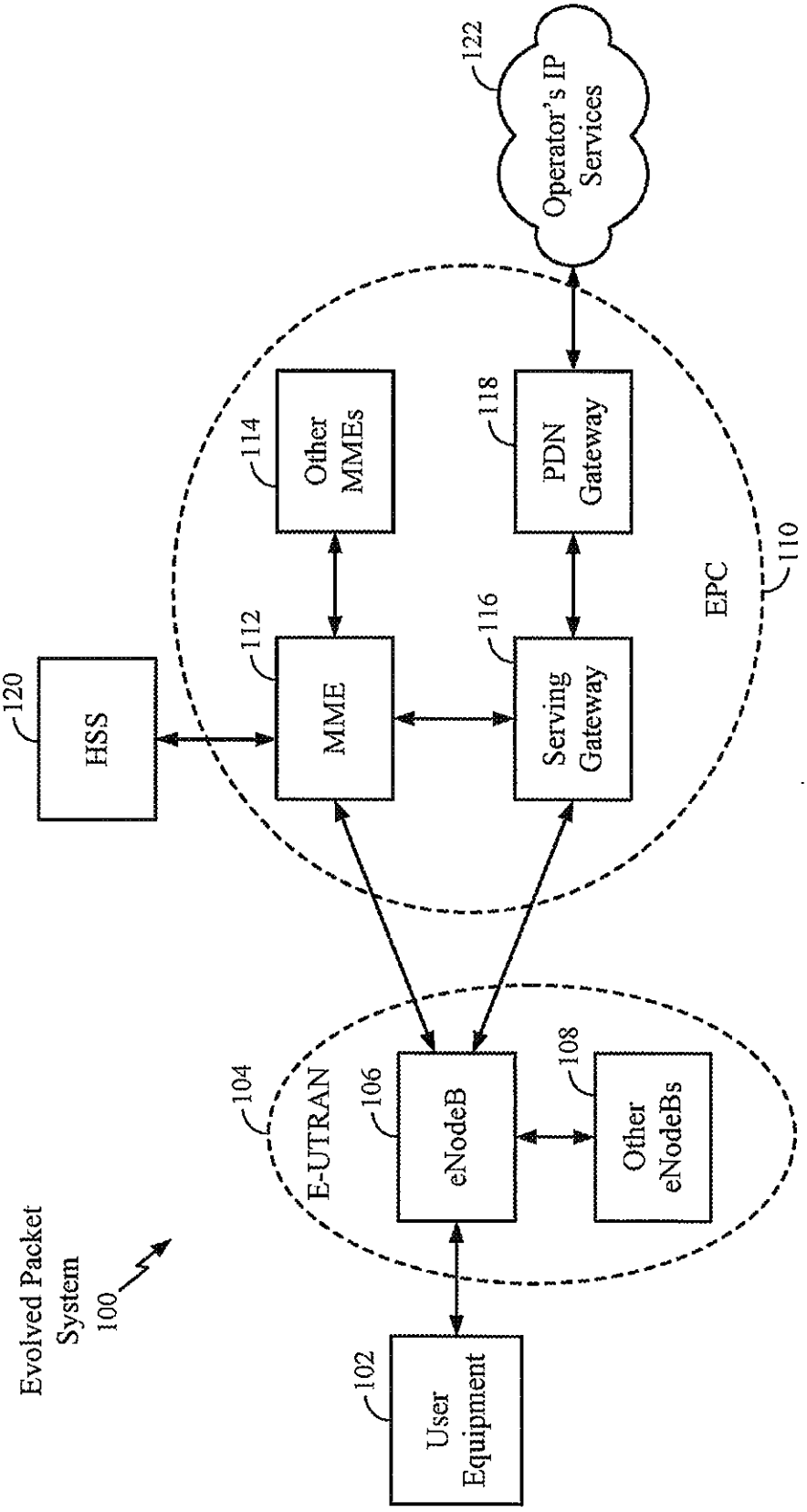
Evolved Packet System
100
User Equipment
102
E-UTRAN
104
eNodeB
106
Other eNodeBs
108
HSS
120
MME
112
Serving Gateway
116
Other MMEs
114
PDN Gateway
118
EPC
110
Operator's IP Services
122

