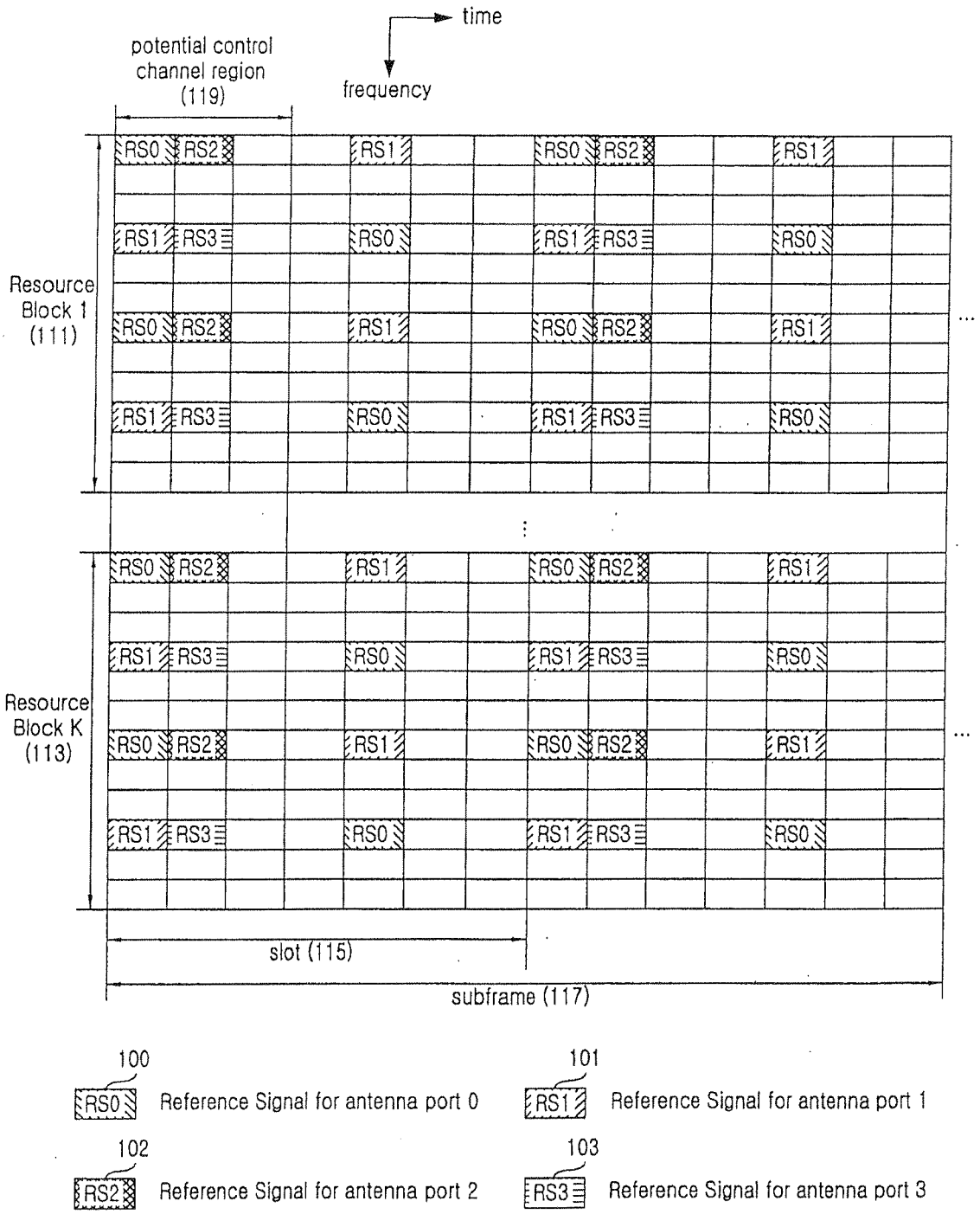

time
frequency
potential control channel region (119)
Resource Block 1 (111)
Resource Block K (113)
RS0
RS1
RS2
RS3
slot (115)
subframe (117)
100
Reference Signal for antenna port 0
101
Reference Signal for antenna port 1
102
Reference Signal for antenna port 2
103
Reference Signal for antenna port 3

FIG.1

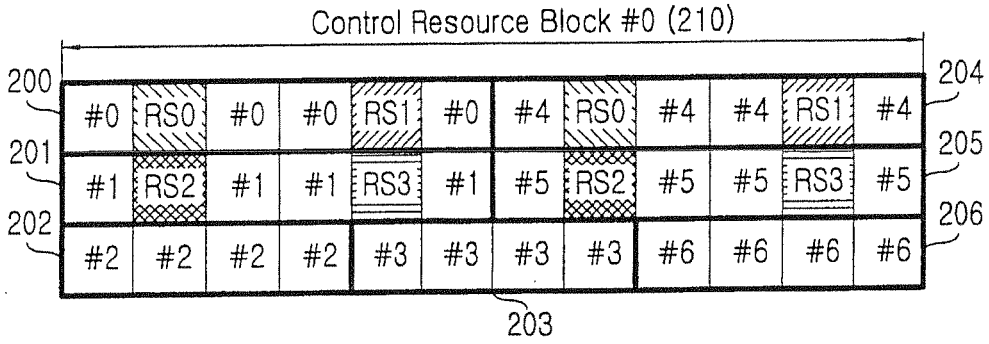

Control Resource Block #0 (210)
200
201
202
203
204
205
206
#0 RS0 #0 #0 RS1 #0 #4 RS0 #4 #4 RS1 #4
#1 RS2 #1 #1 RS3 #1 #5 RS2 #5 #5 RS3 #5
#2 #2 #2 #2 #3 #3 #3 #3 #6 #6 #6 #6

FIG.2

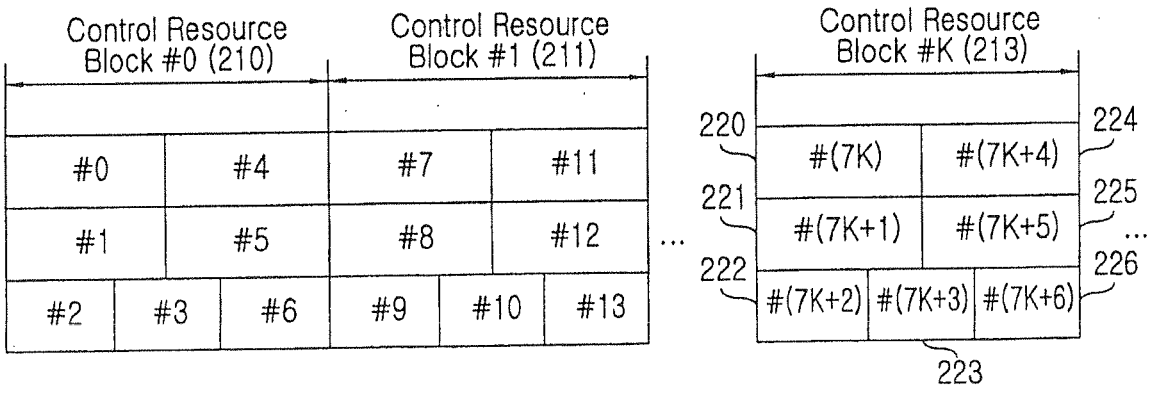

Control Resource Block #0 (210)
Control Resource Block #1 (211)
Control Resource Block #K (213)
#0 #4 #7 #11
#1 #5 #8 #12
#2 #3 #6 #9 #10 #13
220
221
222
223
224
225
226
#(7K) #(7K+4)
#(7K+1) #(7K+5)
#(7K+2) #(7K+3) #(7K+6)

