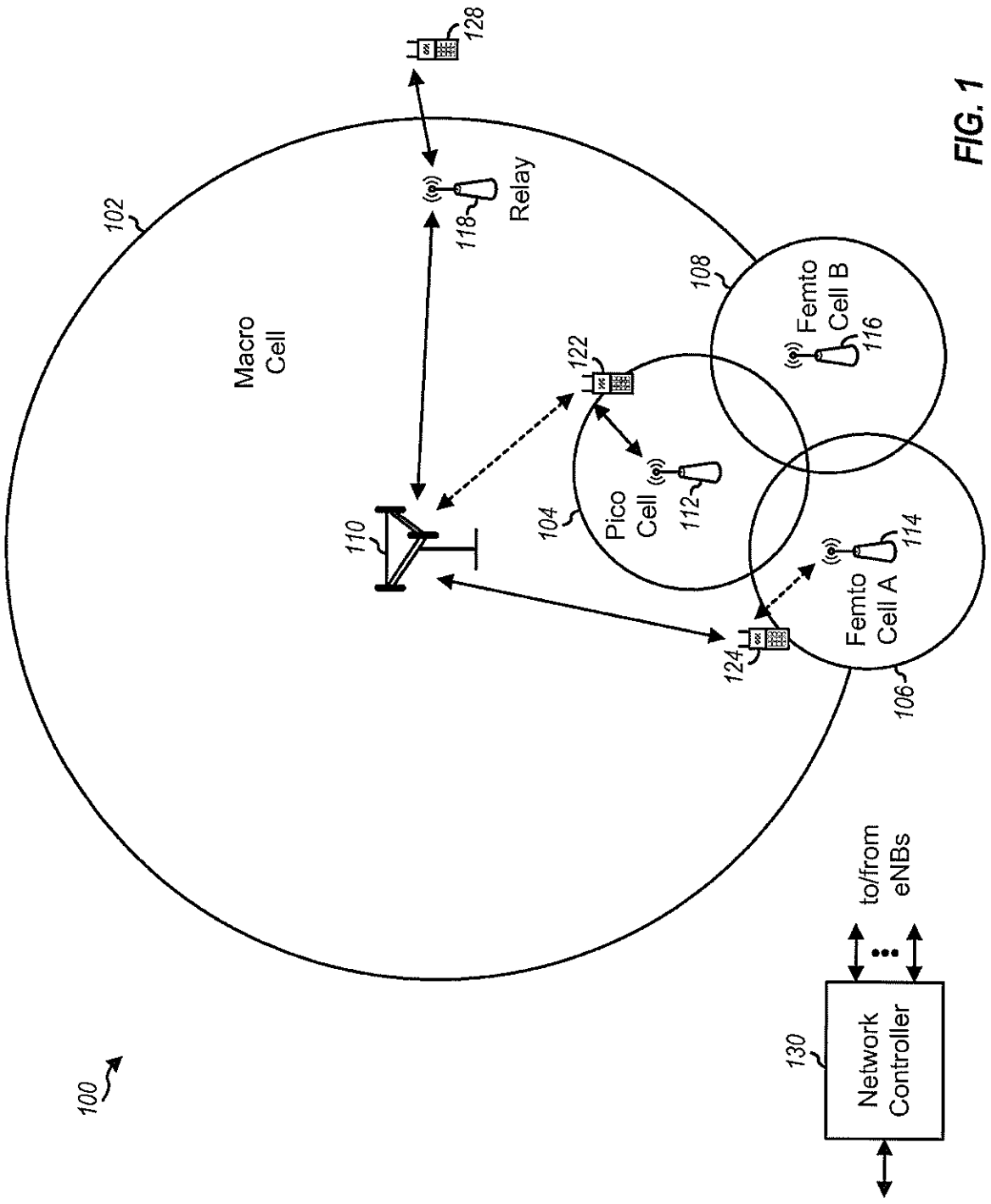

100
102
Macro Cell
110
118
Relay
128
104
Pico Cell
112
122
108
Femto Cell B
116
106
Femto Cell A
114
124
130
Network Controller
to/from eNBs

