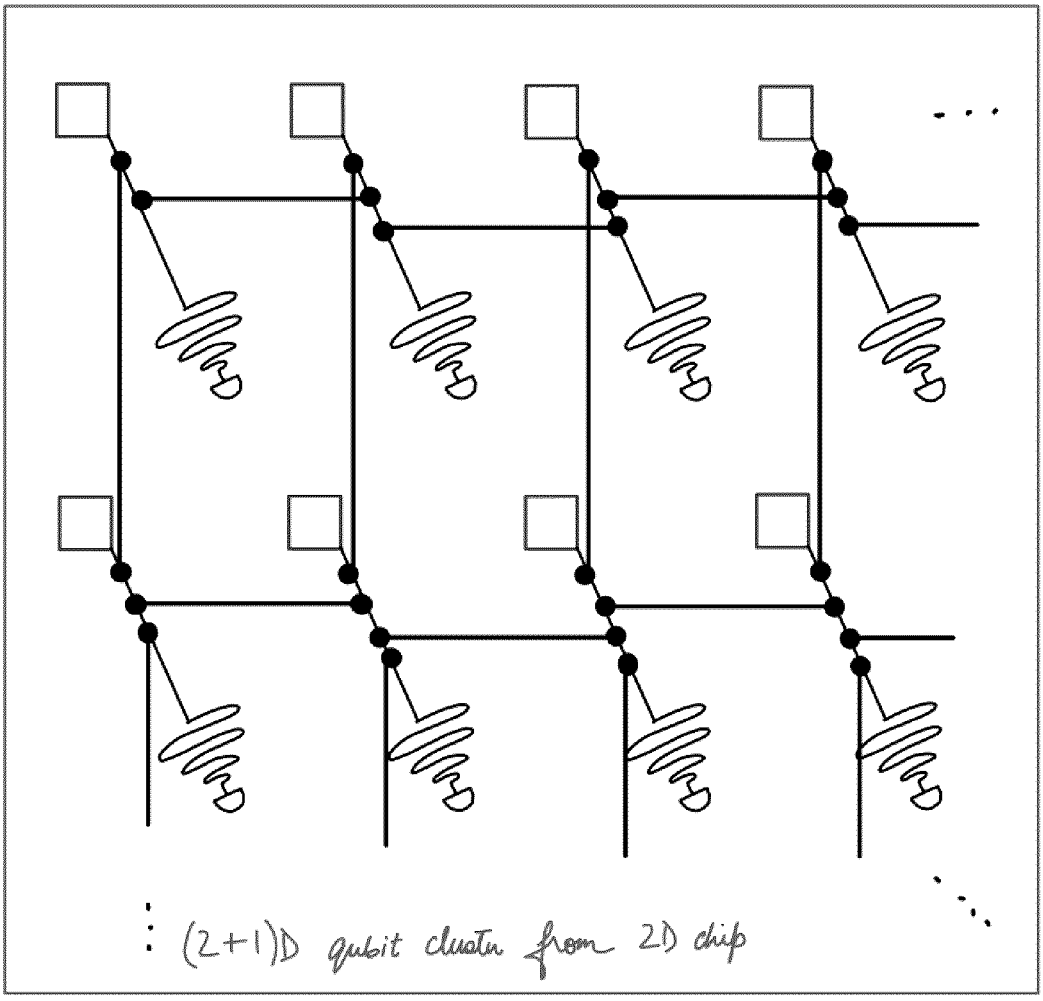


FIG. 5B

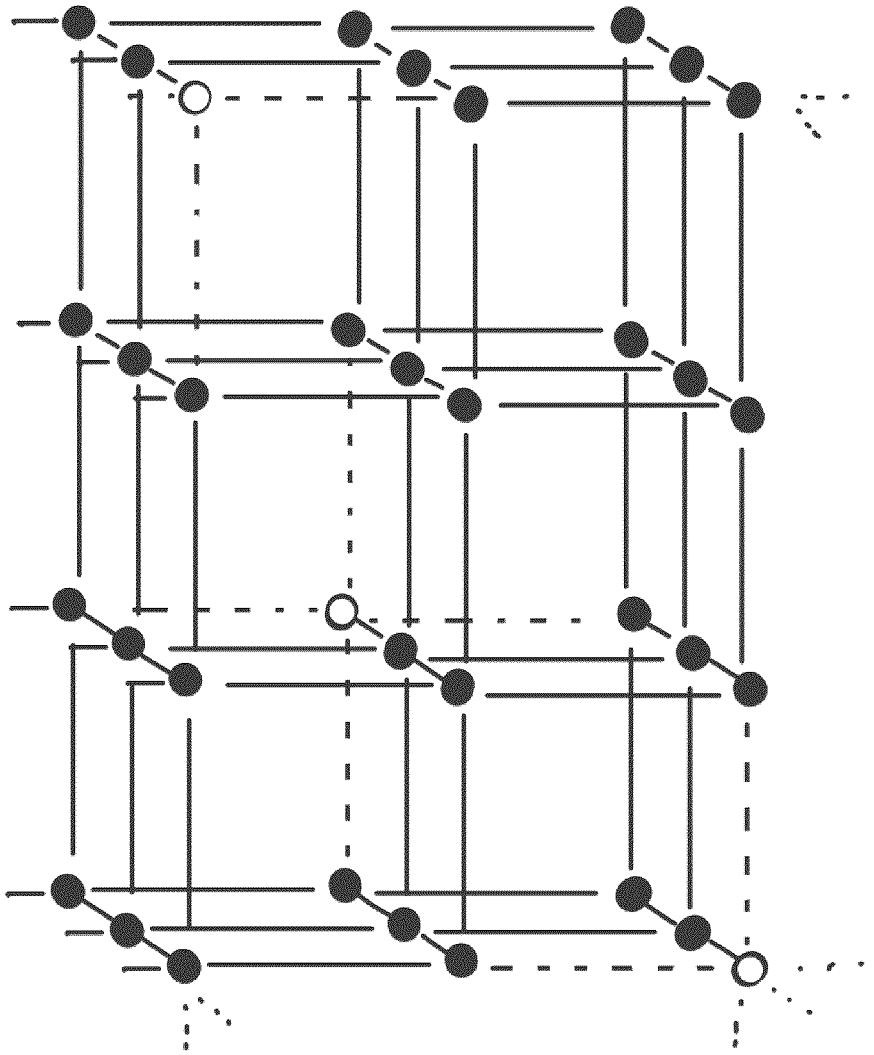


FIG. 5C

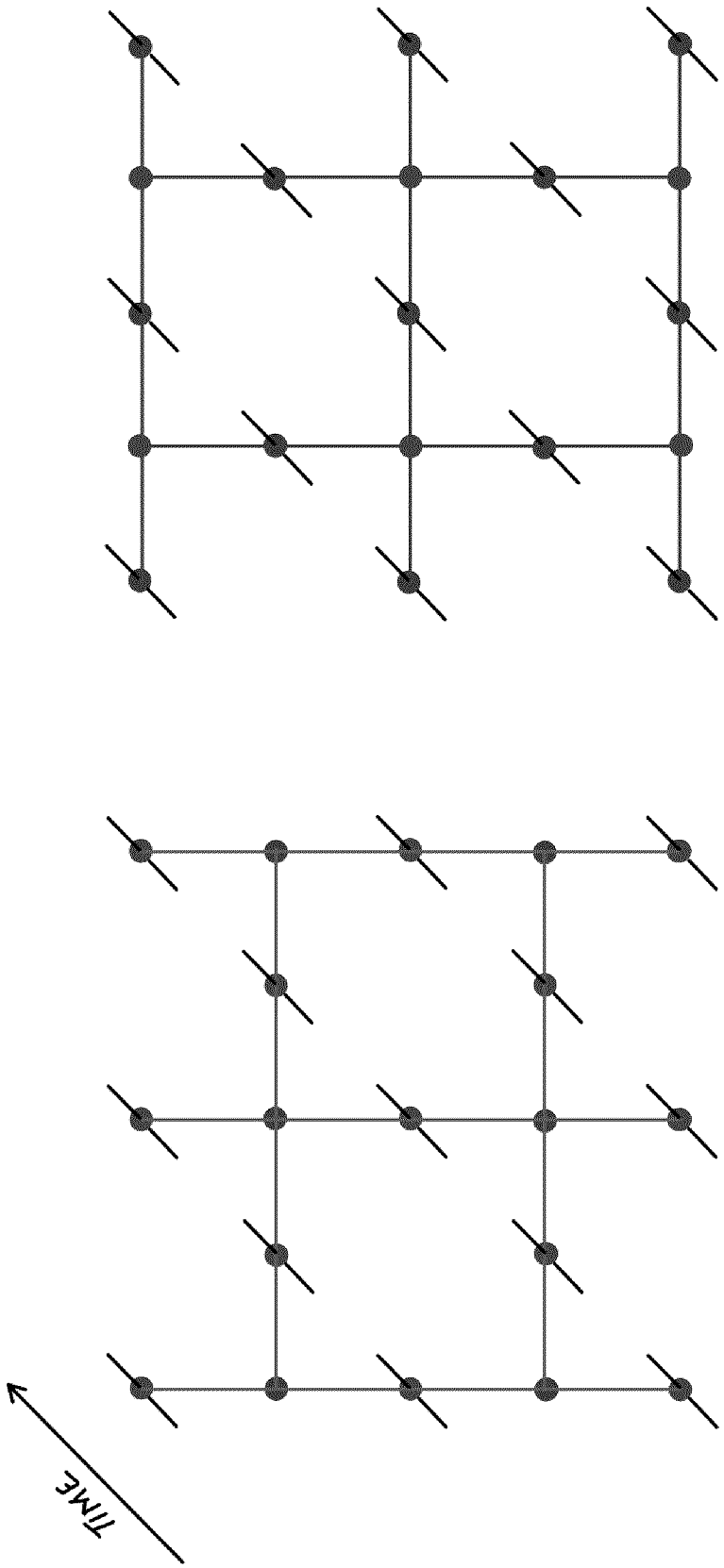


FIG. 6A

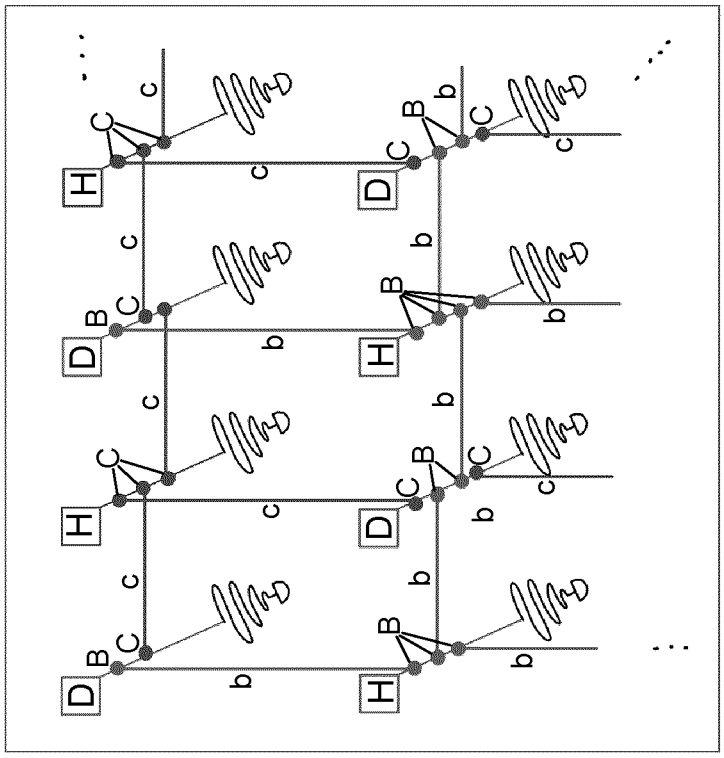


FIG. 6C

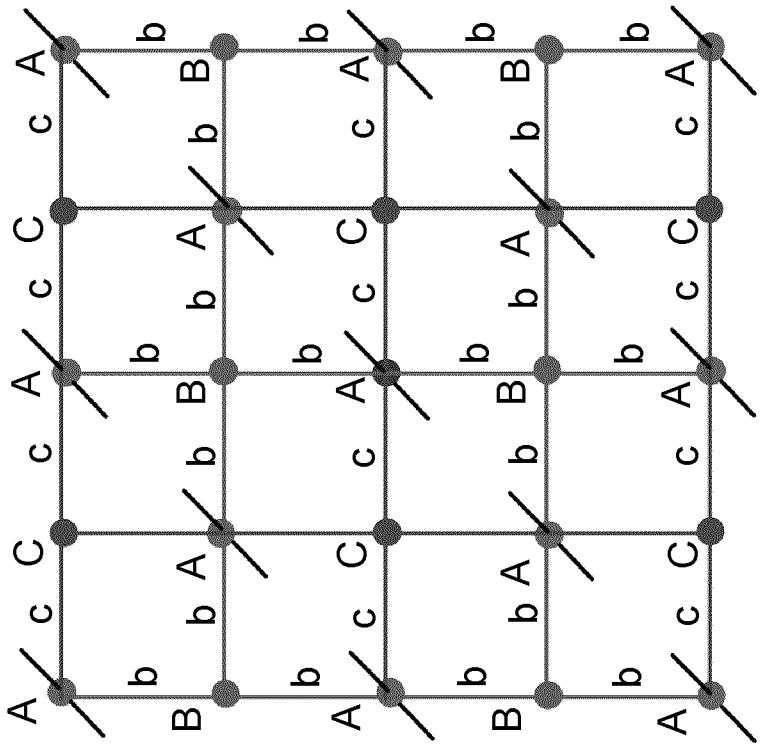