FIG.3

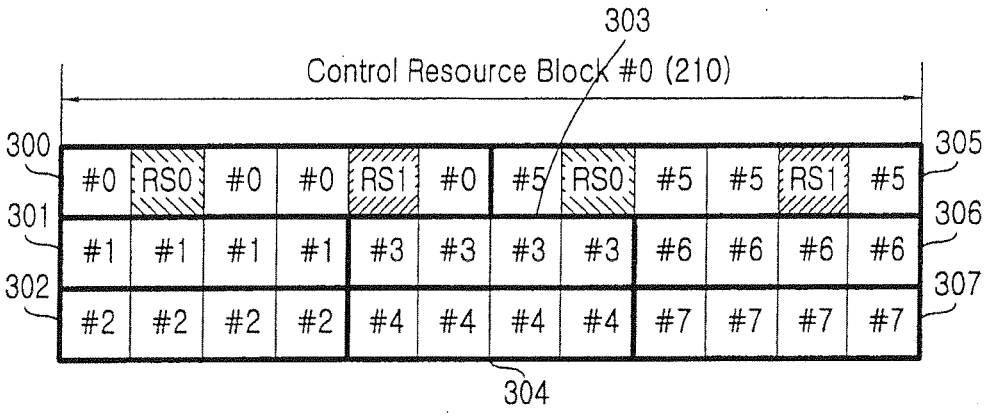

303
Control Resource Block #0 (210)
300
301
302
305
306
307
304
#0 RS0 #0 #0 RS1 #0 #5 RS0 #5 #5 RS1 #5
#1 #1 #1 #1 #3 #3 #3 #3 #6 #6 #6 #6
#2 #2 #2 #2 #4 #4 #4 #4 #7 #7 #7 #7

FIG.4

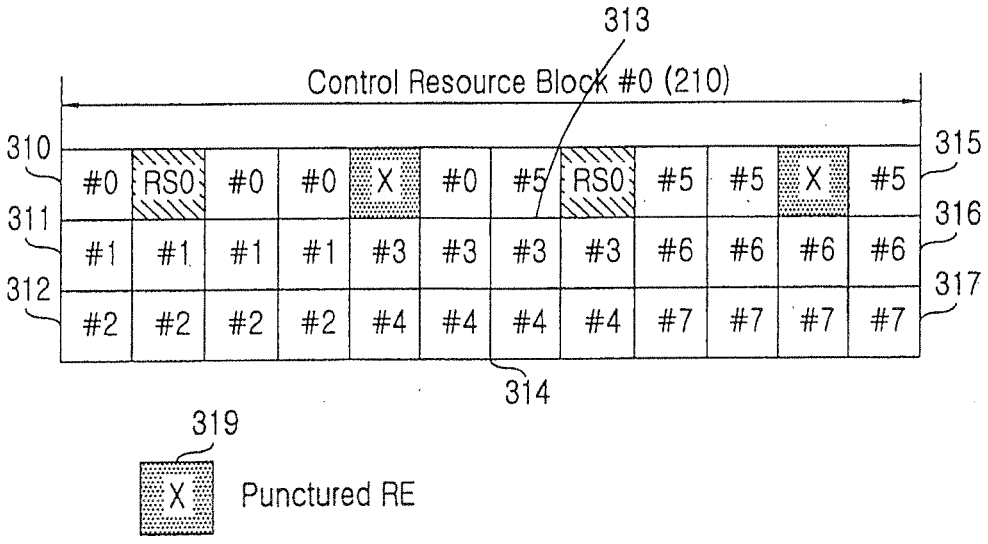

313
Control Resource Block #0 (210)
310
311
312
315
316
317
314
#0 RS0 #0 #0 X #0 #5 RS0 #5 #5 X #5
#1 #1 #1 #1 #3 #3 #3 #3 #6 #6 #6 #6
#2 #2 #2 #2 #4 #4 #4 #4 #7 #7 #7 #7
319
X
Punctured RE

FIG.5

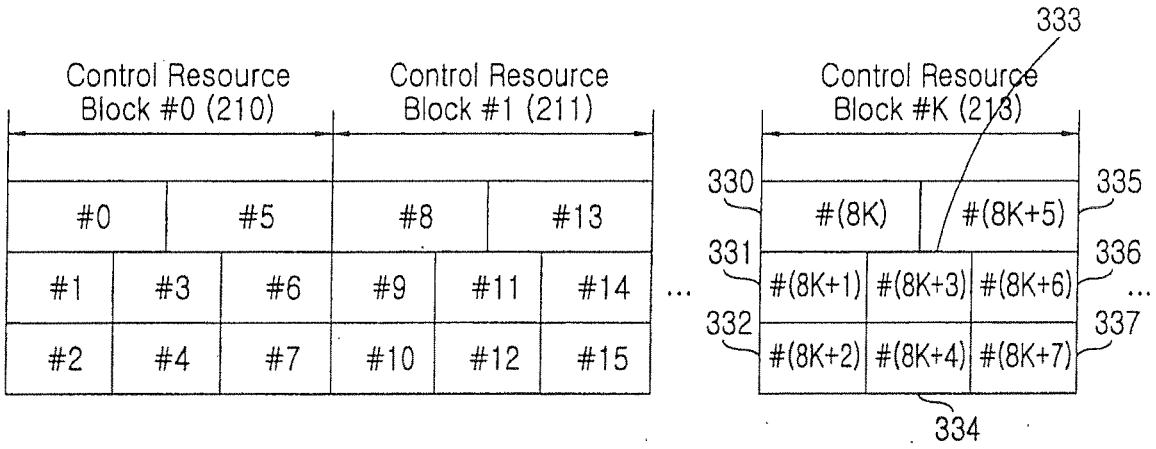

Control Resource Block #0 (210)
Control Resource Block #1 (211)
Control Resource Block #K (213)
333
#0
#5
#8
#13
#1
#3
#6
#9
#11
#14
#2
#4
#7
#10
#12
#15
330
#(8K)
#(8K+5)
335
331
#(8K+1)
#(8K+3)
#(8K+6)
336
332
#(8K+2)
#(8K+4)
#(8K+7)
337
334

FIG.6

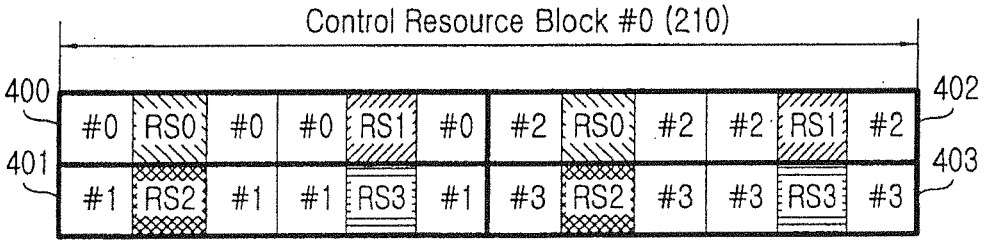

Control Resource Block #0 (210)
400
401
402
403
#0
RS0
#0
#0
RS1
#0
#2
RS0
#2
#2
RS1
#2
#1
RS2
#1
#1
RS3
#1
#3
RS2
#3
#3
RS3
#3