FIG. 1

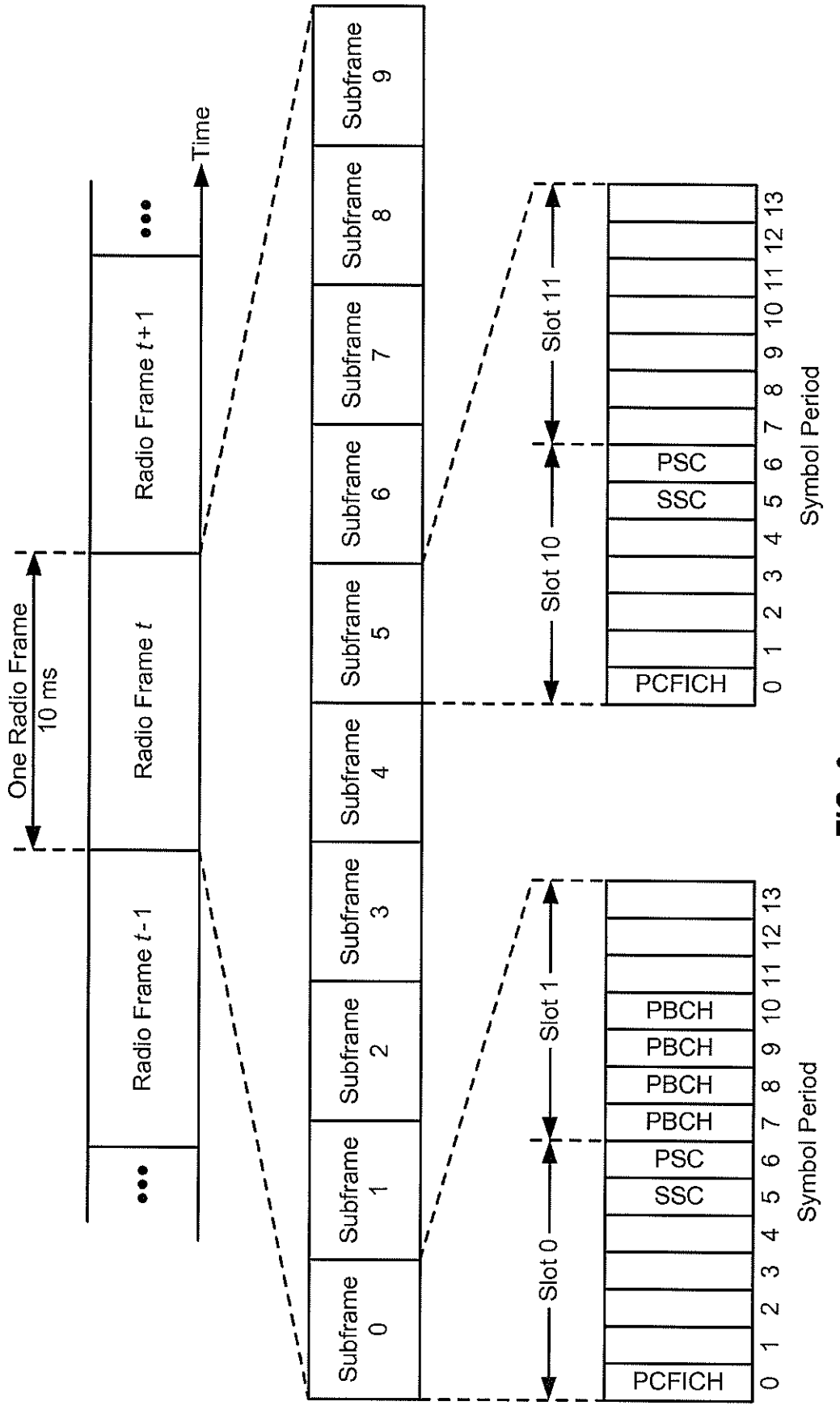

Time
One Radio Frame
10 ms
Radio Frame t - 1
Radio Frame t
Radio Frame t + 1
Subframe 0
Subframe 1
Subframe 2
Subframe 3
Subframe 4
Subframe 5
Subframe 6
Subframe 7
Subframe 8
Subframe 9
Slot 0
Slot 1
Slot 10
Slot 11
PCFICH
PBCH
PSC
SSC
0 1 2 3 4 5 6 7 8 9 10 11 12 13
Symbol Period