FIG. 6B

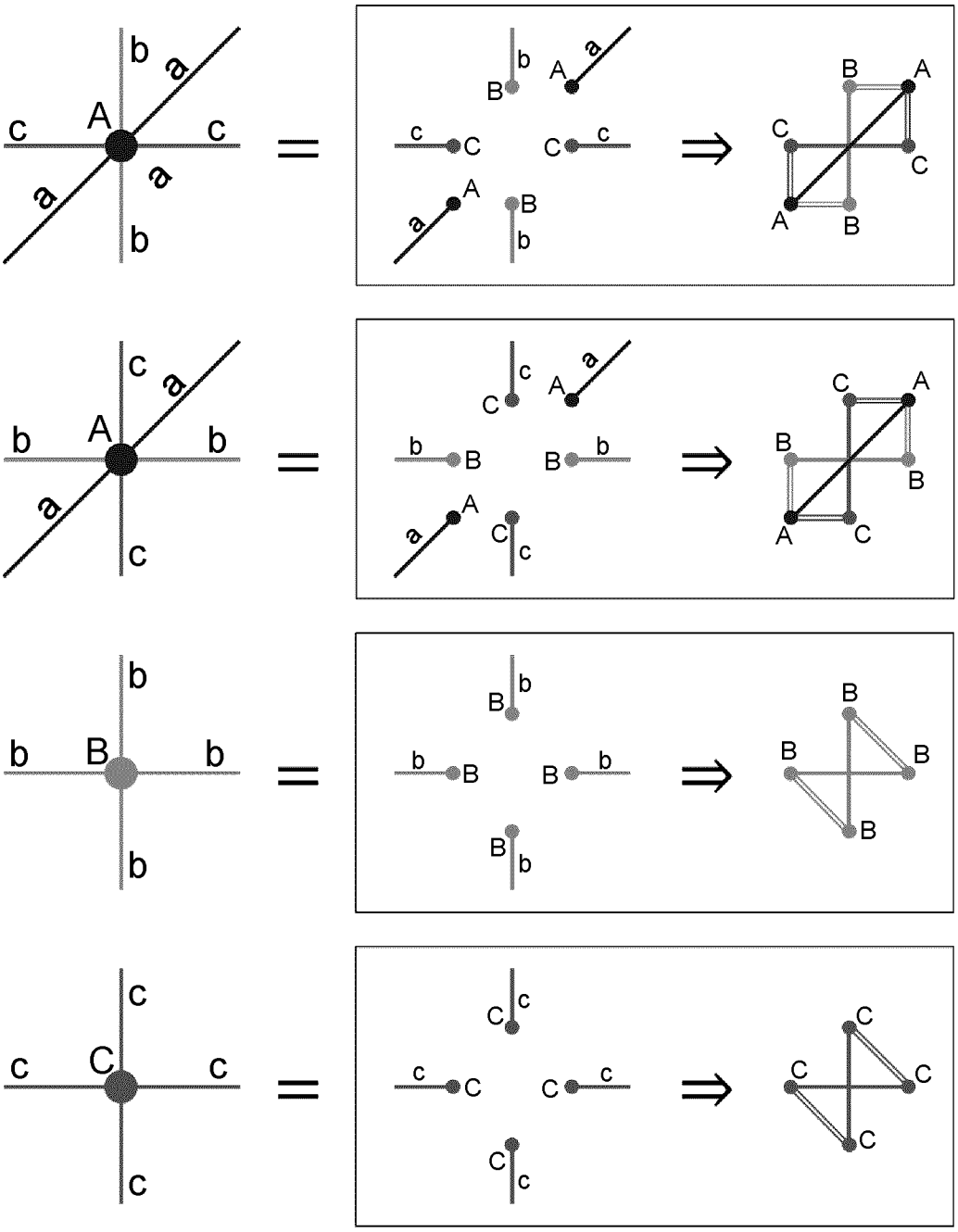

b
a
c
A
c
a
a
b
=
b
A
a
B
c
C
C
c
a
A
B
b
⇒
B
A
C
C
A
B
c
a
b
A
b
a
b
c
=
c
A
a
C
b
B
B
b
a
A
C
c
⇒
C
A
B
B
A
C
b
b
B
b
=
b
B
b
b
B
B
b
b
⇒
B
B
B
B
c
c
C
c
=
c
C
C
c
C
c
⇒
C
C
C
C

