FIG. 1

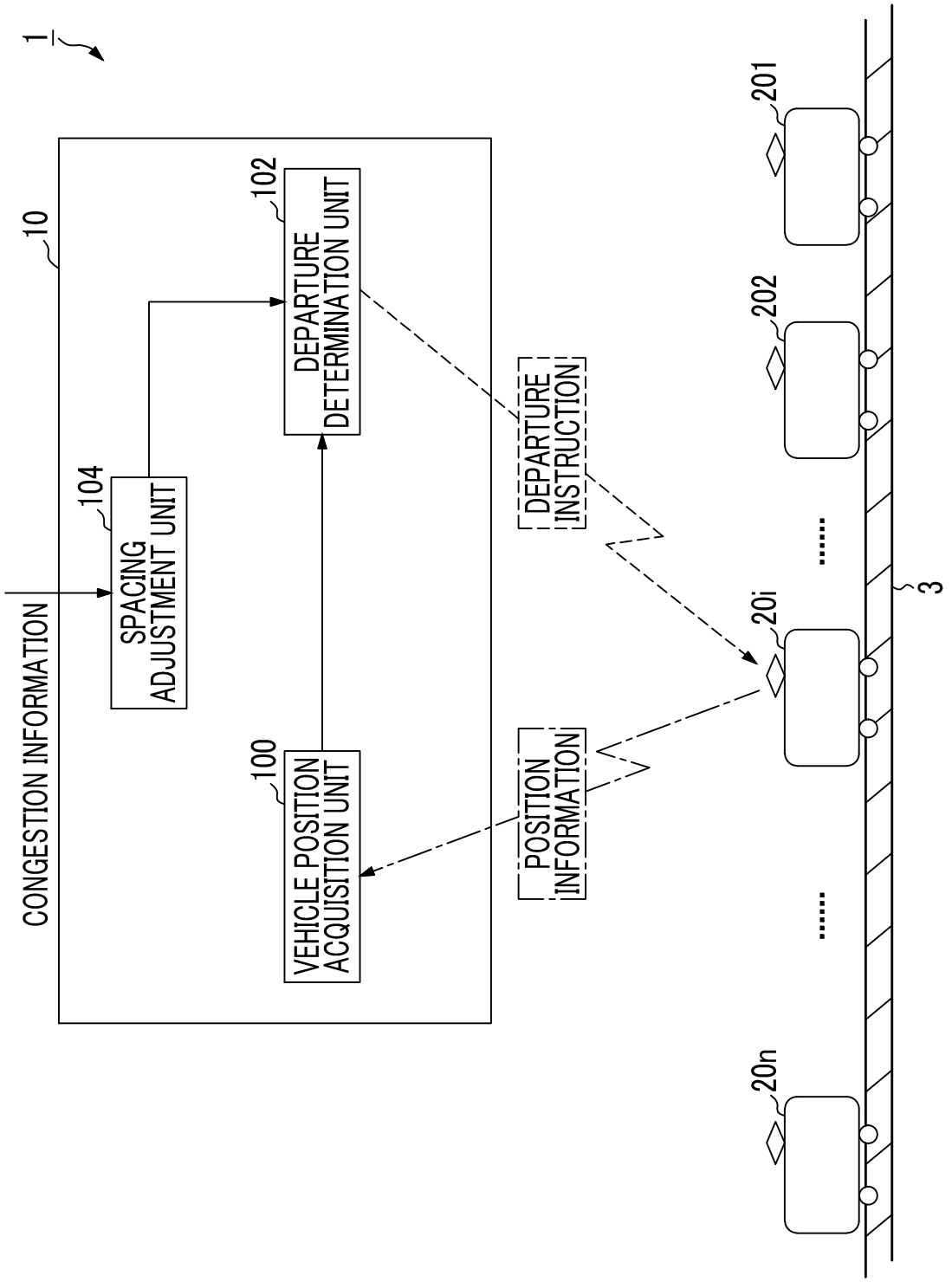

1
10
CONGESTION INFORMATION
SPACING ADJUSTMENT UNIT
104
DEPARTURE DETERMINATION UNIT
102
VEHICLE POSITION ACQUISITION UNIT
100
DEPARTURE INSTRUCTION
POSITION INFORMATION
201
202
20i
20n
3