FIG. 2

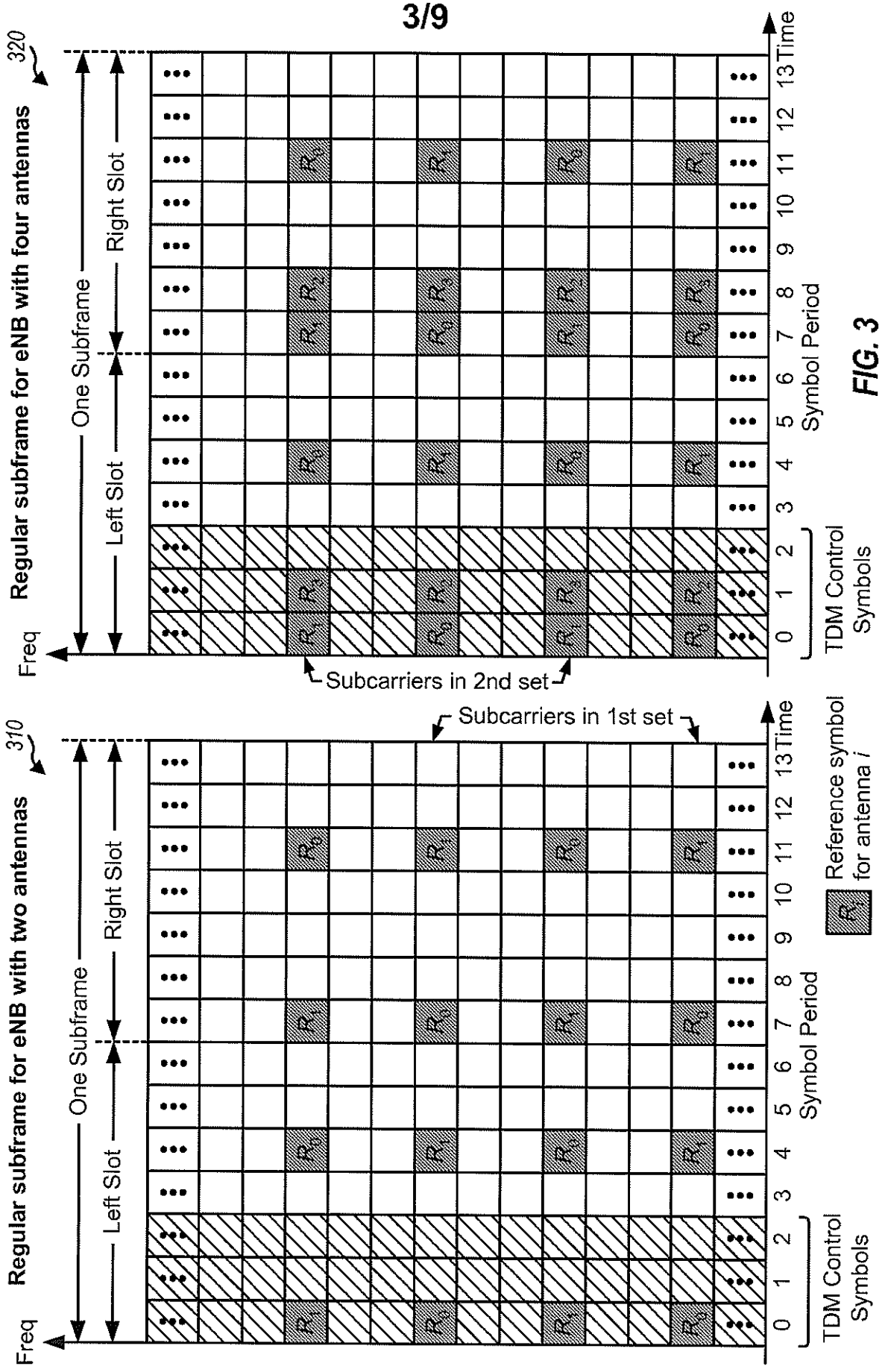

Regular subframe for eNB with four antennas
320
One Subframe
Right Slot
Left Slot
Freq
Time
Symbol Period
TDM Control Symbols
Subcarriers in 2nd set
Regular subframe for eNB with two antennas
310
Subcarriers in 1st set
Reference symbol for antenna i