FIG. 7

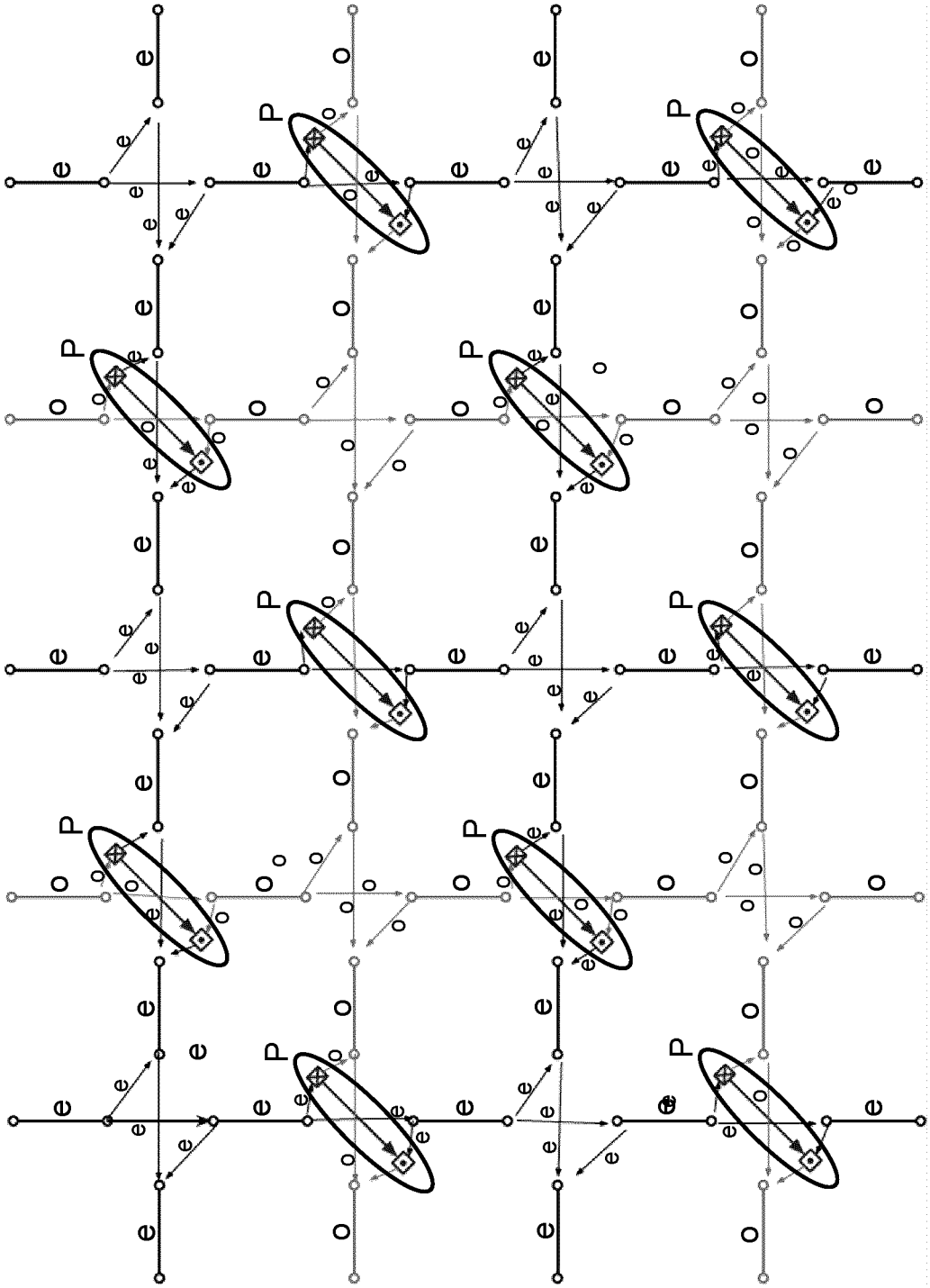


FIG. 8

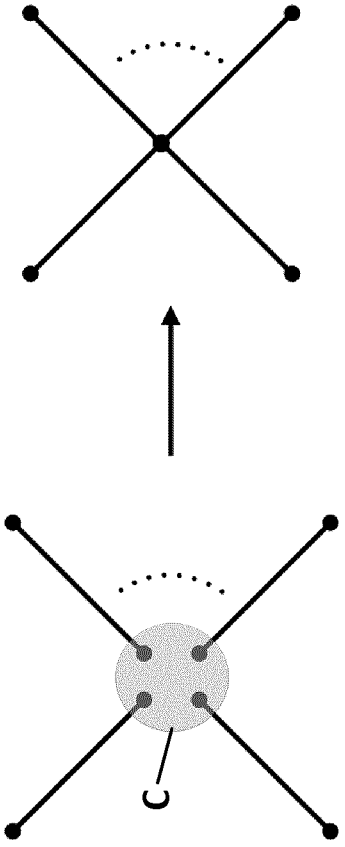


FIG. 9

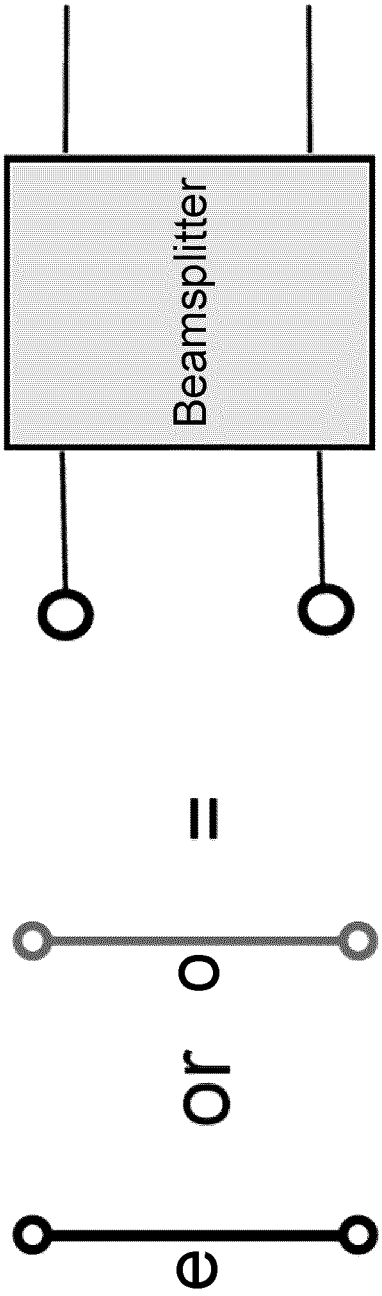