FIG. 1

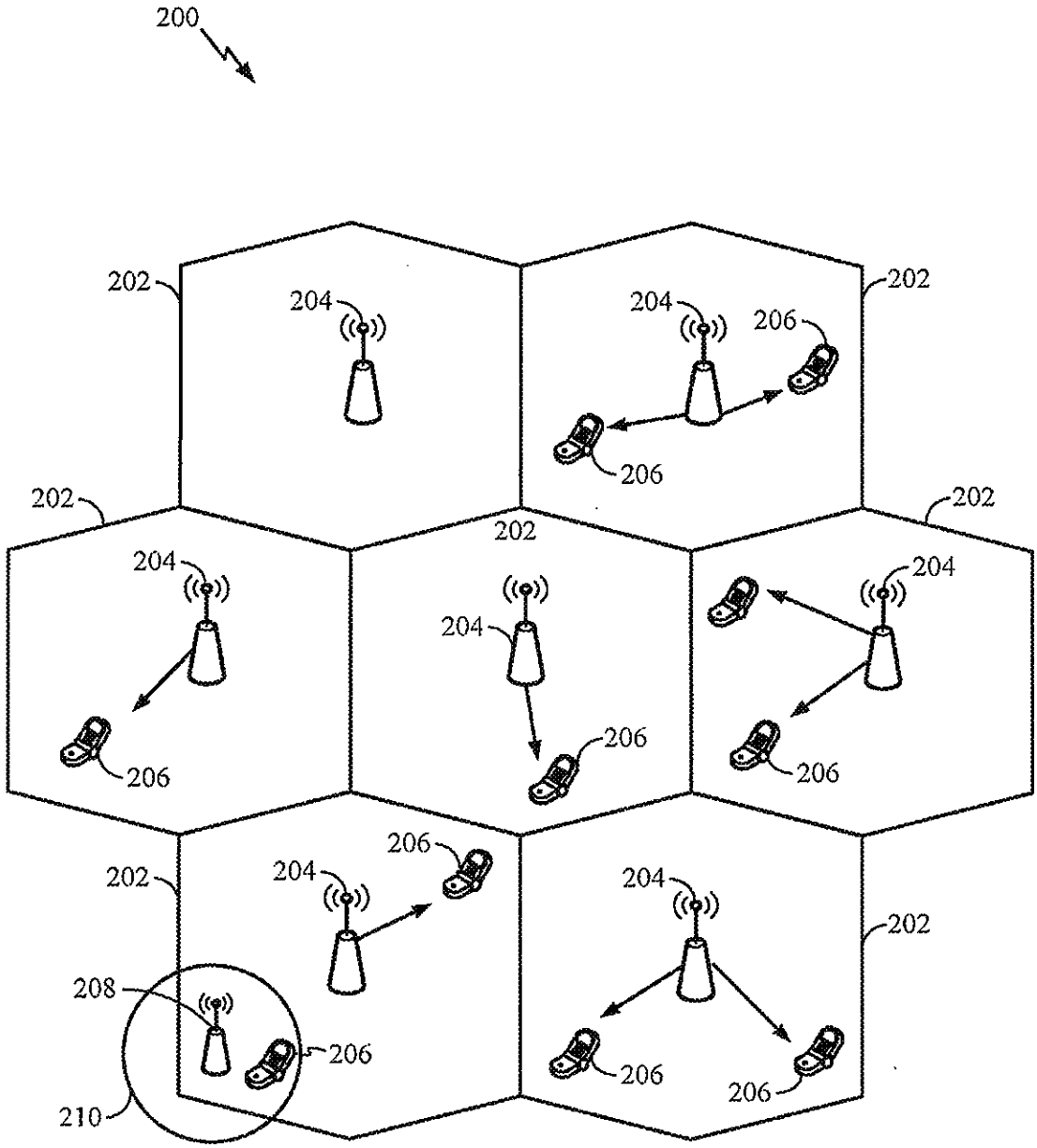

FIG. 2

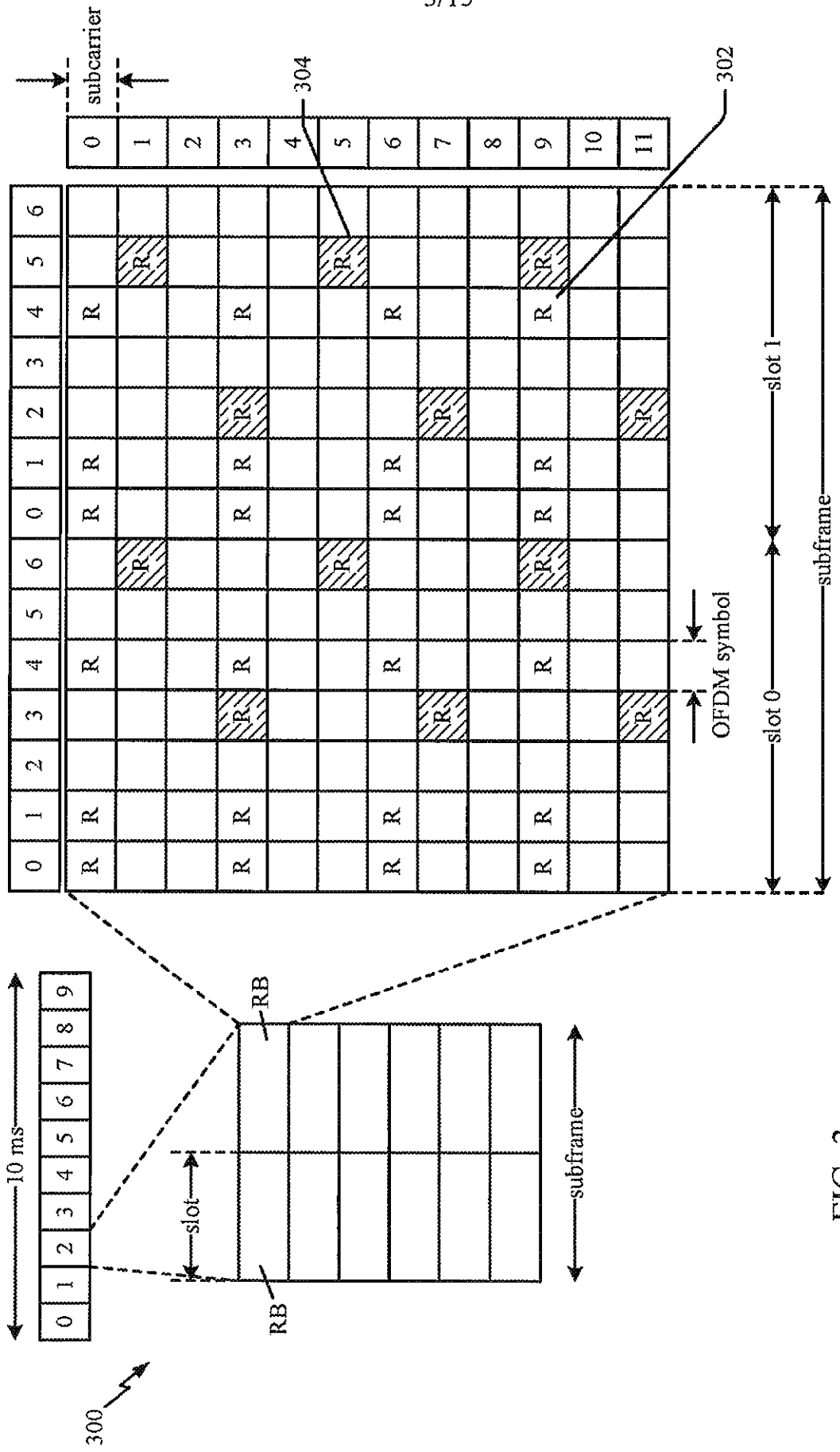
subcarrier
304
302
slot 1
slot 0
subframe
OFDM symbol
10 ms
slot
RB
RB
subframe
300