FIG. 3

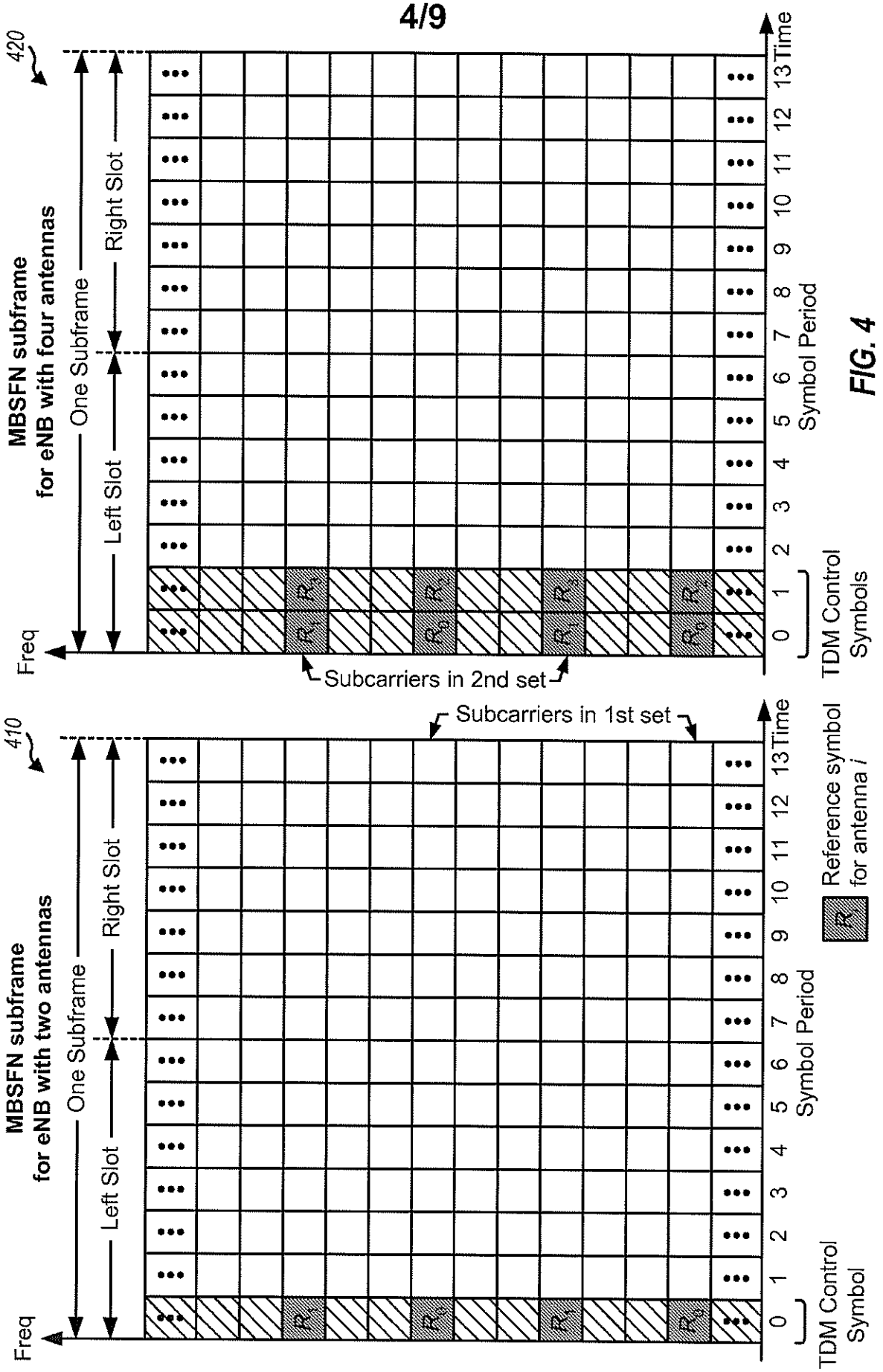

420
MBSFN subframe
for eNB with four antennas
One Subframe
Left Slot
Right Slot
Freq
Time
Symbol Period
TDM Control
Symbols
Subcarriers in 2nd set
410
MBSFN subframe
for eNB with two antennas
Subcarriers in 1st set
TDM Control
Symbol
Reference symbol
for antenna i