FIG. 10A

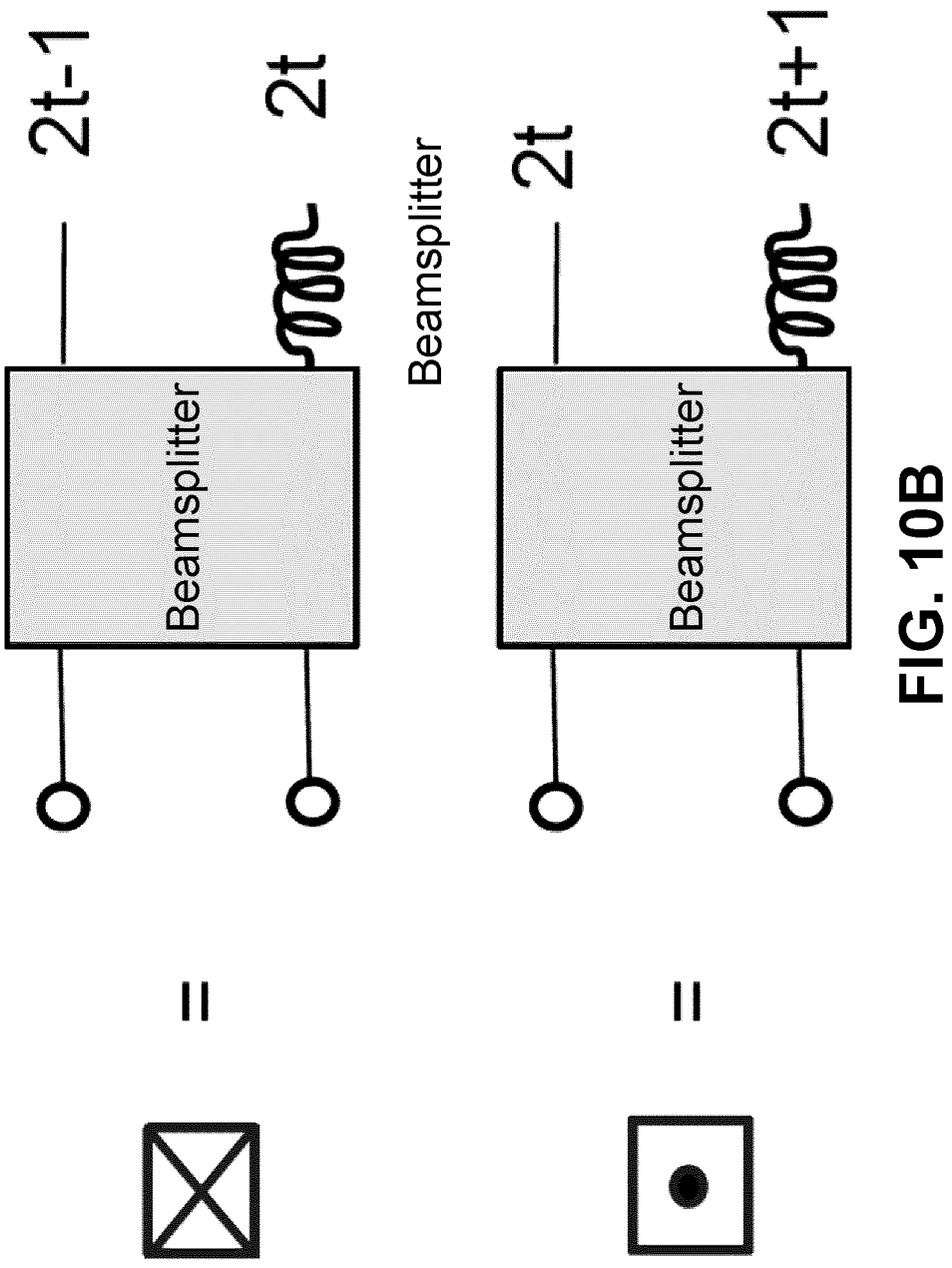


FIG. 10B

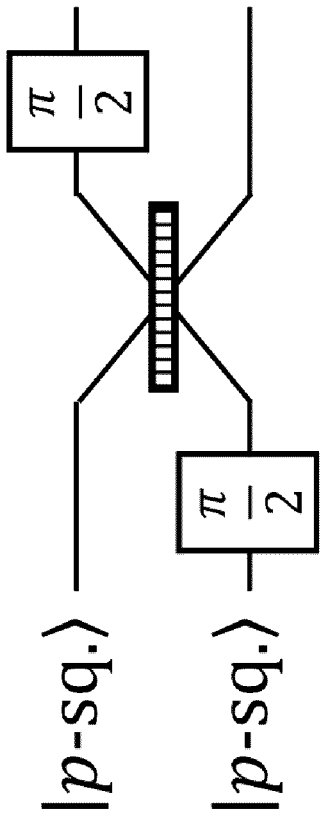


FIG. 11A

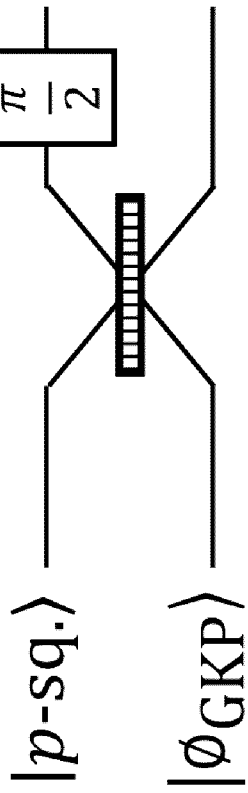