FIG.7

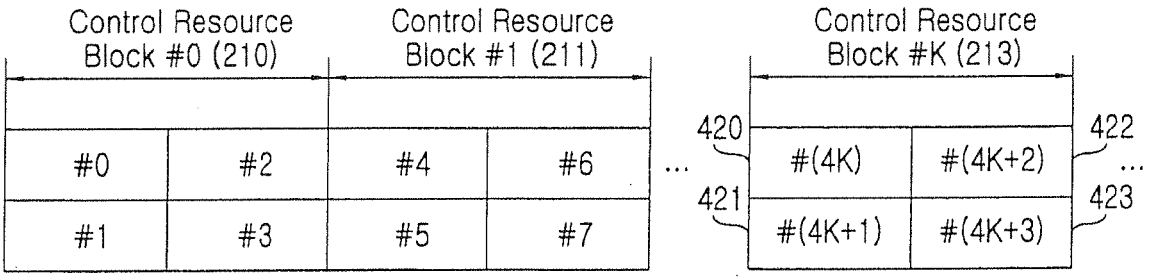

Control Resource Block #0 (210)
Control Resource Block #1 (211)
Control Resource Block #K (213)
#0
#2
#4
#6
#1
#3
#5
#7
420
422
#(4K)
#(4K+2)
421
423
#(4K+1)
#(4K+3)

FIG.8

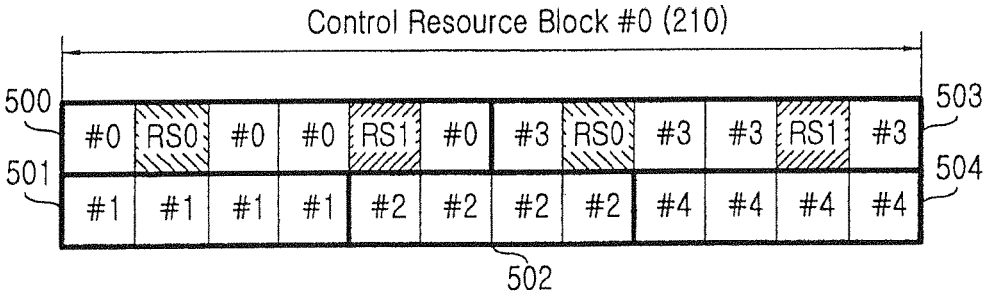

Control Resource Block #0 (210)
500
503
#0
RS0
#0
#0
RS1
#0
#3
RS0
#3
#3
RS1
#3
501
504
#1
#1
#1
#1
#2
#2
#2
#2
#4
#4
#4
#4
502

FIG.9

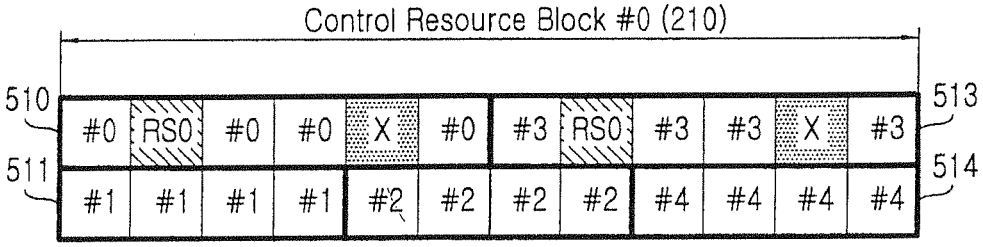

Control Resource Block #0 (210)
510
511
513
514
#0
RS0
#0
#0
X
#0
#3
RS0
#3
#3
X
#3
#1
#1
#1
#1
#2
#2
#2
#2
#4
#4
#4
#4

FIG.10

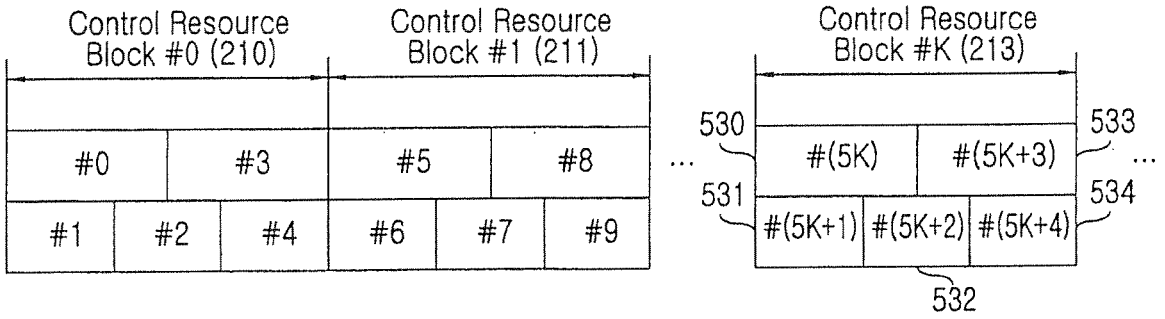

Control Resource Block #0 (210)
Control Resource Block #1 (211)
Control Resource Block #K (213)
#0
#3
#5
#8
#1
#2
#4
#6
#7
#9
530
531
532
533
534
#(5K)
#(5K+3)
#(5K+1)
#(5K+2)
#(5K+4)

FIG.11

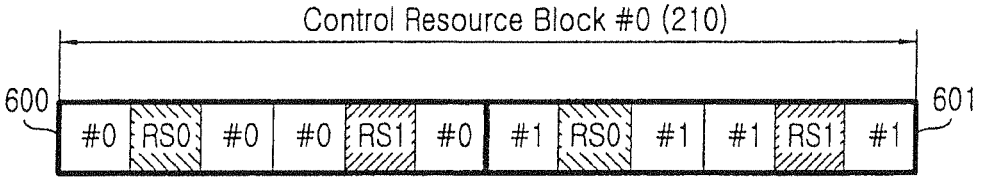

Control Resource Block #0 (210)
600
601
#0
RS0
#0
#0
RS1
#0
#1
RS0
#1
#1
RS1
#1

FIG.12

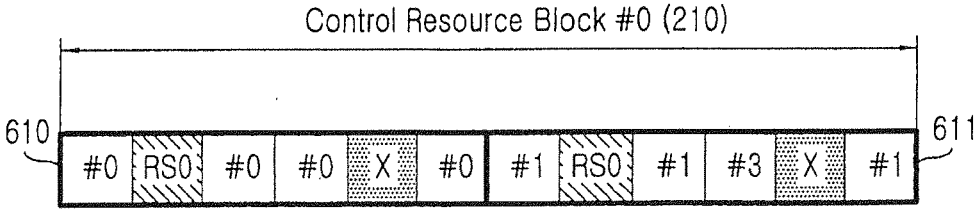

Control Resource Block #0 (210)
610
611
#0
RS0
#0
#0
X
#0
#1
RS0
#1
#3
X
#1

FIG.13

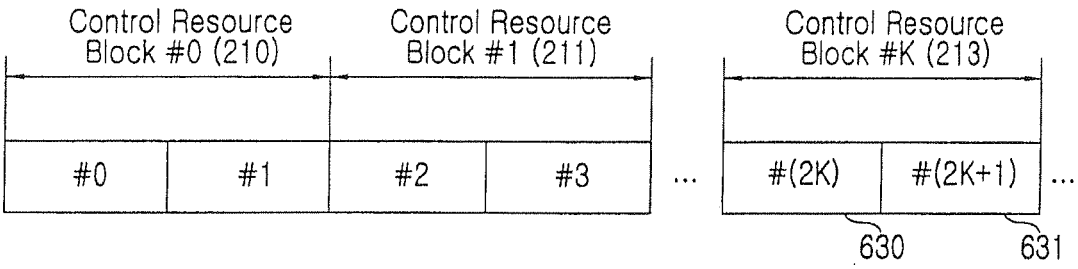

Control Resource Block #0 (210)
Control Resource Block #1 (211)
Control Resource Block #K (213)
#0
#1
#2
#3
...
#(2K)
#(2K+1)
...
630
631