FIG. 3

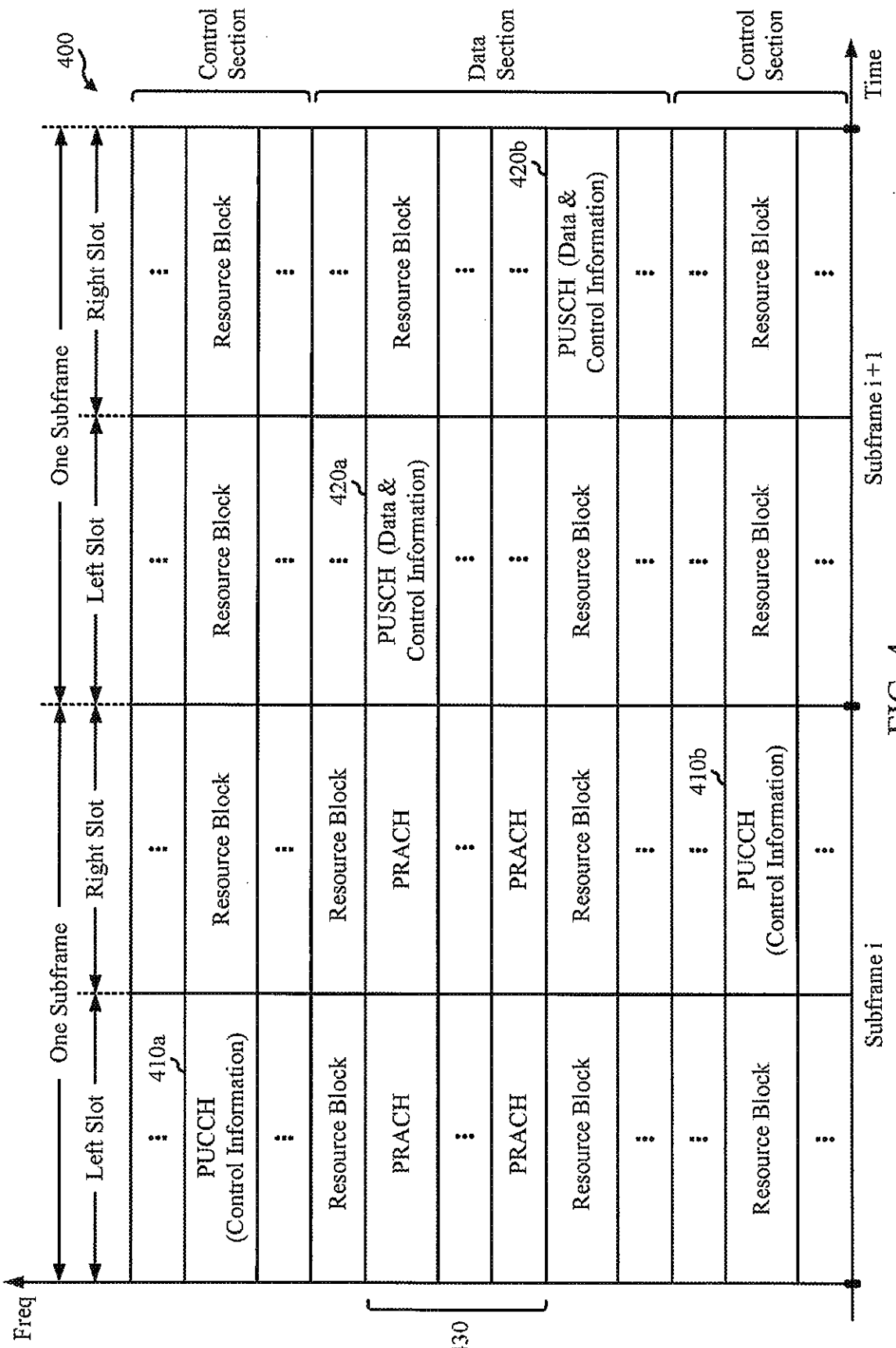
400
Control Section
Data Section
Control Section
Time
Freq
One Subframe
One Subframe
Left Slot
Right Slot
Left Slot
Right Slot
410a
PUCCH (Control Information)
Resource Block
420a
PUSCH (Data & Control Information)
420b
PUSCH (Data & Control Information)
PRACH
410b
PUCCH (Control Information)
430
Subframe i
Subframe i+1

FIG. 4

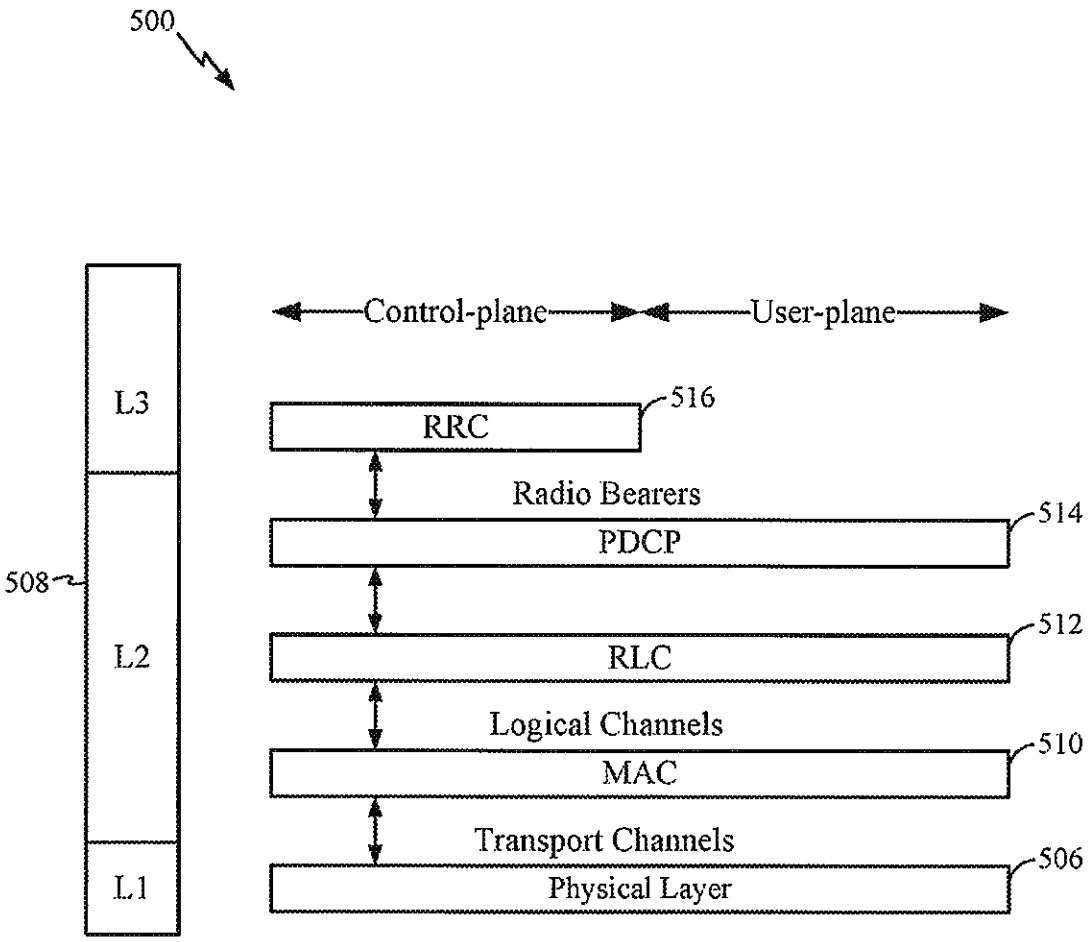
500
Control-plane
User-plane
L3
L2
L1
508
RRC
516
Radio Bearers
PDCP
514
RLC
512
Logical Channels
MAC
510
Transport Channels
Physical Layer
506