FIG. 11B

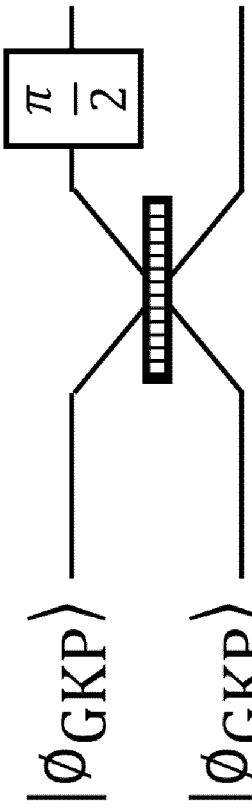


FIG. 11C

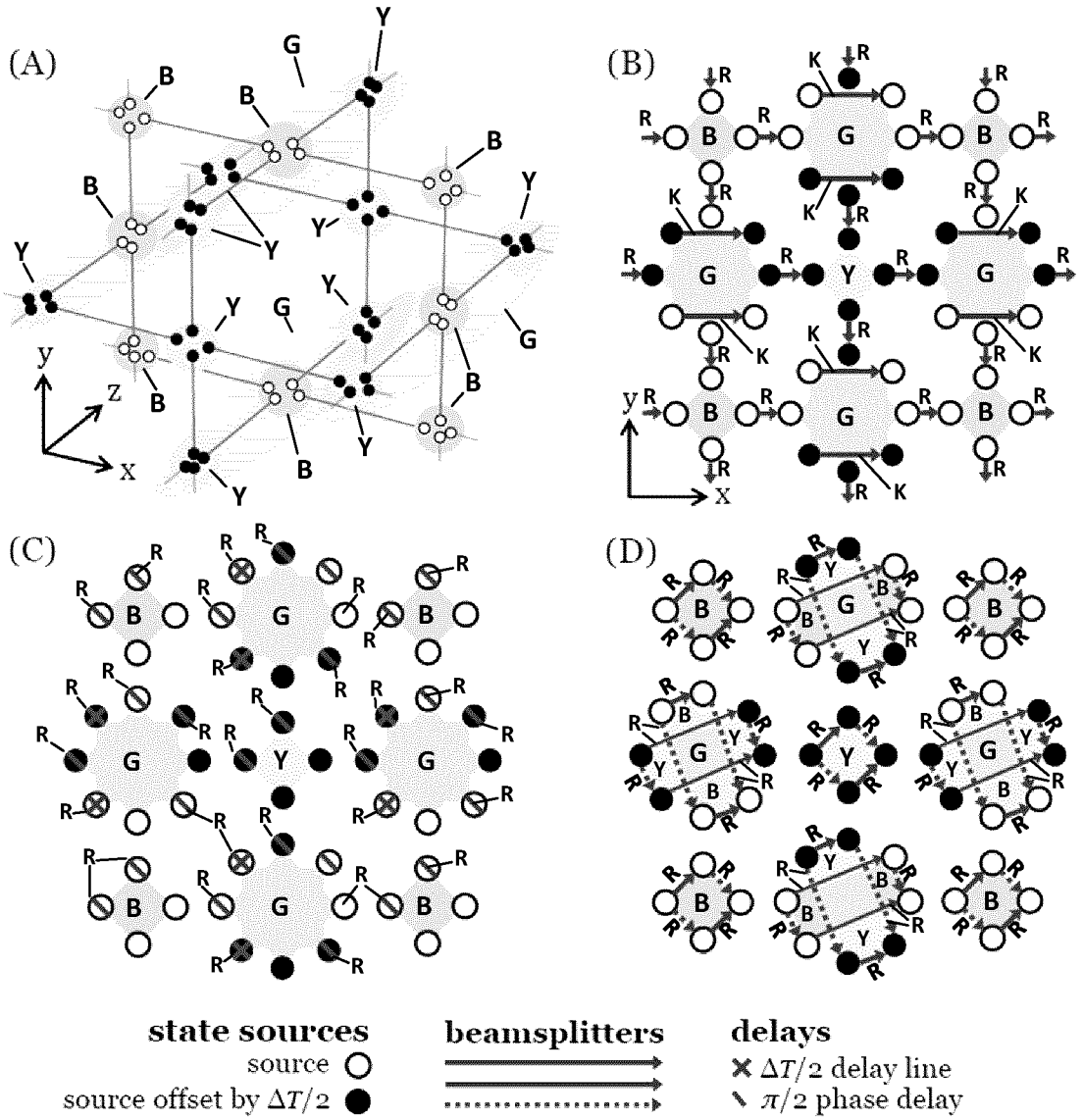
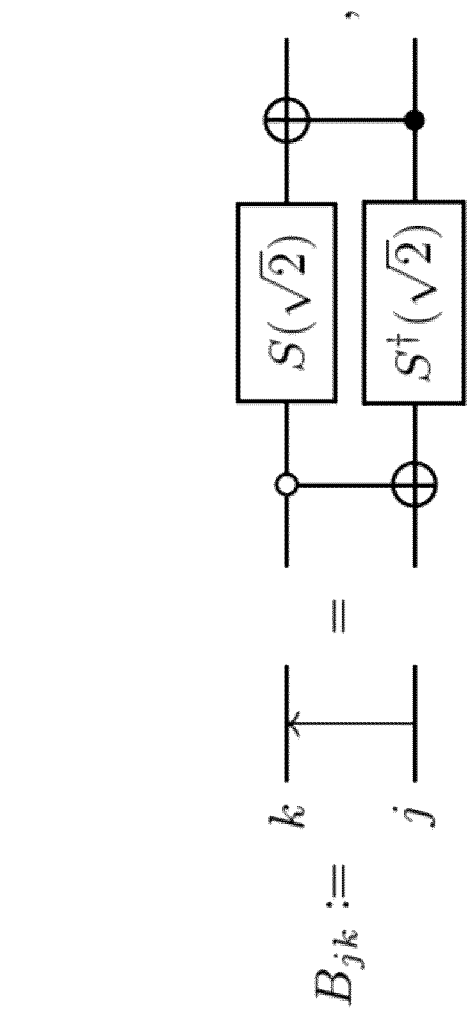