FIG.14

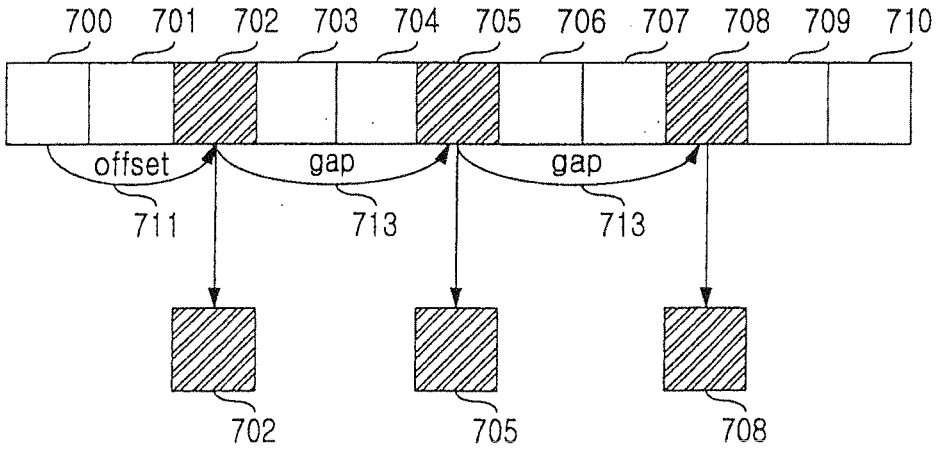

700
701
702
703
704
705
706
707
708
709
710
offset
gap
gap
711
713
713
702
705
708

FIG.15

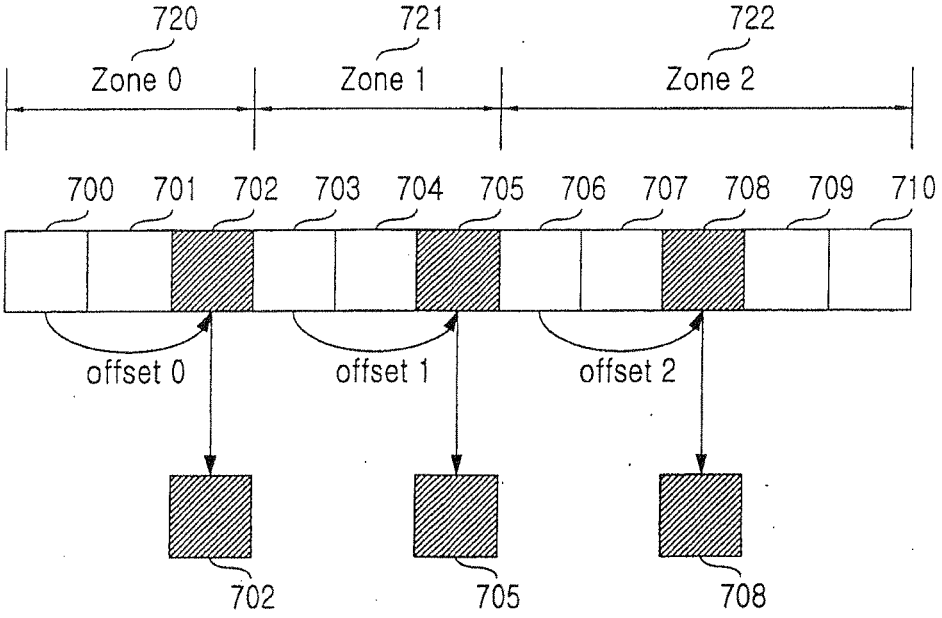

720
721
722
Zone 0
Zone 1
Zone 2
700 701 702 703 704 705 706 707 708 709 710
offset 0
offset 1
offset 2
702
705
708

FIG.16

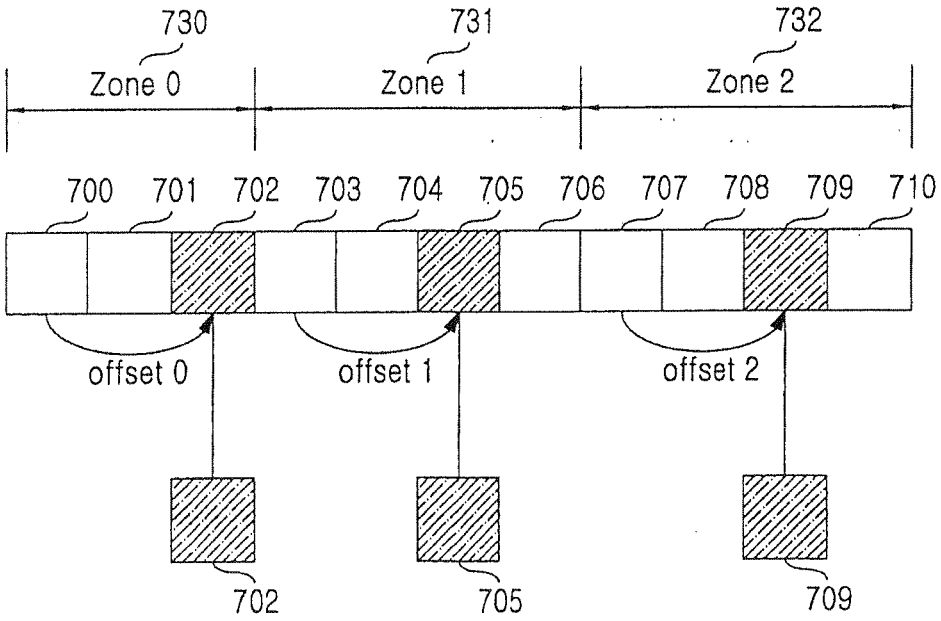

730
731
732
Zone 0
Zone 1
Zone 2
700 701 702 703 704 705 706 707 708 709 710
offset 0
offset 1
offset 2
702
705
709