FIG. 5

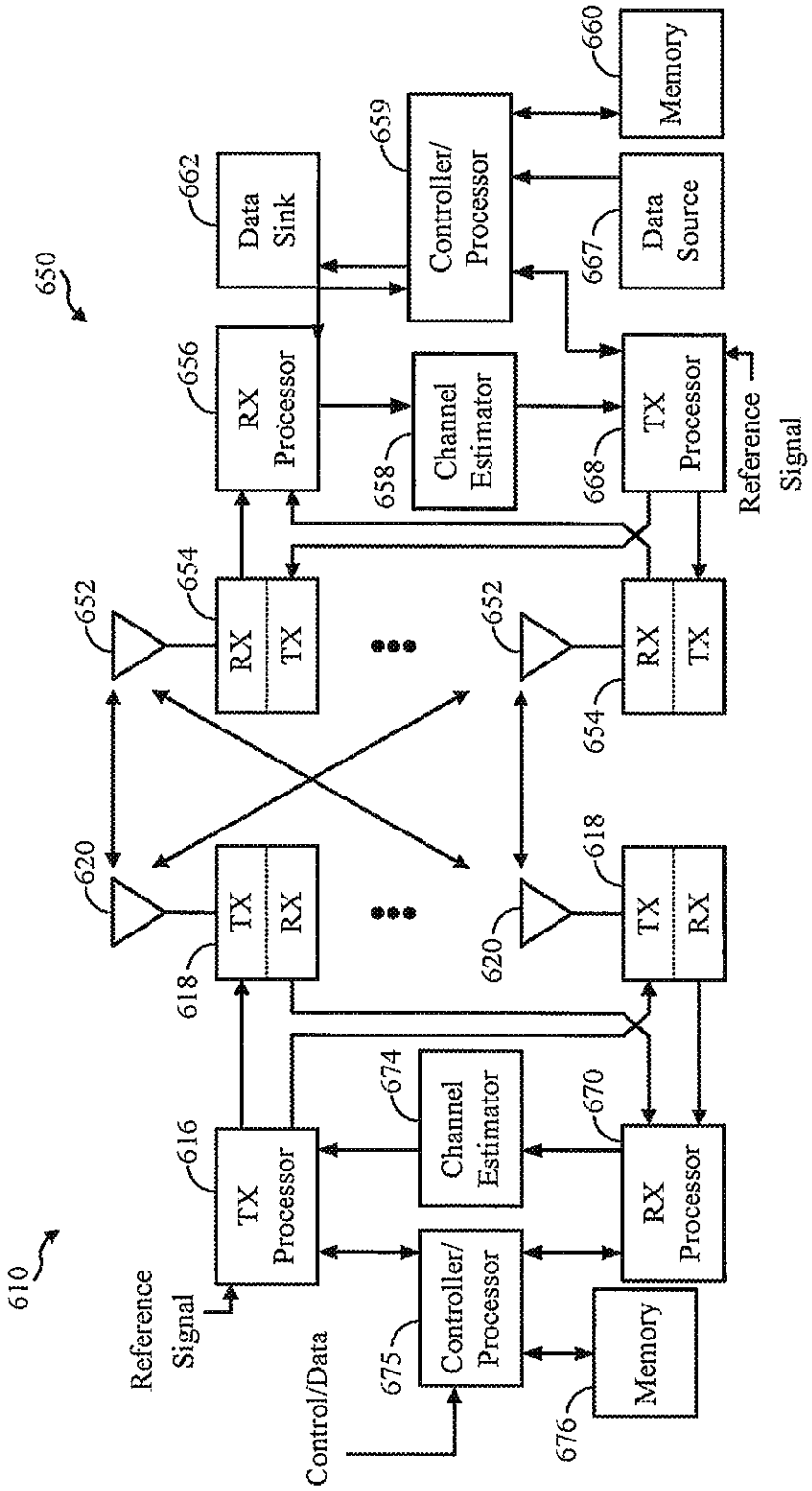
610
650
Reference Signal
Control/Data
TX Processor
Controller/ Processor
Memory
RX Processor
Channel Estimator
Data Sink
Data Source
TX
RX
Reference Signal
616
618
620
652
654
656
658
659
660
662
667
668
670
674
675
676

FIG. 6

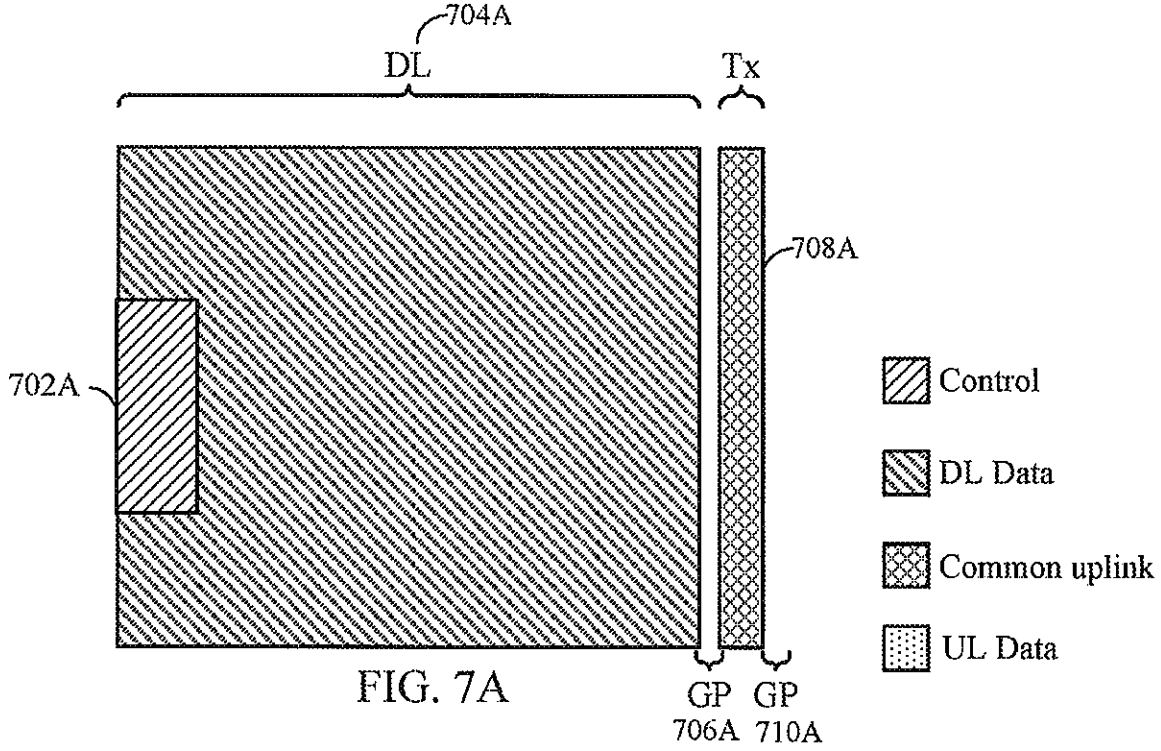
704A
DL
Tx
708A
702A
Control
DL Data
Common uplink
UL Data
GP
706A
GP
710A

FIG. 7A

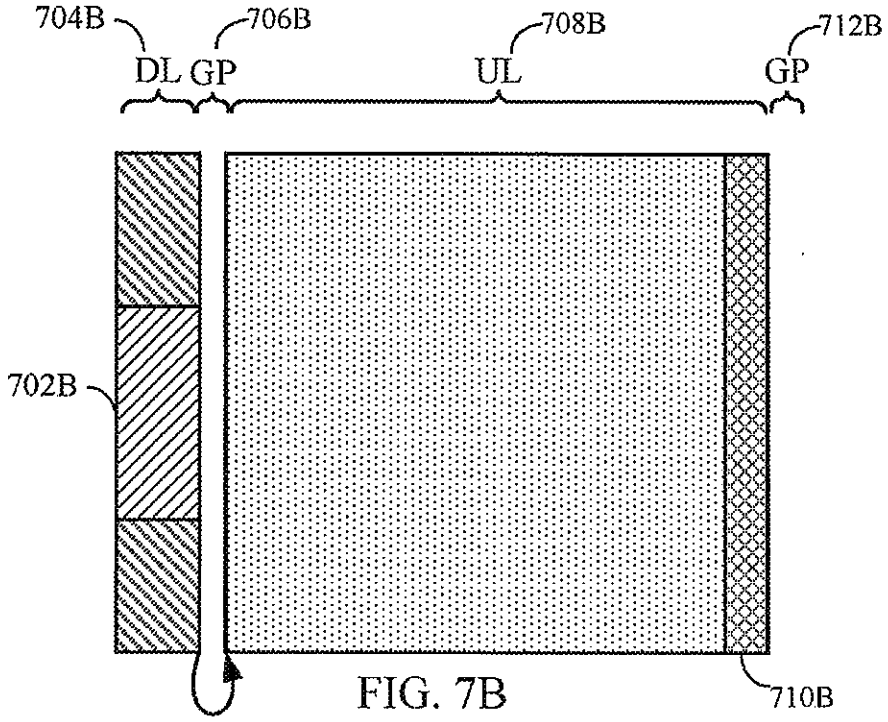
704B
706B
708B
712B
DL
GP
UL
GP
702B
710B