(A)
(B)
(C)
(D)
state sources
source
source offset by ΔT/2
beamsplitters
delays
ΔT/2 delay line
π/2 phase delay

FIG. 12



(3)

$$CX_{jk}^{\dagger} \, |\varnothing\rangle_j \, |\varnothing\rangle_k = |\varnothing\rangle_j \, |\varnothing\rangle_k \,, \tag{4}$$

$$CX_{jk}^{\dagger} \, |\varphi\rangle_j \, |0\rangle_{p_k} = |\varphi\rangle_j \, |0\rangle_{p_k} \,, \tag{5}$$

$$CX_{jk}^{\dagger} \, |0\rangle_{q_j} \, |\varphi\rangle_k = |0\rangle_{q_j} \, |\varphi\rangle_k \,, \tag{6}$$

FIG. 13

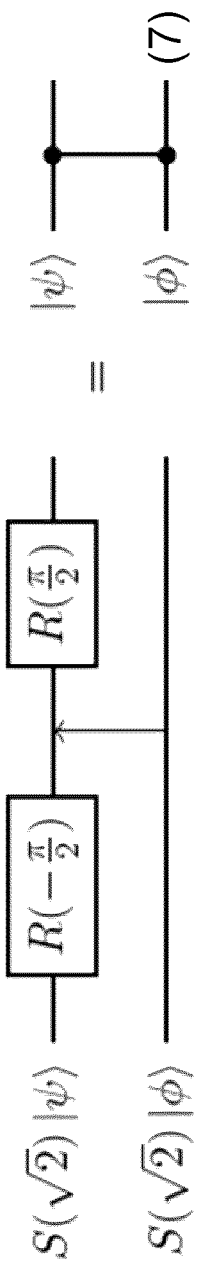

$S(\sqrt{2})\,|\psi\rangle$
$S(\sqrt{2})\,|\phi\rangle$
$R(-\frac{\pi}{2})$
$R(\frac{\pi}{2})$
=
$|\psi\rangle$
$|\phi\rangle$
(7)

FIG. 14

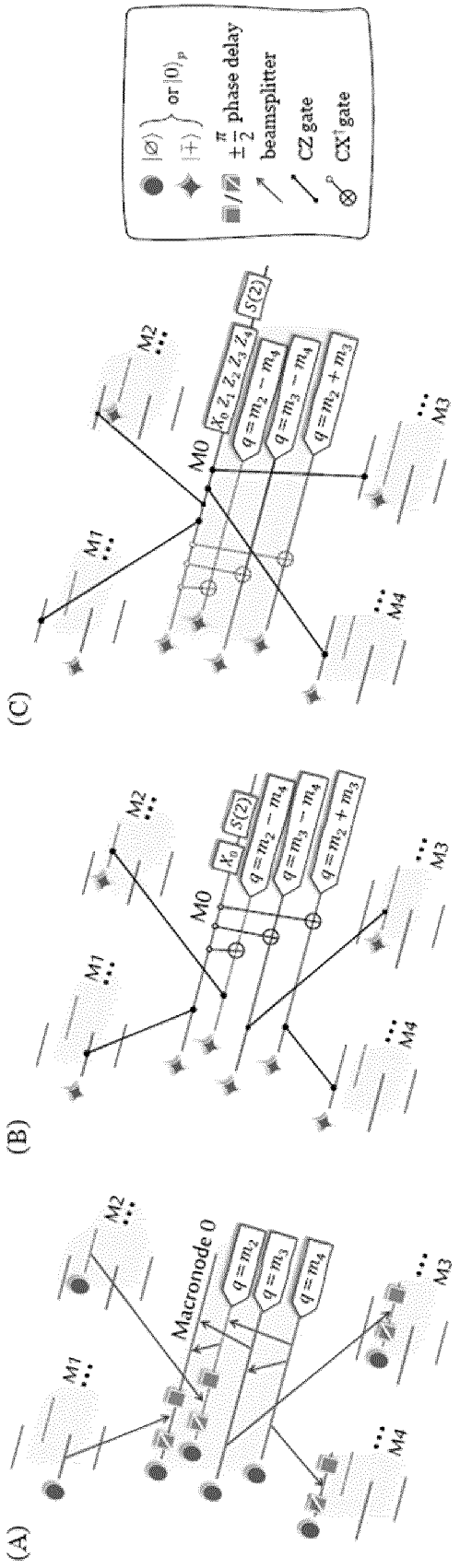

(A)
(B)
(C)
M0
M1
M2
M3
M4
Macronode 0
$q = m_2$
$q = m_3$
$q = m_4$
X_0
$S(2)$
$q = m_2 - m_4$
$q = m_3 - m_4$
$q = m_2 + m_3$
$X_0 Z_1 Z_2 Z_3 Z_4$
$|\oslash\rangle$ or $|0\rangle_p$
$|+\rangle$
$\pm\frac{\pi}{2}$ phase delay
beamsplitter
CZ gate
CX^1 gate