FIG.17

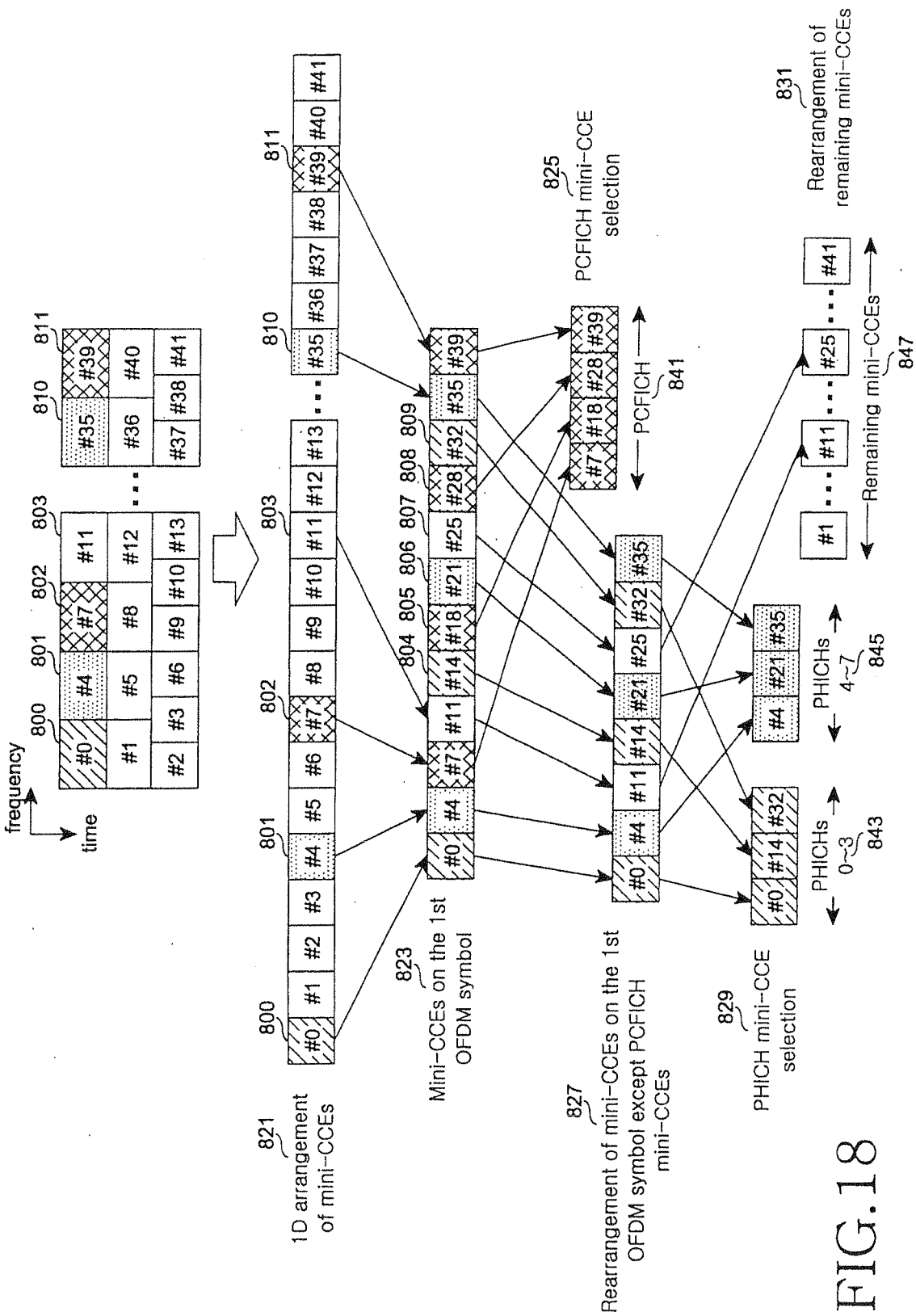

frequency
time
800
801
802
803
810
811
#0
#1
#2
#3
#4
#5
#6
#7
#8
#9
#10
#11
#12
#13
#35
#36
#37
#38
#39
#40
#41
821
1D arrangement of mini-CCEs
823
Mini-CCEs on the 1st OFDM symbol
825
PCFICH mini-CCE selection
827
Rearrangement of mini-CCEs on the 1st OFDM symbol except PCFICH mini-CCEs
829
PHICH mini-CCE selection
831
Rearrangement of remaining mini-CCEs
841
PCFICH
843
PHICHs 0~3
845
PHICHs 4~7
847
Remaining mini-CCEs

FIG. 18

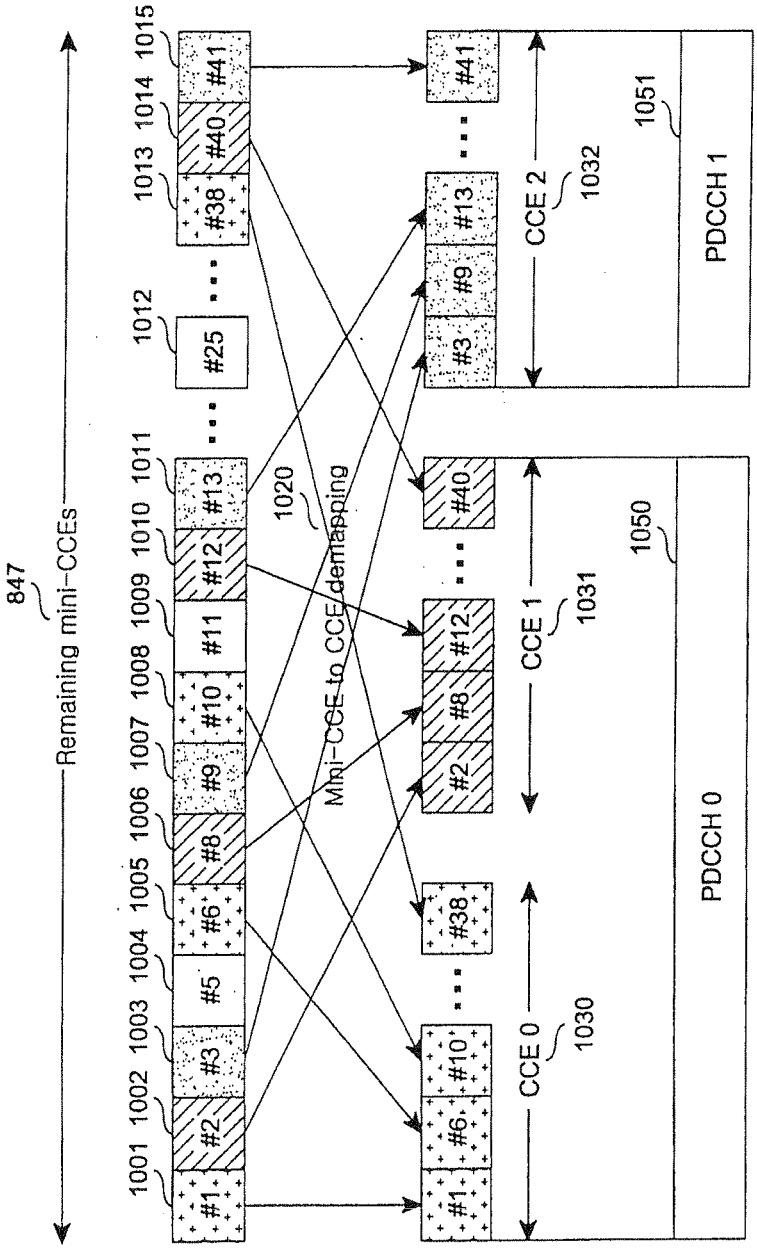

847
Remaining mini-CCEs
1001
1002
1003
1004
1005
1006
1007
1008
1009
1010
1011
1012
1013
1014
1015
#1
#2
#3
#5
#6
#8
#9
#10
#11
#12
#13
#25
#38
#40
#41
1020
Mini-CCE to CCE demapping
CCE 0
1030
CCE 1
1031
CCE 2
1032
PDCCH 0
1050
PDCCH 1
1051