FIG. 2

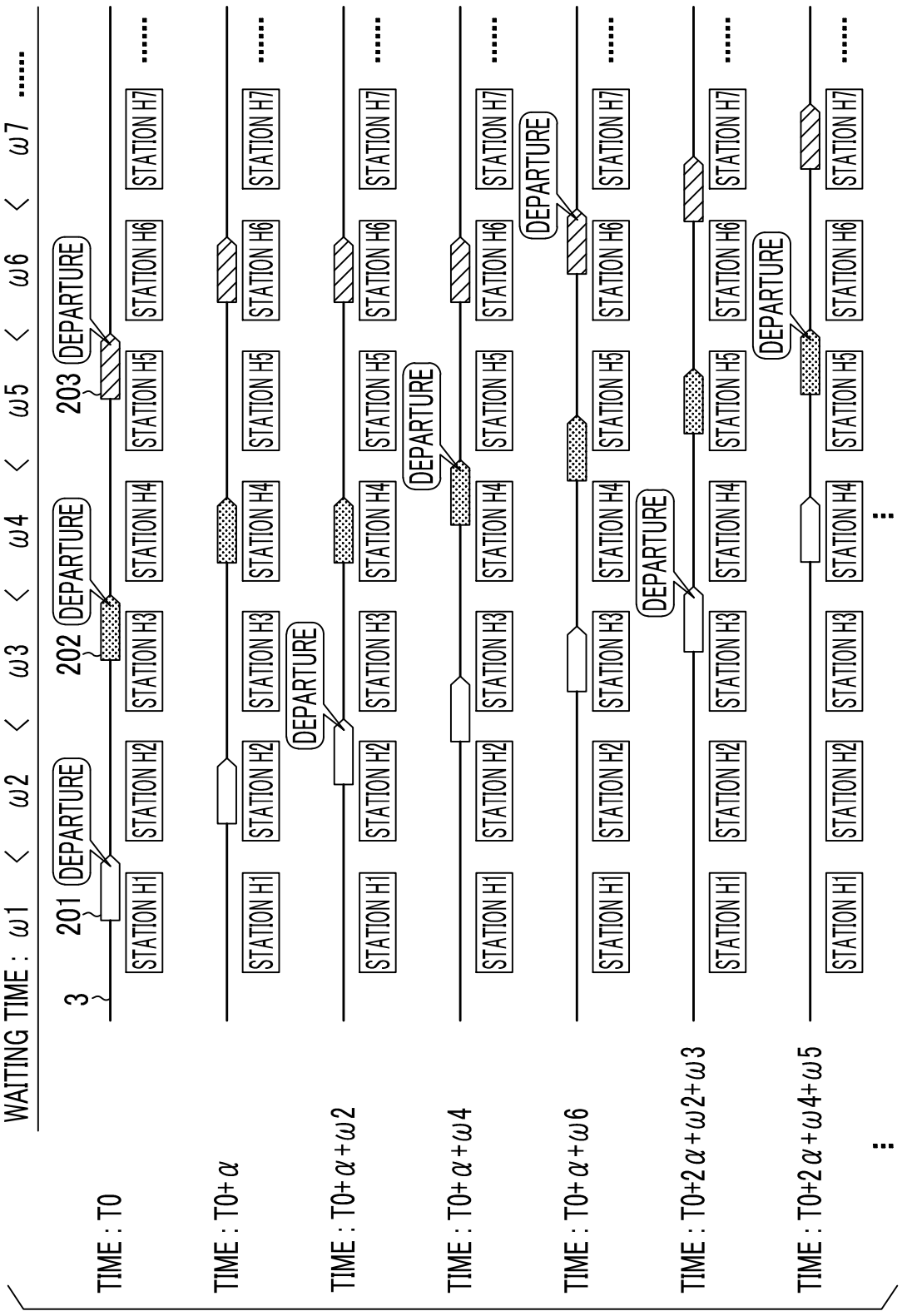

WAITING TIME : ω1 < ω2 < ω3 < ω4 < ω5 < ω6 < ω7 .....
3
201
202
203
DEPARTURE
STATION H1
STATION H2
STATION H3
STATION H4
STATION H5
STATION H6
STATION H7
TIME : T0
TIME : T0+α
TIME : T0+α+ω2
TIME : T0+α+ω4
TIME : T0+α+ω6
TIME : T0+2α+ω2+ω3
TIME : T0+2α+ω4+ω5