FIG. 15

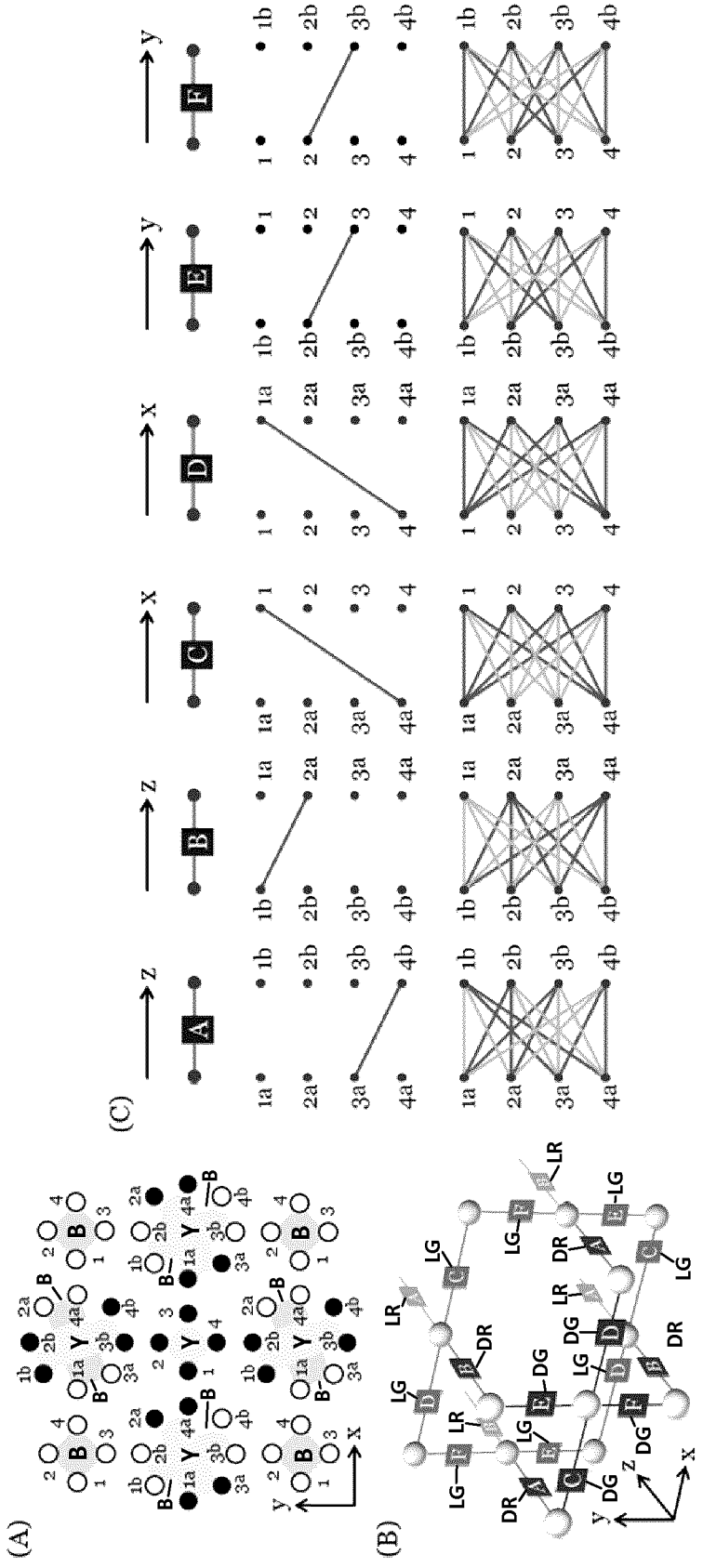


FIG. 16

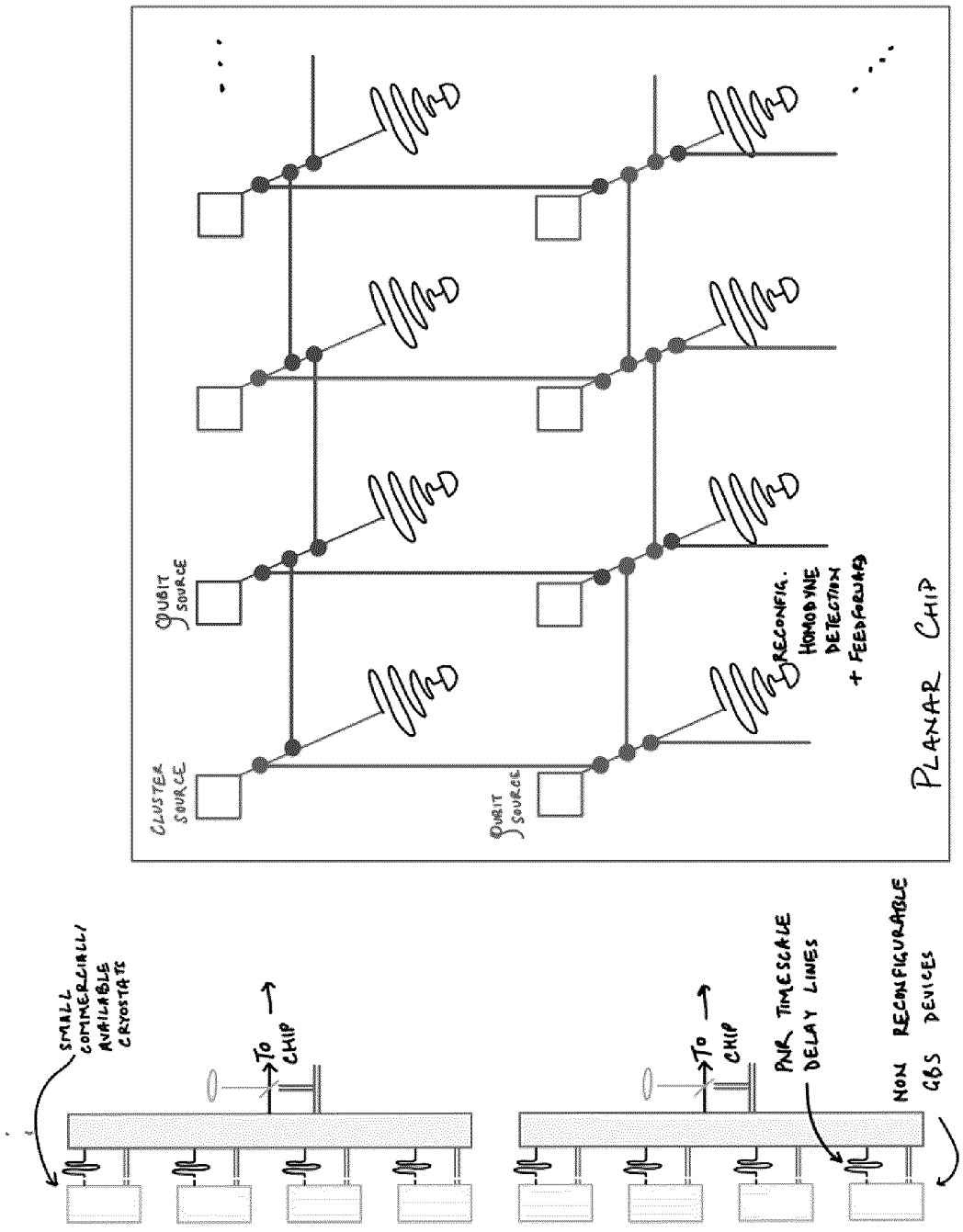

SMALL COMMERCIALLY AVAILABLE CRYOSTATS
TO CHIP
TO CHIP
PNR TIMESCALE DELAY LINES
NON RECONFIGURABLE GBS DEVICES
CLUSTER SOURCE
QUBIT SOURCE
QUBIT SOURCE
RECONFIG. HOMODYNE DETECTION + FEEDFORWARD
PLANAR CHIP