FIG. 19

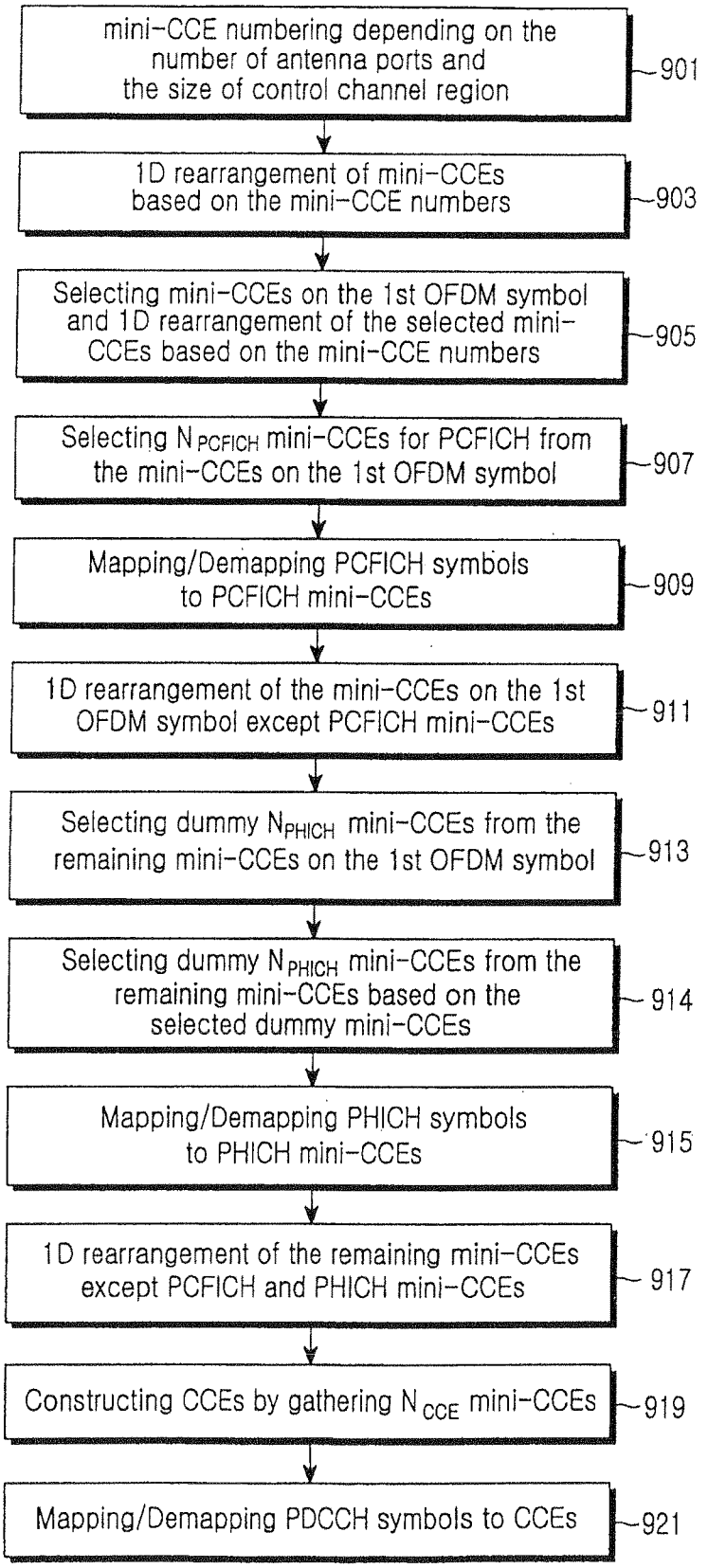

mini-CCE numbering depending on the number of antenna ports and the size of control channel region
901
1D rearrangement of mini-CCEs based on the mini-CCE numbers
903
Selecting mini-CCEs on the 1st OFDM symbol and 1D rearrangement of the selected mini-CCEs based on the mini-CCE numbers
905
Selecting N_{PCFICH} mini-CCEs for PCFICH from the mini-CCEs on the 1st OFDM symbol
907
Mapping/Demapping PCFICH symbols to PCFICH mini-CCEs
909
1D rearrangement of the mini-CCEs on the 1st OFDM symbol except PCFICH mini-CCEs
911
Selecting dummy N_{PHICH} mini-CCEs from the remaining mini-CCEs on the 1st OFDM symbol
913
Selecting dummy N_{PHICH} mini-CCEs from the remaining mini-CCEs based on the selected dummy mini-CCEs
914
Mapping/Demapping PHICH symbols to PHICH mini-CCEs
915
1D rearrangement of the remaining mini-CCEs except PCFICH and PHICH mini-CCEs
917
Constructing CCEs by gathering N_{CCE} mini-CCEs
919
Mapping/Demapping PDCCH symbols to CCEs
921