FIG. 7B

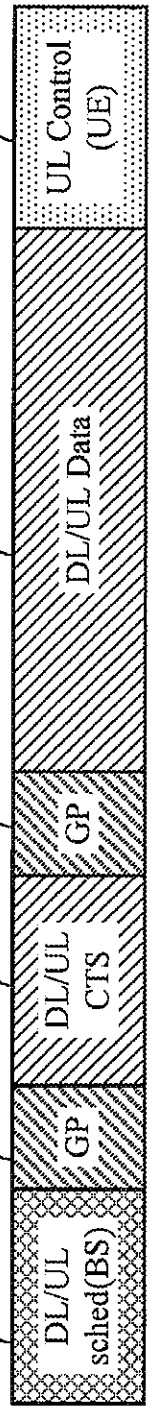

FIG. 8A

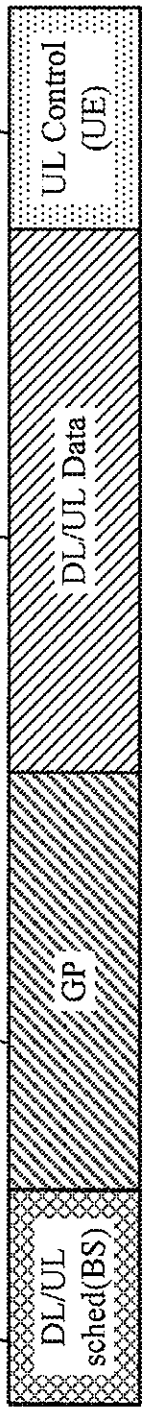

FIG. 8B

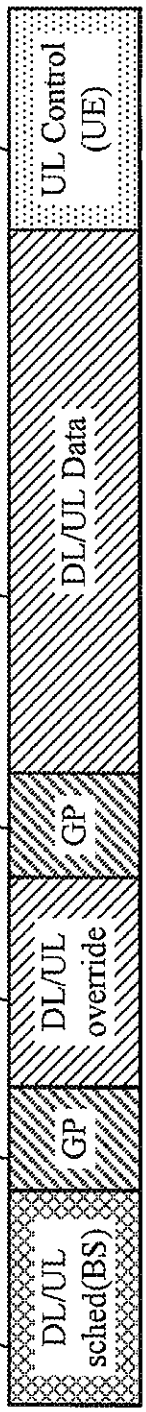

FIG. 8C

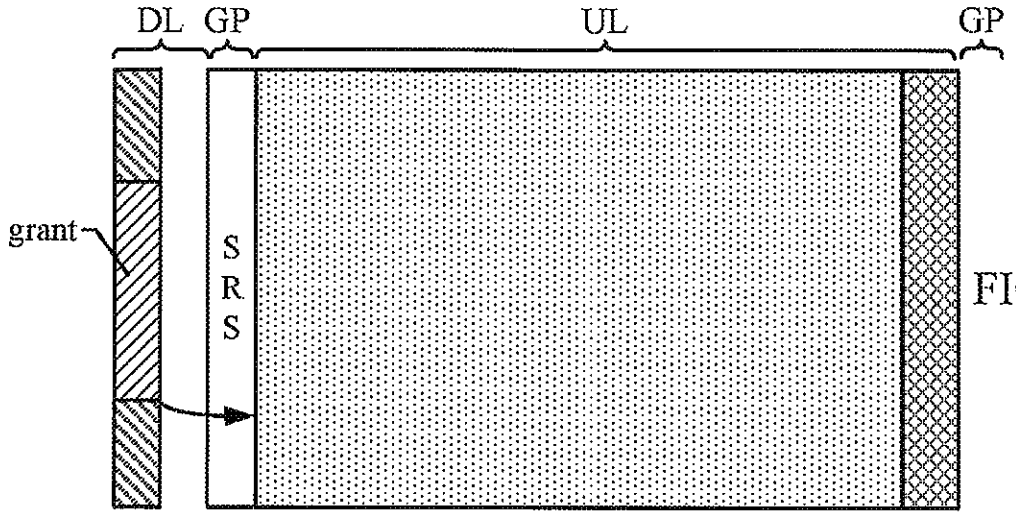

FIG. 9A

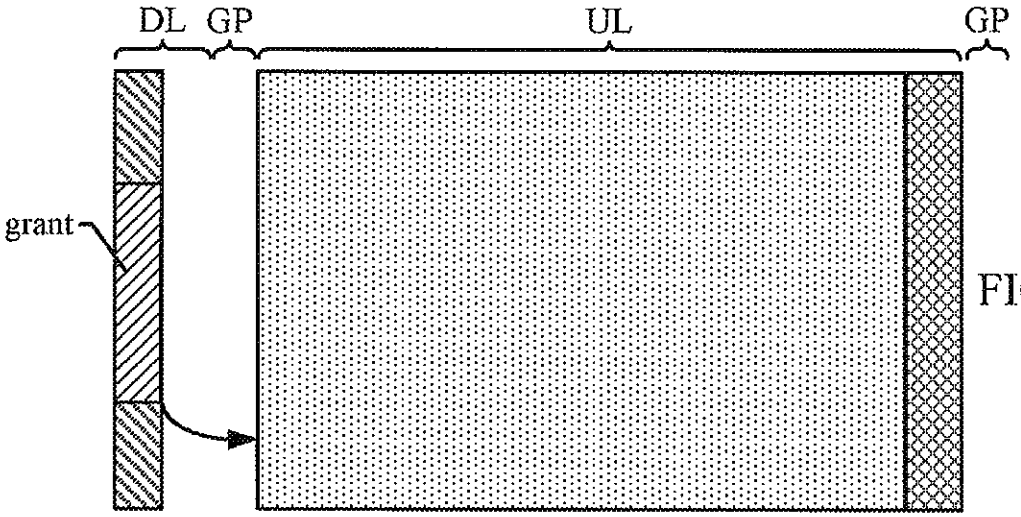

FIG. 9B

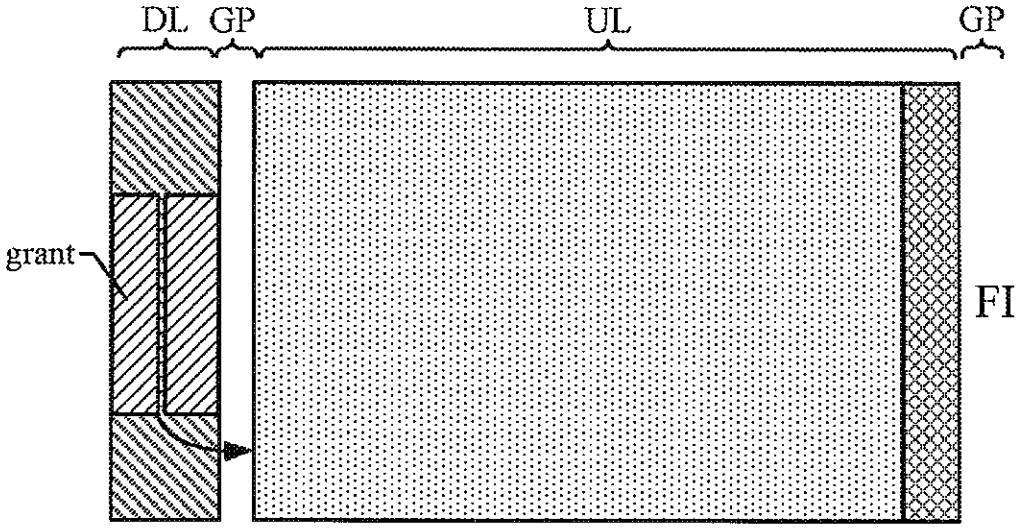

FIG. 9C



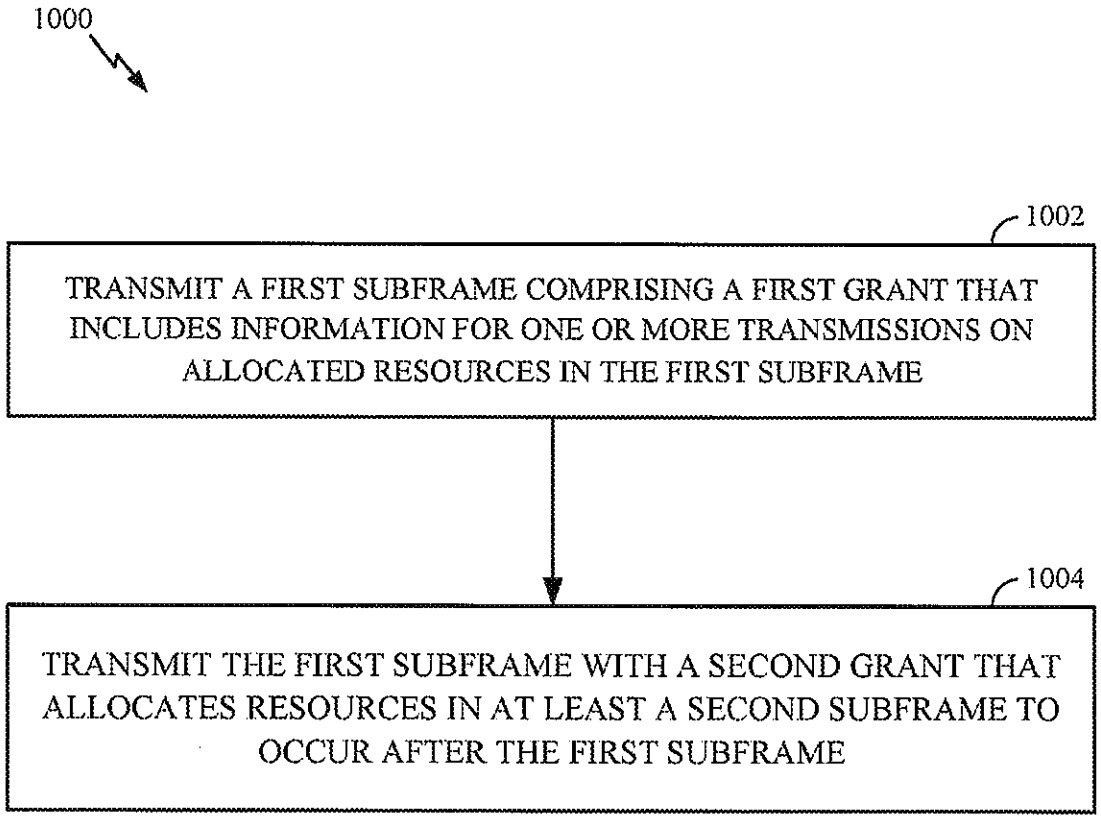
1000
1002
TRANSMIT A FIRST SUBFRAME COMPRISING A FIRST GRANT THAT INCLUDES INFORMATION FOR ONE OR MORE TRANSMISSIONS ON ALLOCATED RESOURCES IN THE FIRST SUBFRAME