FIG. 4

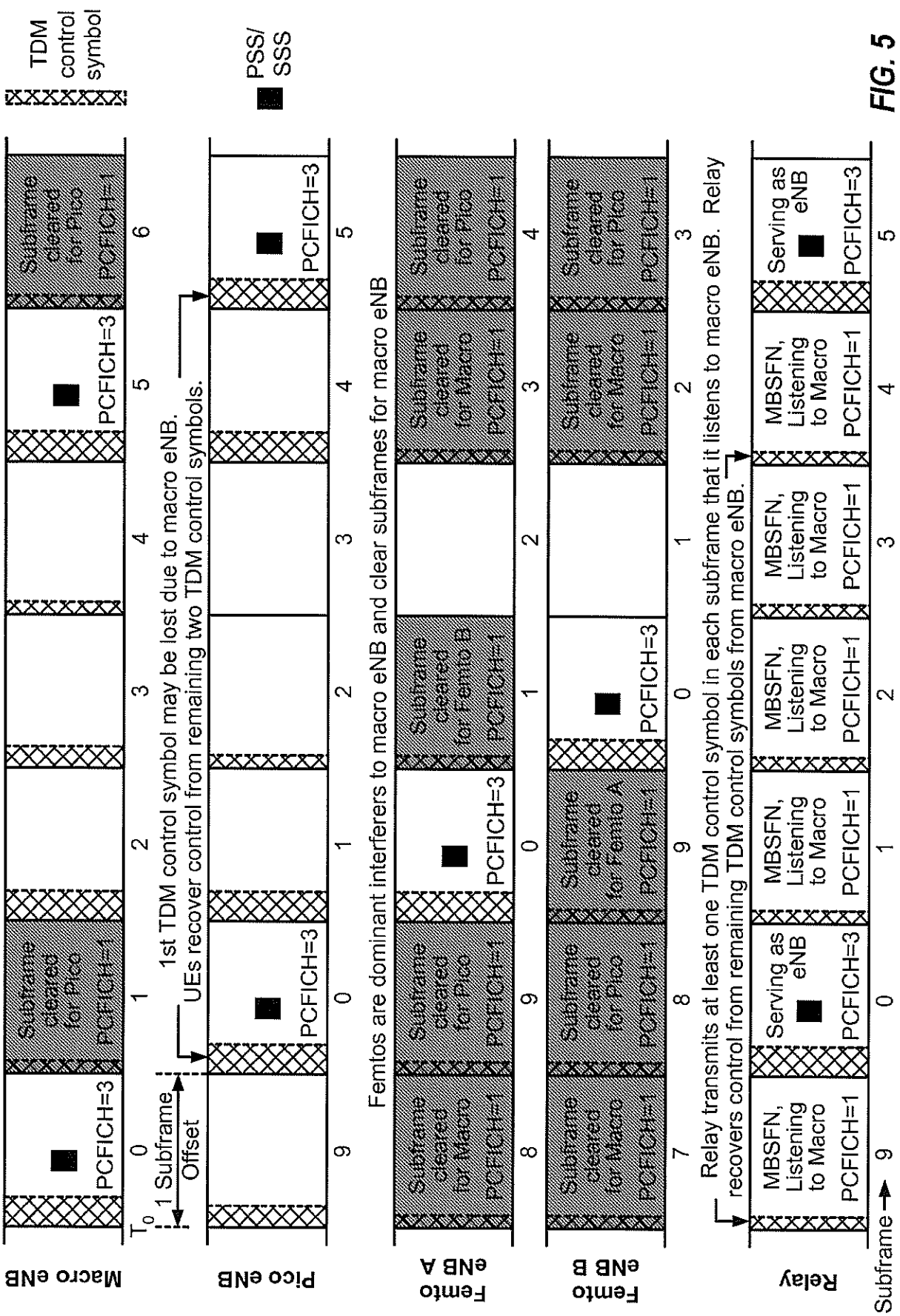

TDM control symbol
PSS/ SSS
Macro eNB
Pico eNB
Femto eNB A
Femto eNB B
Relay
Subframe
Subframe cleared for Pico
PCFICH=1
PCFICH=3
1st TDM control symbol may be lost due to macro eNB.
UEs recover control from remaining two TDM control symbols.
1 Subframe Offset
T_0
Femtos are dominant interferers to macro eNB and clear subframes for macro eNB
Subframe cleared for Macro
Subframe cleared for Femto B
Subframe cleared for Femto A
Relay transmits at least one TDM control symbol in each subframe that it listens to macro eNB. Relay recovers control from remaining TDM control symbols from macro eNB.
MBSFN, Listening to Macro
Serving as eNB

FIG. 5

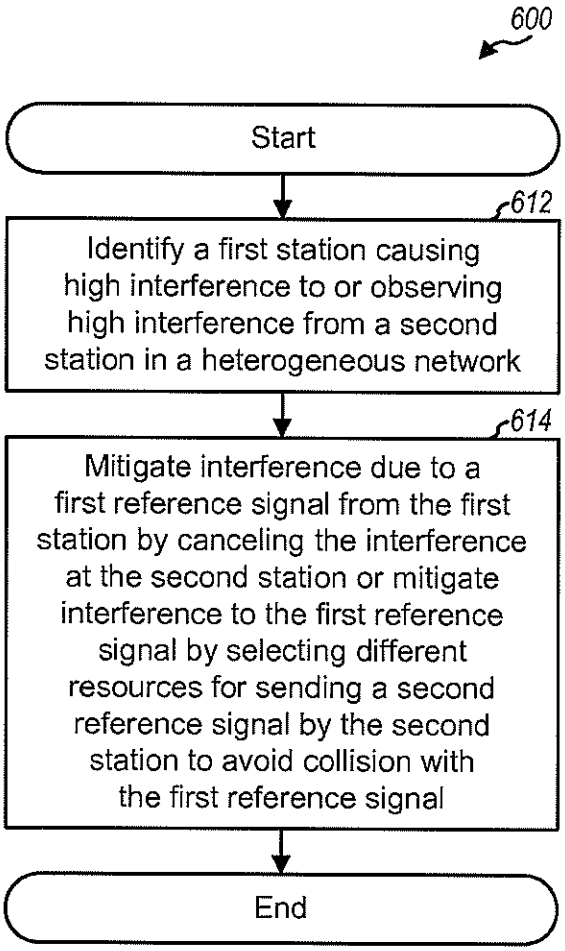

600
Start
612
Identify a first station causing high interference to or observing high interference from a second station in a heterogeneous network
614
Mitigate interference due to a first reference signal from the first station by canceling the interference at the second station or mitigate interference to the first reference signal by selecting different resources for sending a second reference signal by the second station to avoid collision with the first reference signal
End