FIG. 17

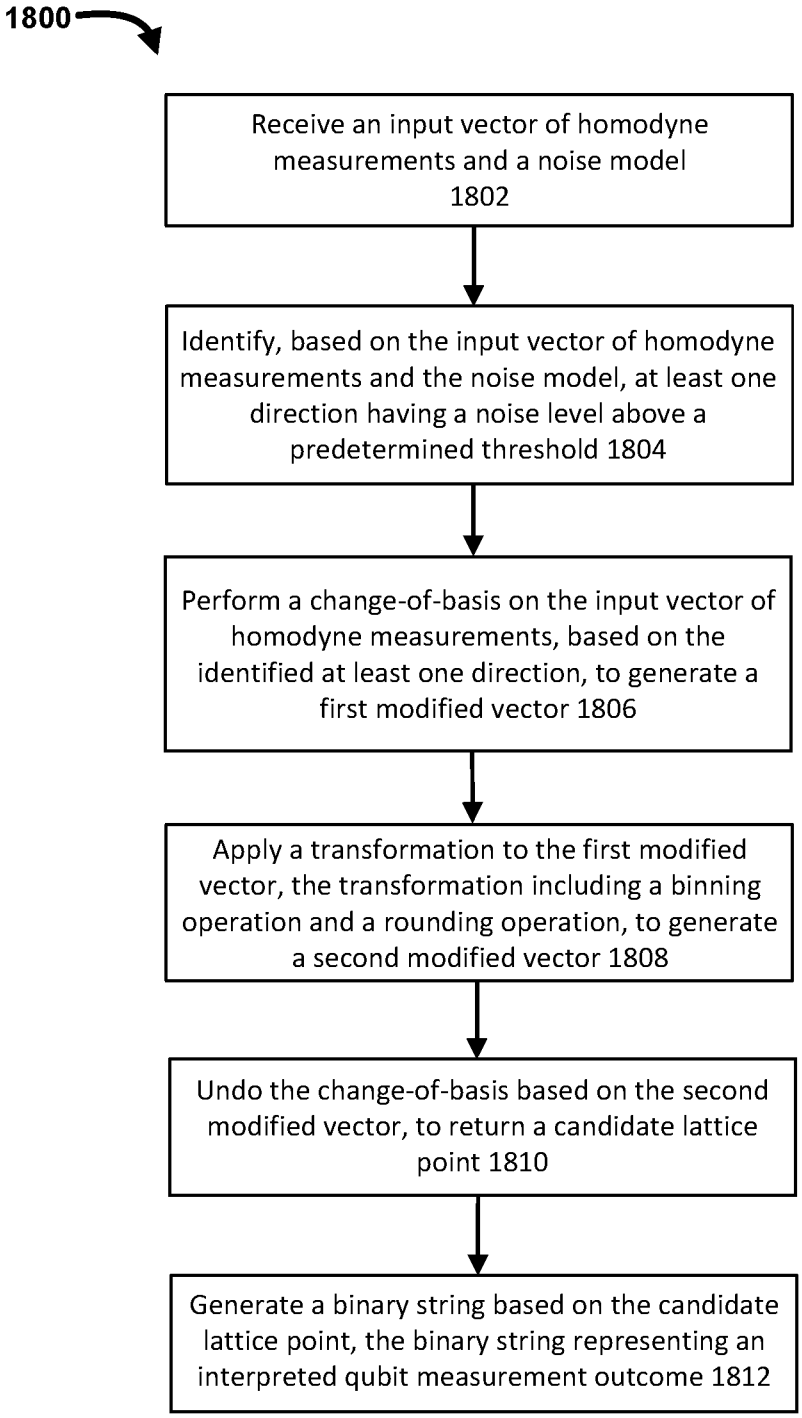

1800
Receive an input vector of homodyne measurements and a noise model 1802
Identify, based on the input vector of homodyne measurements and the noise model, at least one direction having a noise level above a predetermined threshold 1804
Perform a change-of-basis on the input vector of homodyne measurements, based on the identified at least one direction, to generate a first modified vector 1806
Apply a transformation to the first modified vector, the transformation including a binning operation and a rounding operation, to generate a second modified vector 1808
Undo the change-of-basis based on the second modified vector, to return a candidate lattice point 1810
Generate a binary string based on the candidate lattice point, the binary string representing an interpreted qubit measurement outcome 1812

FIG. 18

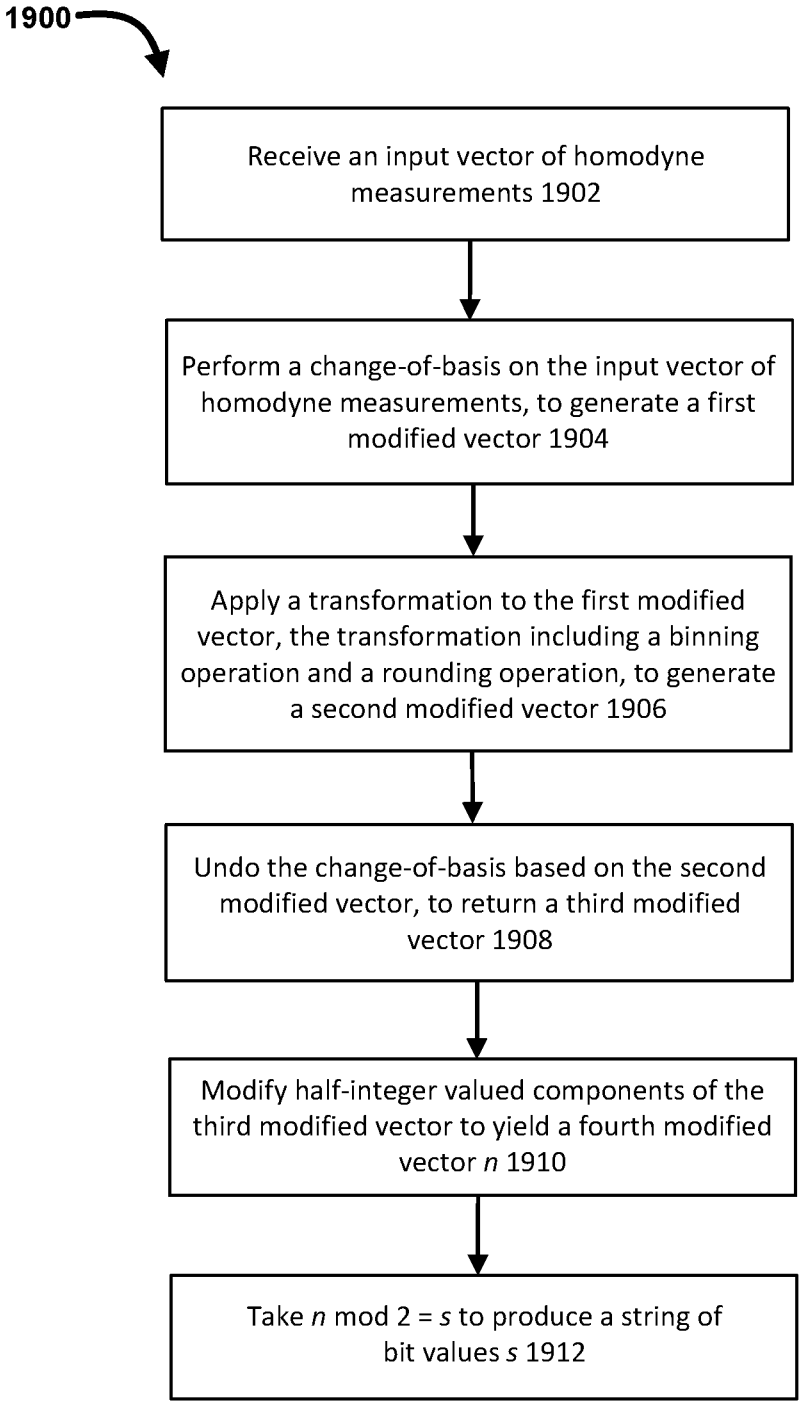

1900
Receive an input vector of homodyne measurements 1902
Perform a change-of-basis on the input vector of homodyne measurements, to generate a first modified vector 1904
Apply a transformation to the first modified vector, the transformation including a binning operation and a rounding operation, to generate a second modified vector 1906
Undo the change-of-basis based on the second modified vector, to return a third modified vector 1908
Modify half-integer valued components of the third modified vector to yield a fourth modified vector *n* 1910
Take *n* mod 2 = *s* to produce a string of bit values *s* 1912

FIG. 19