1004
TRANSMIT THE FIRST SUBFRAME WITH A SECOND GRANT THAT ALLOCATES RESOURCES IN AT LEAST A SECOND SUBFRAME TO OCCUR AFTER THE FIRST SUBFRAME

FIG. 10

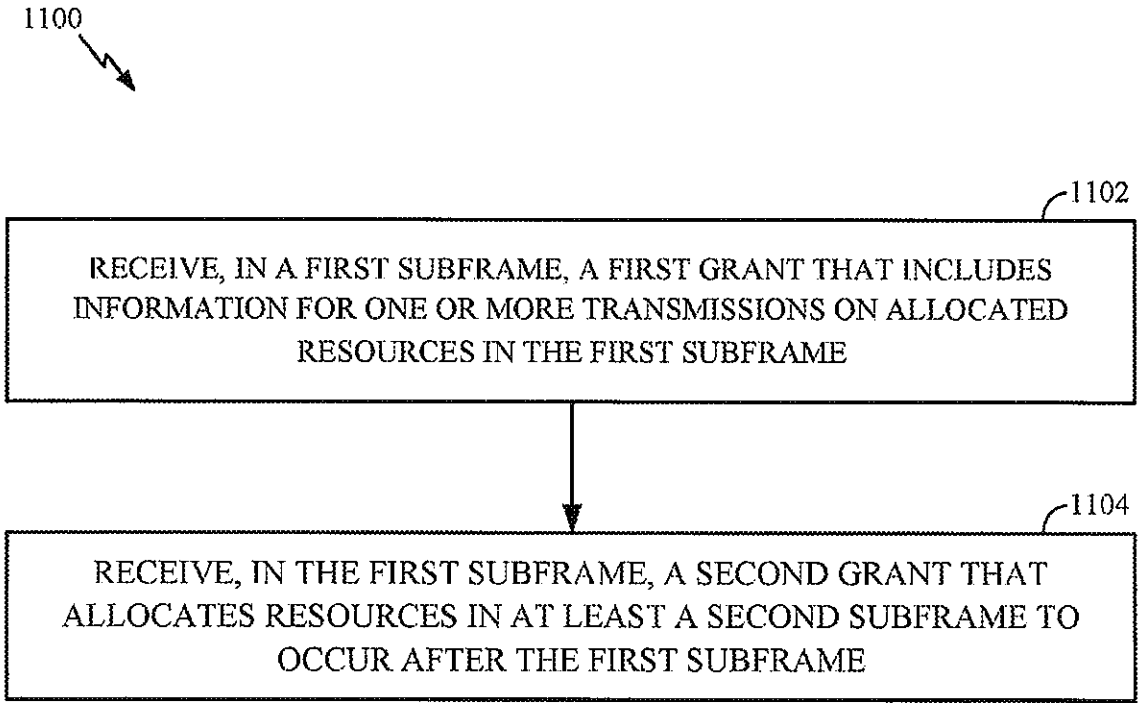
1100
1102
RECEIVE, IN A FIRST SUBFRAME, A FIRST GRANT THAT INCLUDES INFORMATION FOR ONE OR MORE TRANSMISSIONS ON ALLOCATED RESOURCES IN THE FIRST SUBFRAME
1104
RECEIVE, IN THE FIRST SUBFRAME, A SECOND GRANT THAT ALLOCATES RESOURCES IN AT LEAST A SECOND SUBFRAME TO OCCUR AFTER THE FIRST SUBFRAME