FIG. 6

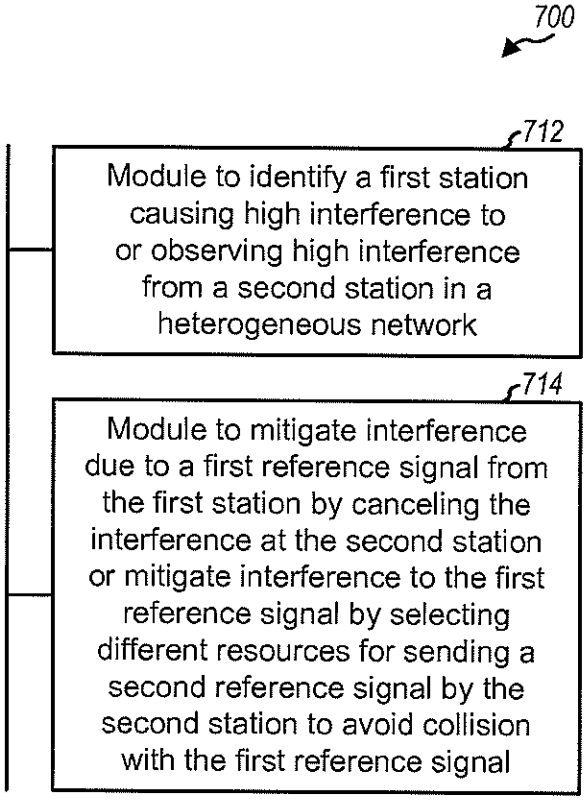

700
712
Module to identify a first station causing high interference to or observing high interference from a second station in a heterogeneous network
714
Module to mitigate interference due to a first reference signal from the first station by canceling the interference at the second station or mitigate interference to the first reference signal by selecting different resources for sending a second reference signal by the second station to avoid collision with the first reference signal

FIG. 7

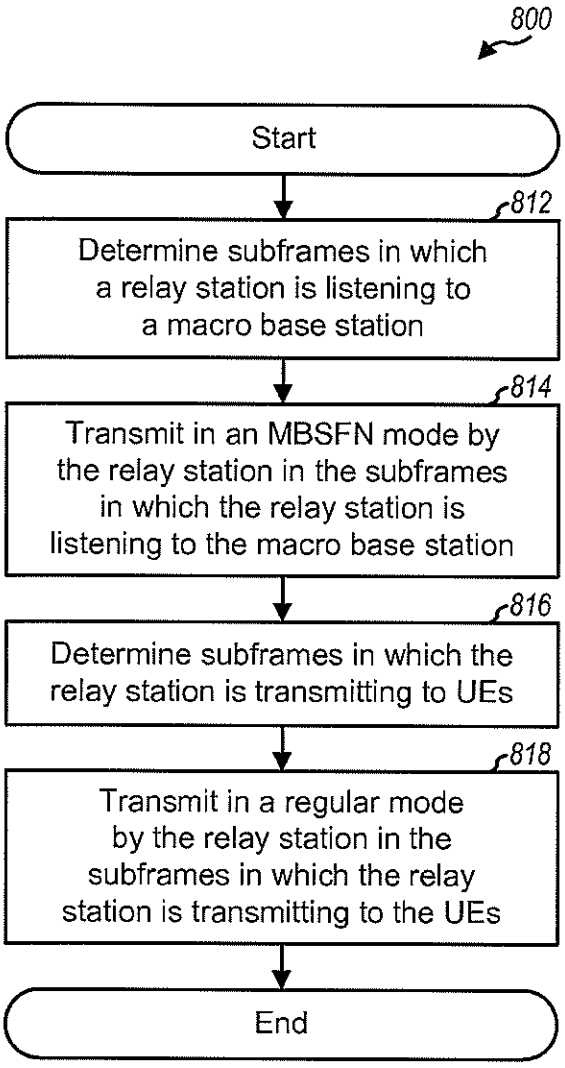

800
Start
812
Determine subframes in which a relay station is listening to a macro base station
814
Transmit in an MBSFN mode by the relay station in the subframes in which the relay station is listening to the macro base station
816
Determine subframes in which the relay station is transmitting to UEs
818
Transmit in a regular mode by the relay station in the subframes in which the relay station is transmitting to the UEs
End