FIG. 3

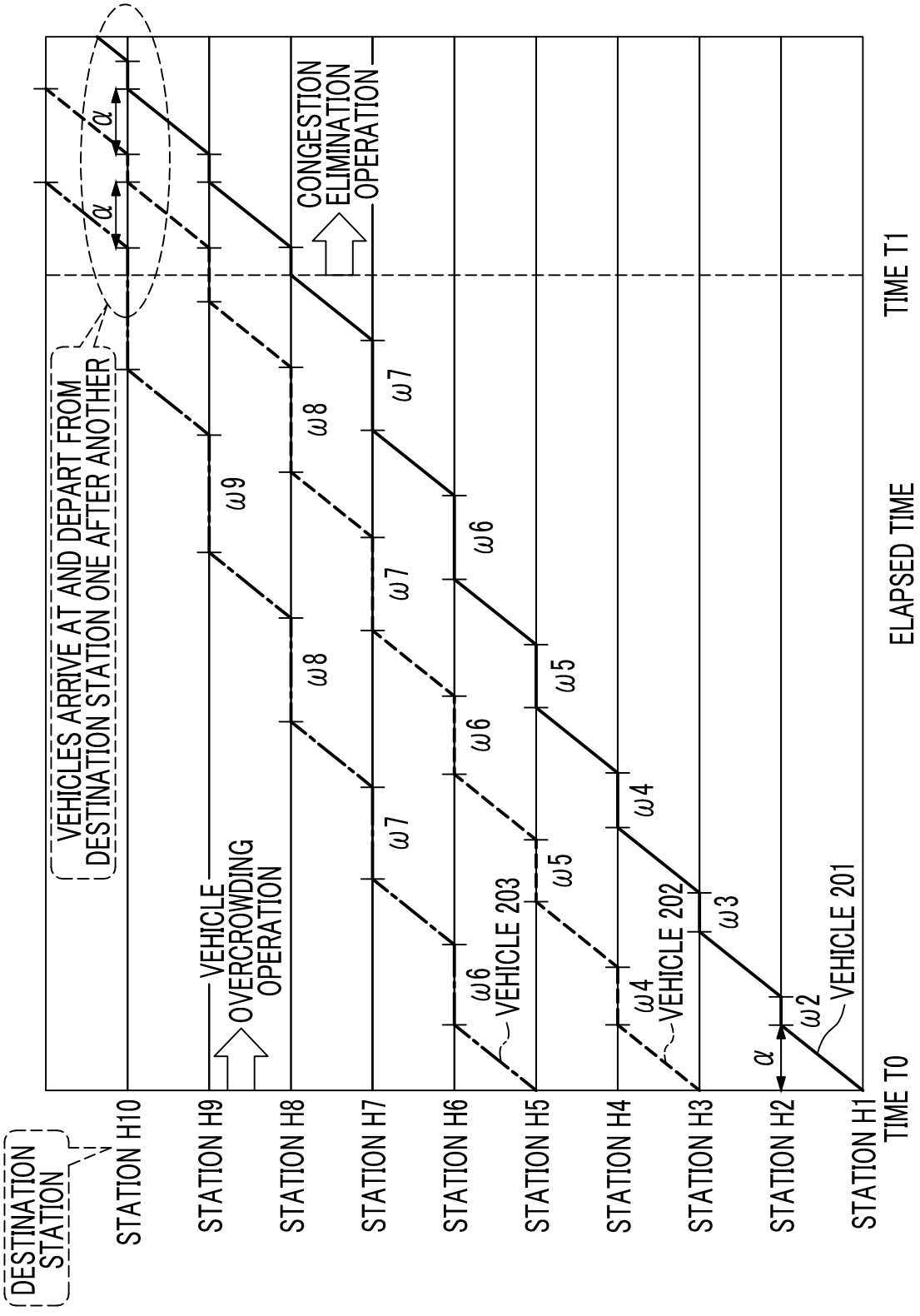

DESTINATION STATION
STATION H10
STATION H9
STATION H8
STATION H7
STATION H6
STATION H5
STATION H4
STATION H3
STATION H2
STATION H1
TIME T0
TIME T1
ELAPSED TIME
VEHICLES ARRIVE AT AND DEPART FROM DESTINATION STATION ONE AFTER ANOTHER
VEHICLE OVERCROWDING OPERATION
CONGESTION ELIMINATION OPERATION