FIG.20

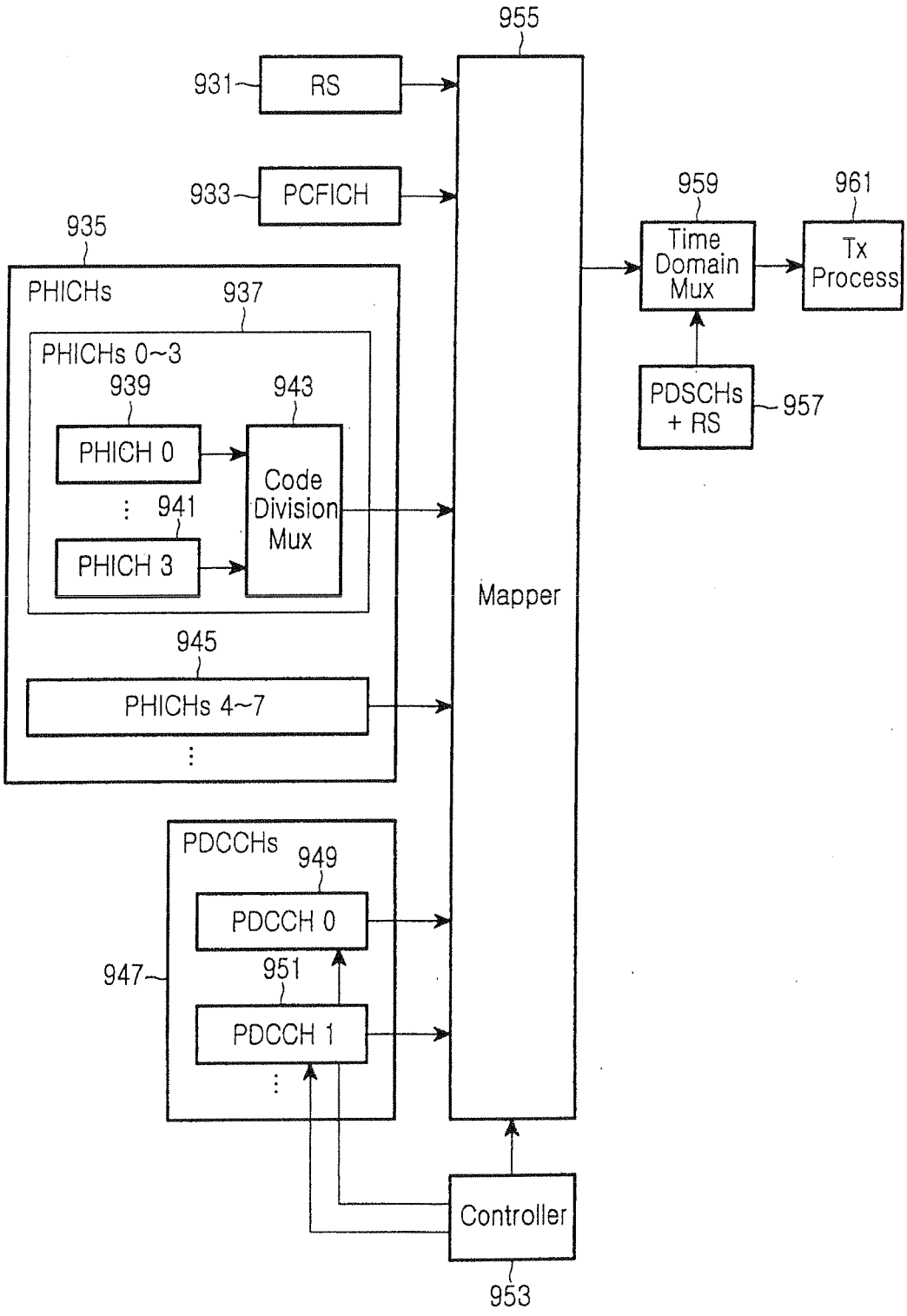

955
931
RS
933
PCFICH
959
961
935
Time Domain Mux
Tx Process
PHICHs
937
PHICHs 0~3
939
943
PHICH 0
Code Division Mux
941
PHICH 3
PDSCHs + RS
957
Mapper
945
PHICHs 4~7
PDCCHs
949
PDCCH 0
947
951
PDCCH 1
Controller
953

FIG.21

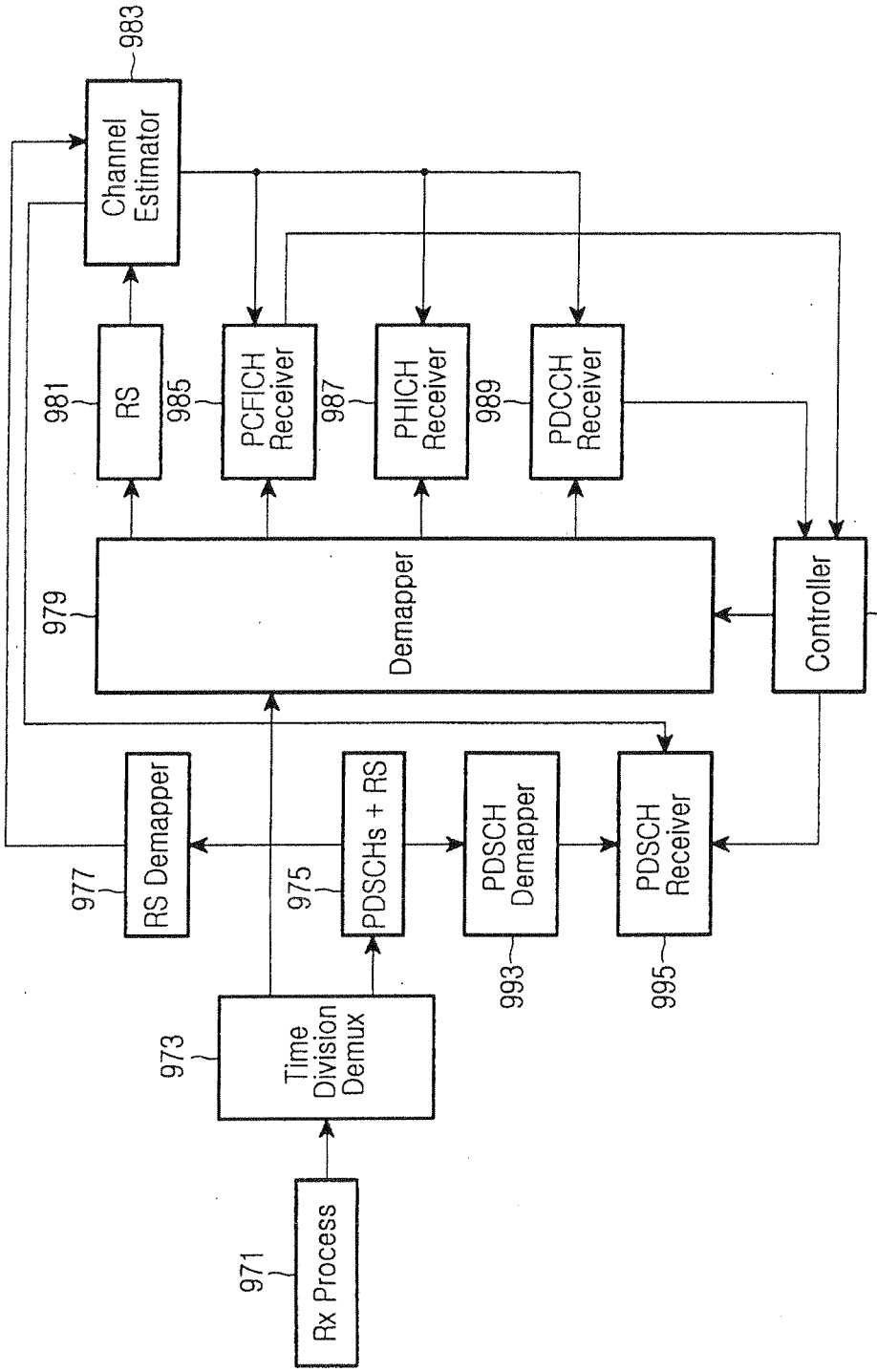

Channel Estimator
983
RS
981
985
PCFICH Receiver
987
PHICH Receiver
989
PDCCH Receiver
Demapper
979
Controller
991
RS Demapper
977
PDSCHs + RS
975
PDSCH Demapper
993
PDSCH Receiver
995
Time Division Demux
973
Rx Process
971