FIG. 8

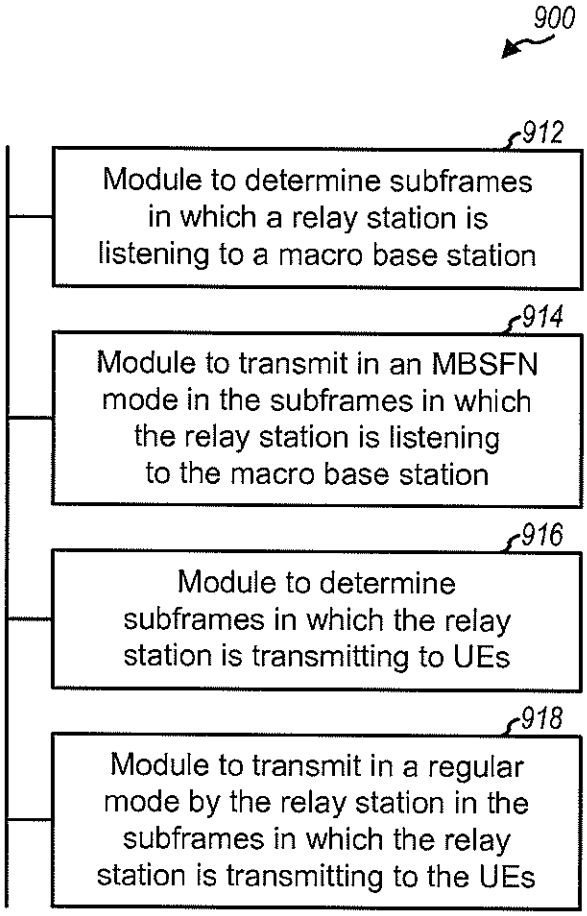

900
912
Module to determine subframes in which a relay station is listening to a macro base station
914
Module to transmit in an MBSFN mode in the subframes in which the relay station is listening to the macro base station
916
Module to determine subframes in which the relay station is transmitting to UEs
918
Module to transmit in a regular mode by the relay station in the subframes in which the relay station is transmitting to the UEs

FIG. 9

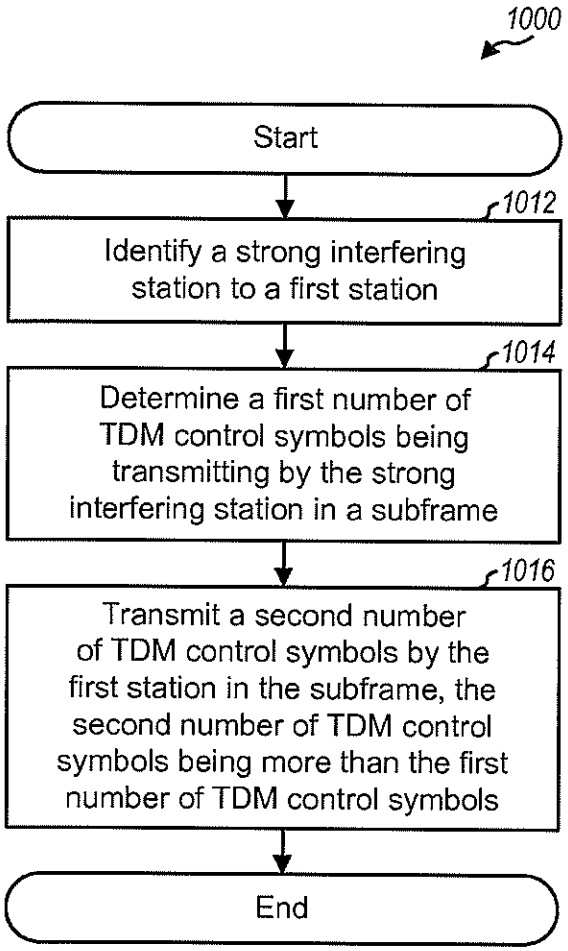

1000
Start
1012
Identify a strong interfering station to a first station
1014
Determine a first number of TDM control symbols being transmitting by the strong interfering station in a subframe
1016
Transmit a second number of TDM control symbols by the first station in the subframe, the second number of TDM control symbols being more than the first number of TDM control symbols
End

FIG. 10

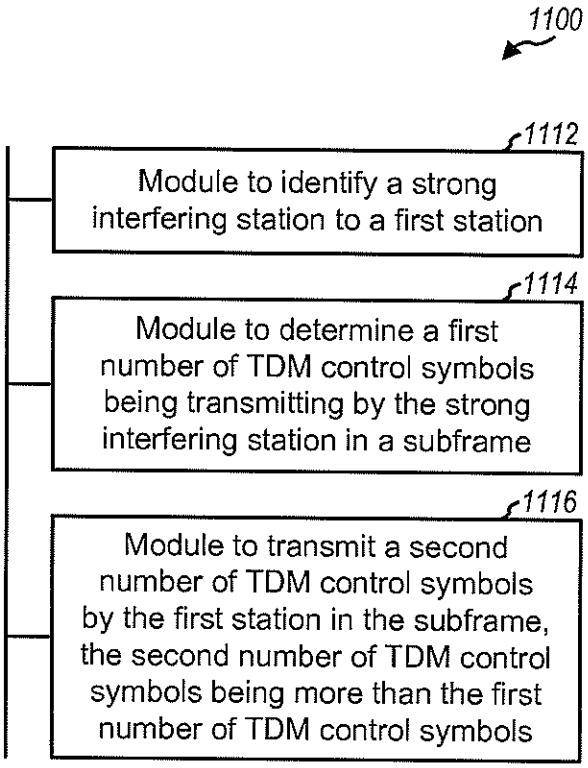

1100
1112
Module to identify a strong interfering station to a first station
1114
Module to determine a first number of TDM control symbols being transmitting by the strong interfering station in a subframe
1116
Module to transmit a second number of TDM control symbols by the first station in the subframe, the second number of TDM control symbols being more than the first number of TDM control symbols