VEHICLE 201
VEHICLE 202
VEHICLE 203
α
ω2
ω3
ω4
ω5
ω6
ω7
ω8
ω9

FIG. 4

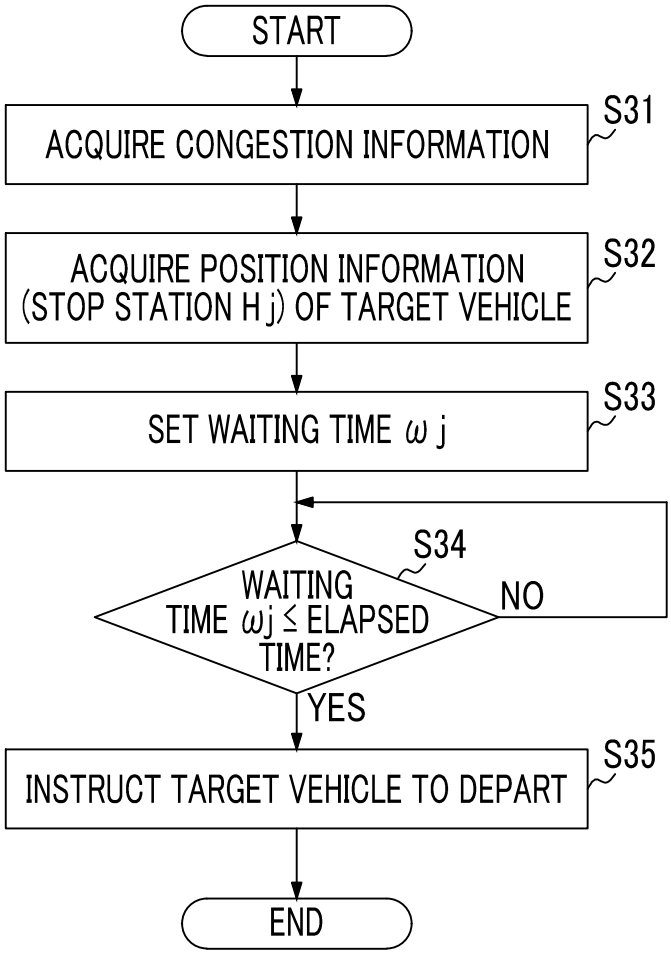

START
ACQUIRE CONGESTION INFORMATION
S31
ACQUIRE POSITION INFORMATION (STOP STATION H j) OF TARGET VEHICLE
S32
SET WAITING TIME ω j
S33
S34
WAITING TIME ωj ≤ ELAPSED TIME?
NO
YES
INSTRUCT TARGET VEHICLE TO DEPART
S35
END