FIG.22

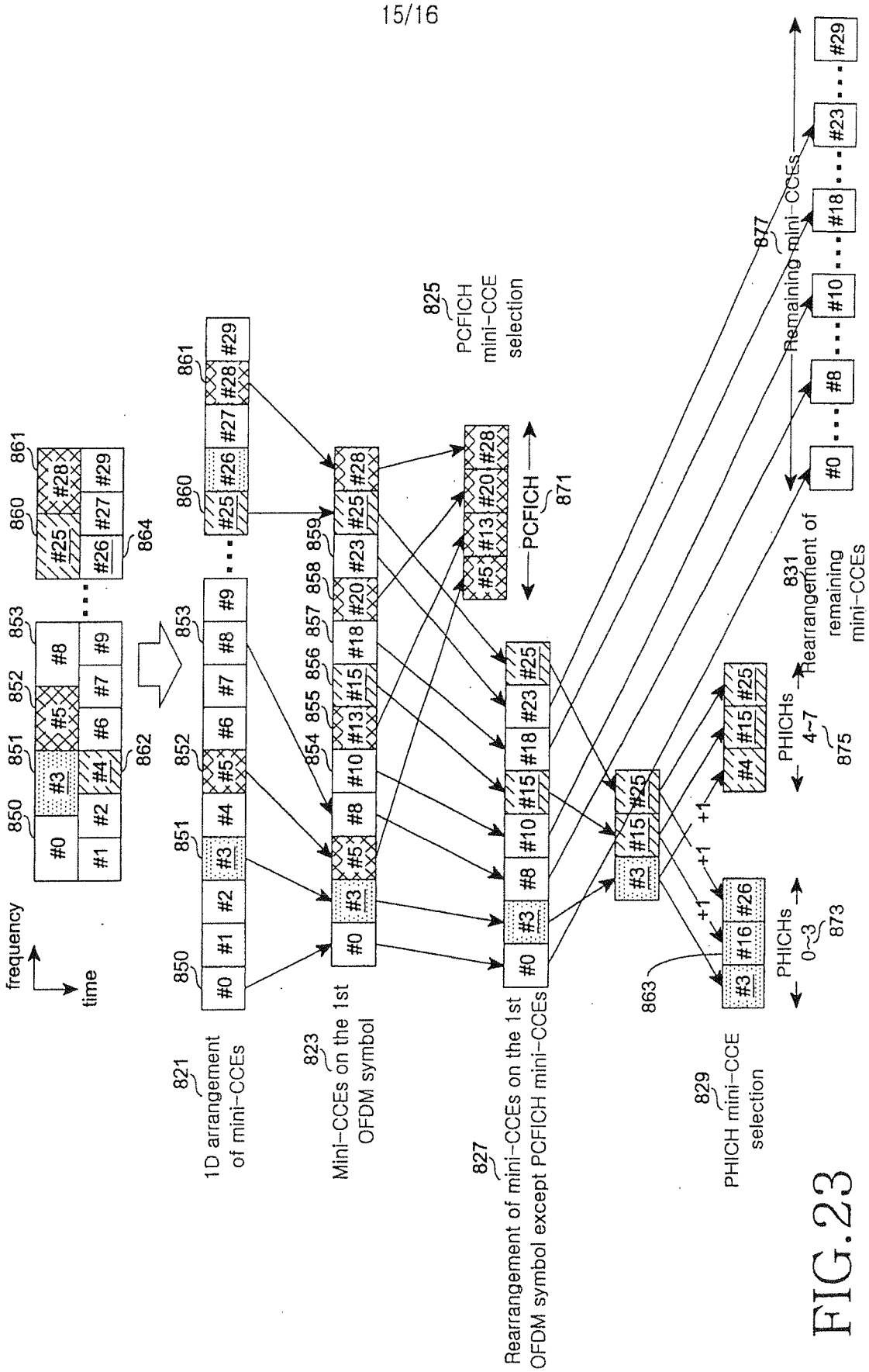

frequency
time
850
851
852
853
860
861
862
864
821
1D arrangement of mini-CCEs
823
Mini-CCEs on the 1st OFDM symbol
825
PCFICH mini-CCE selection
827
Rearrangement of mini-CCEs on the 1st OFDM symbol except PCFICH mini-CCEs
PCFICH
871
877
Remaining mini-CCEs
831
Rearrangement of remaining mini-CCEs
PHICHs 4~7
875
PHICHs 0~3
873
863
829
PHICH mini-CCE selection
+1

FIG.23

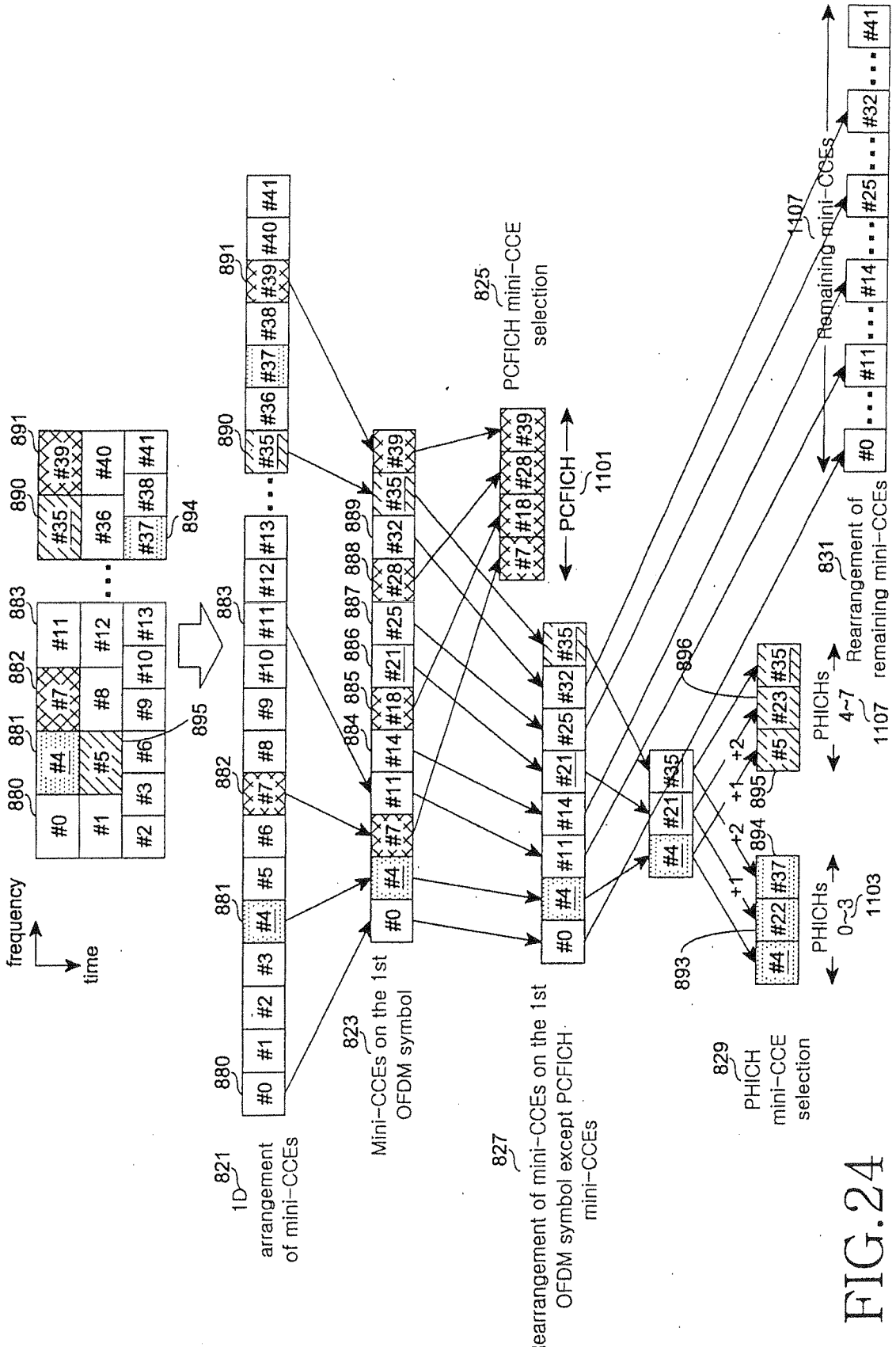

frequency
time
880
881
882
883
890
891
894
895
821
1D arrangement of mini-CCEs
823
Mini-CCEs on the 1st OFDM symbol
825
PCFICH mini-CCE selection
827
Rearrangement of mini-CCEs on the 1st OFDM symbol except PCFICH mini-CCEs
829
PHICH mini-CCE selection
831
Rearrangement of remaining mini-CCEs
884
885
886
887
888
889
893
896
1101
PCFICH
1103
PHICHs 0~3
1107
Remaining mini-CCEs
PHICHs 4~7
+1
+2

FIG.24