FIG. 11

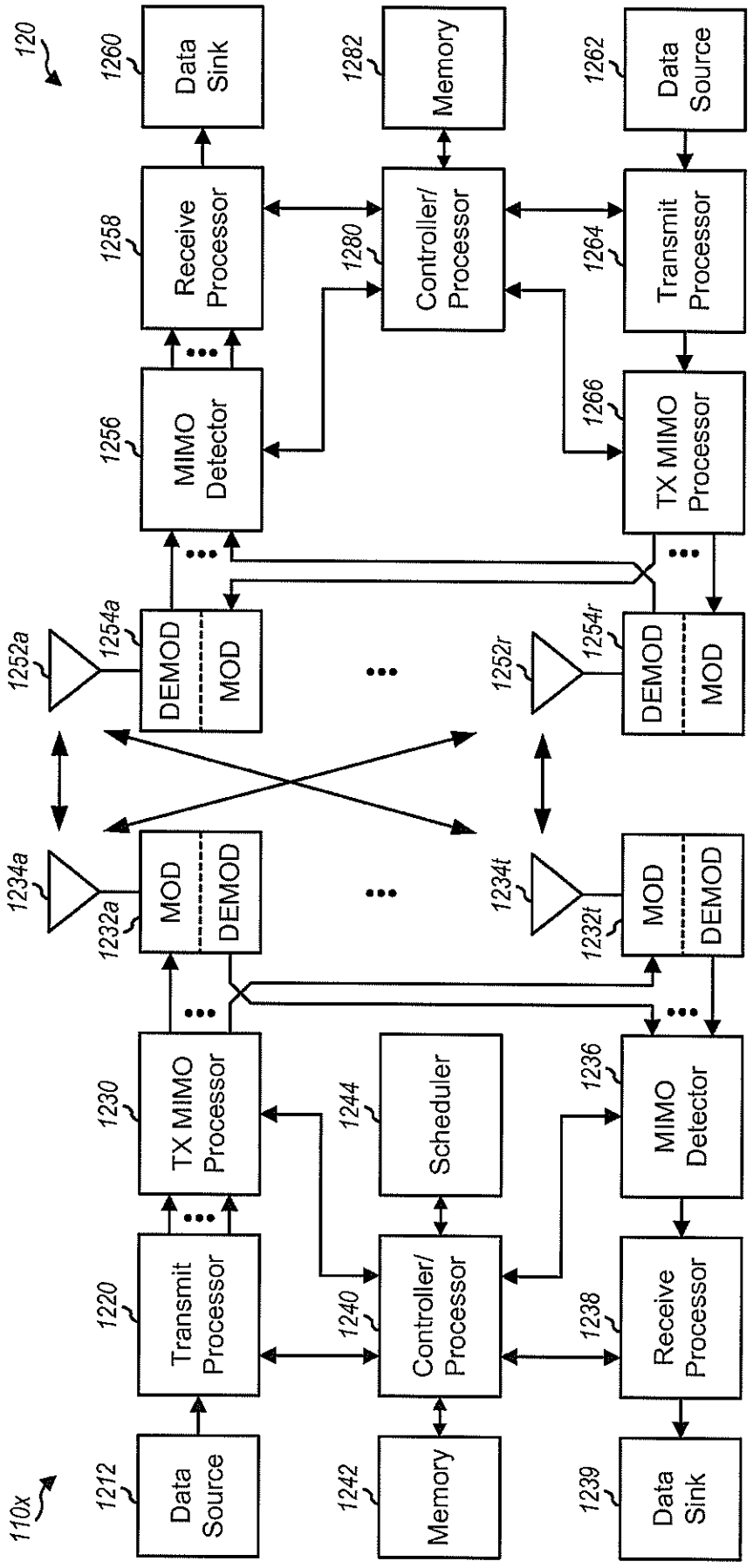

120
1260
Data Sink
1282
Memory
1262
Data Source
1258
Receive Processor
1280
Controller/ Processor
1264
Transmit Processor
1256
MIMO Detector
1266
TX MIMO Processor
1252a
1254a
DEMOD
MOD
1252r
1254r
DEMOD
MOD
1234a
1232a
MOD
DEMOD
1234t
1232t
MOD
DEMOD
1230
TX MIMO Processor
1244
Scheduler
1236
MIMO Detector
1220
Transmit Processor
1240
Controller/ Processor
1238
Receive Processor
110x
1212
Data Source
1242
Memory
1239
Data Sink

FIG. 12