FIG. 11

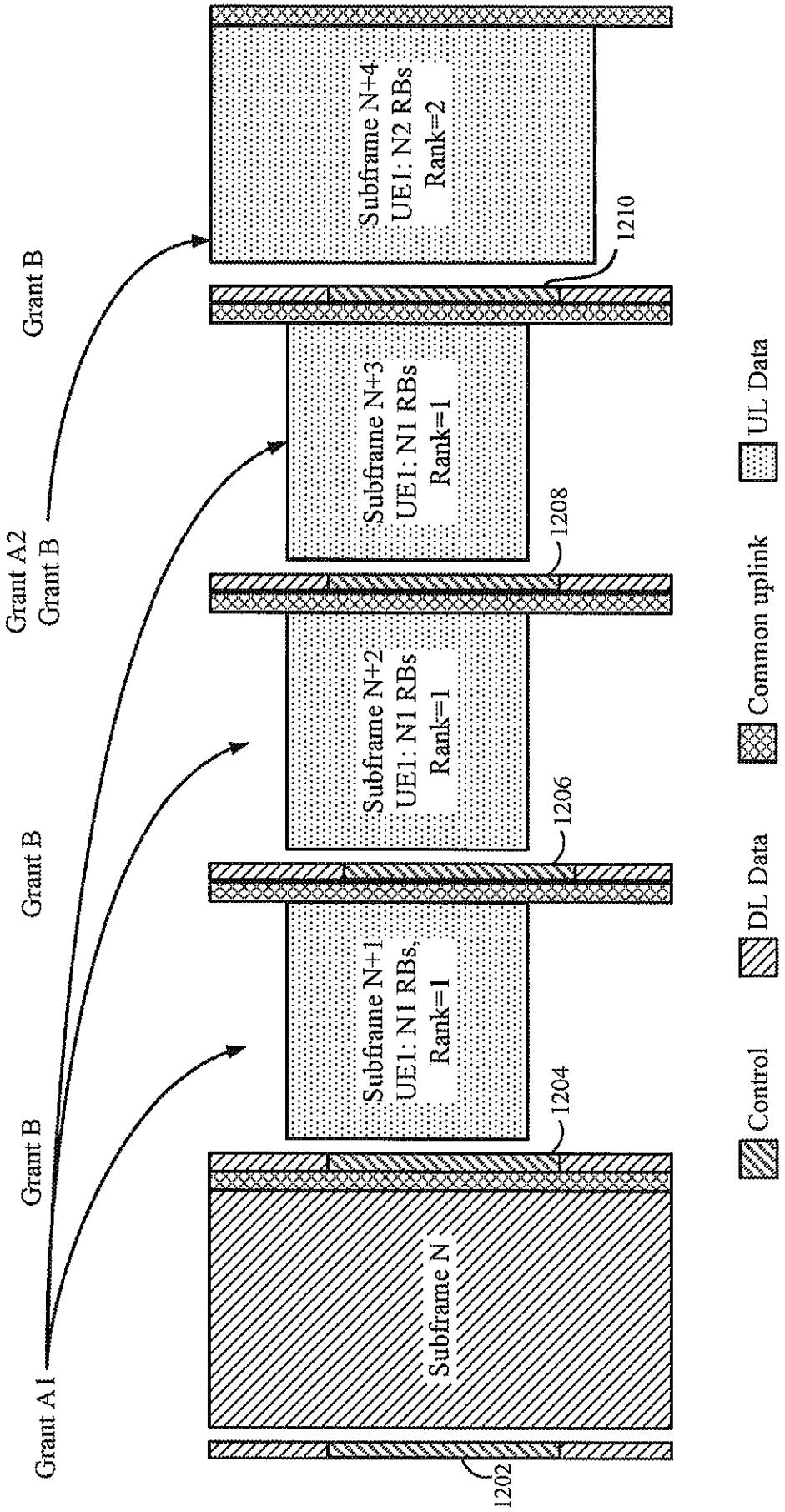
Grant A1
Grant B
Grant A2
Grant B
Grant B
Grant B
Subframe N
Subframe N+1
UE1: N1 RBs,
Rank=1
Subframe N+2
UE1: N1 RBs
Rank=1
Subframe N+3
UE1: N1 RBs
Rank=1
Subframe N+4
UE1: N2 RBs
Rank=2
1202
1204
1206
1208
1210
Control
DL Data
Common uplink
UL Data

FIG. 12

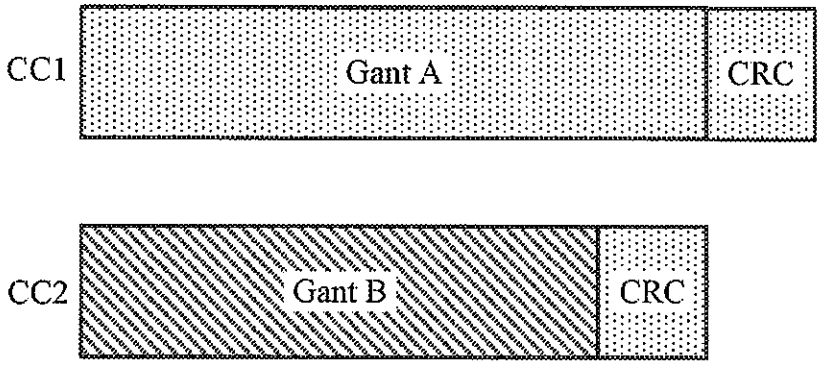

FIG. 13A

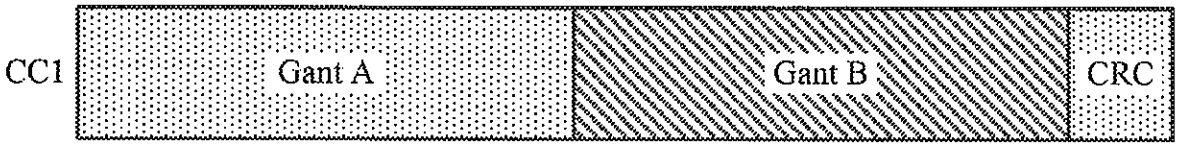

FIG. 13B

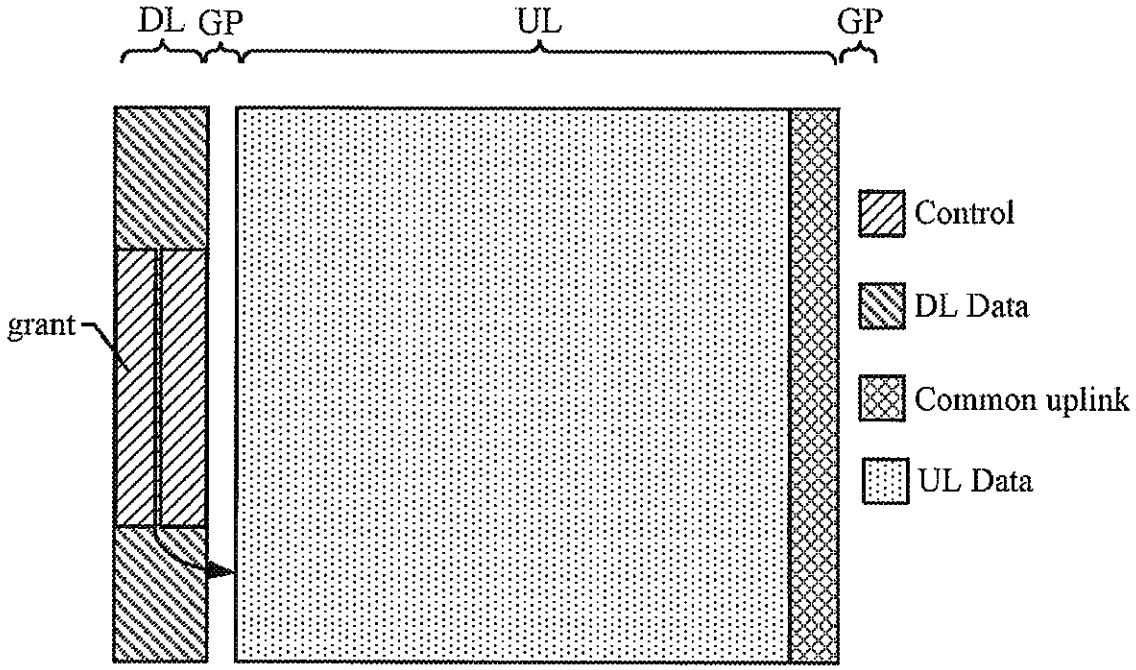

FIG. 14

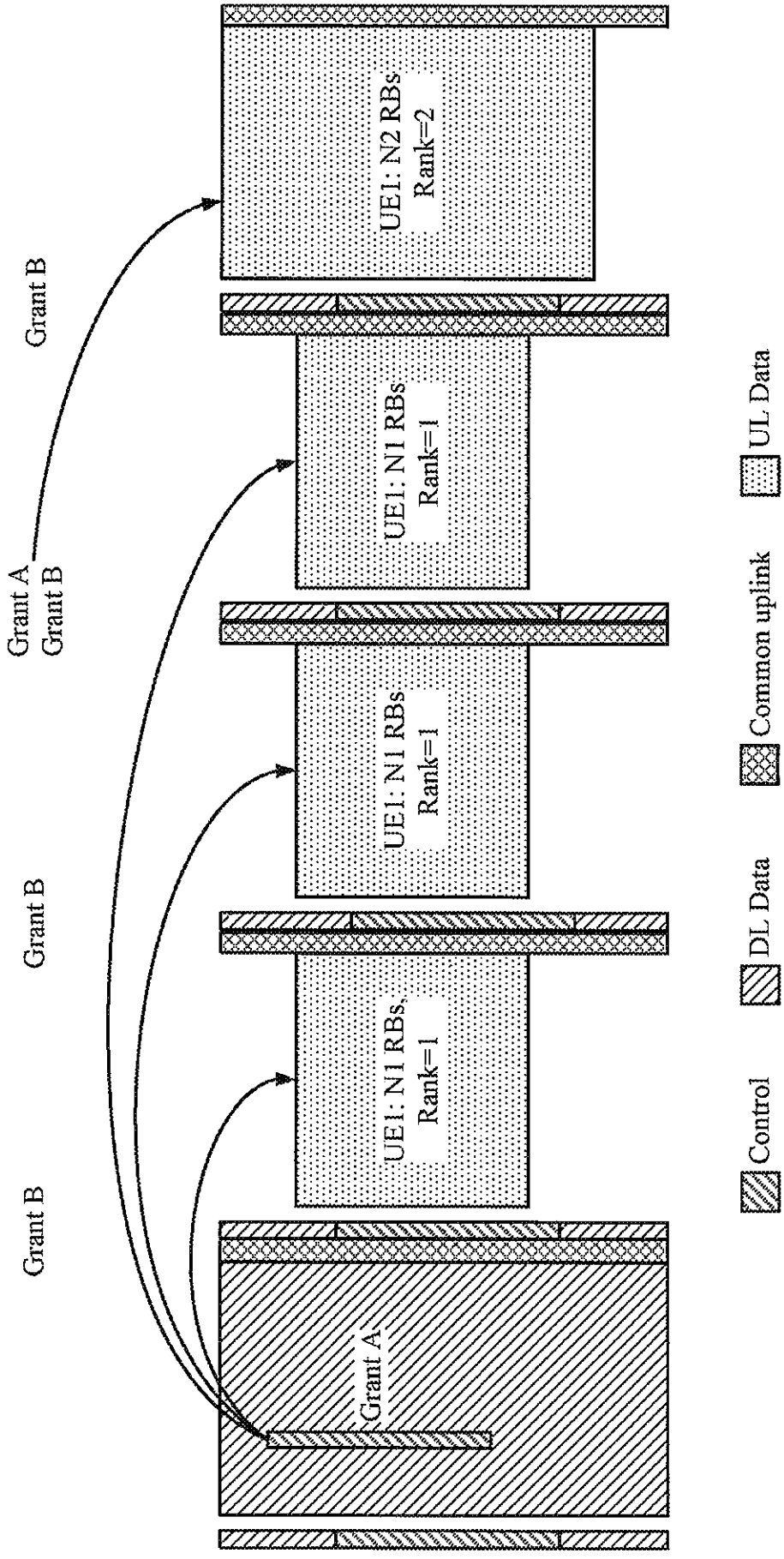
Grant A
Grant B
Grant B
Grant B
Grant B
Grant A
UE1: N2 RBs
Rank=2
UE1: N1 RBs
Rank=1
UE1: N1 RBs
Rank=1
UE1: N1 RBs
Rank=1
Control
DL Data
Common uplink
UL Data

FIG. 15