FIG. 5

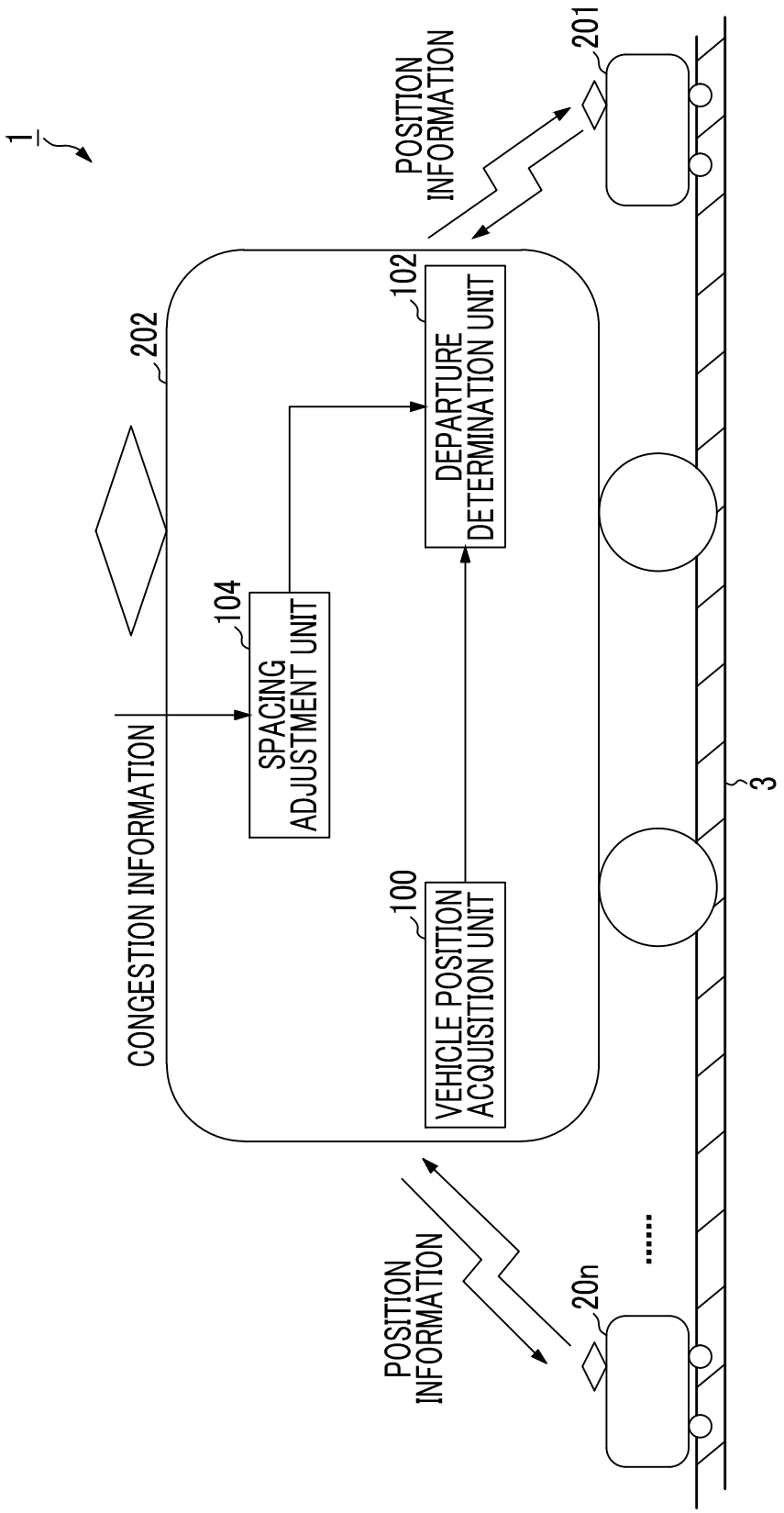

1
POSITION INFORMATION
201
202
102
DEPARTURE DETERMINATION UNIT
104
SPACING ADJUSTMENT UNIT
CONGESTION INFORMATION
100
VEHICLE POSITION ACQUISITION UNIT
3
POSITION INFORMATION
20n
.....

FIG. 6

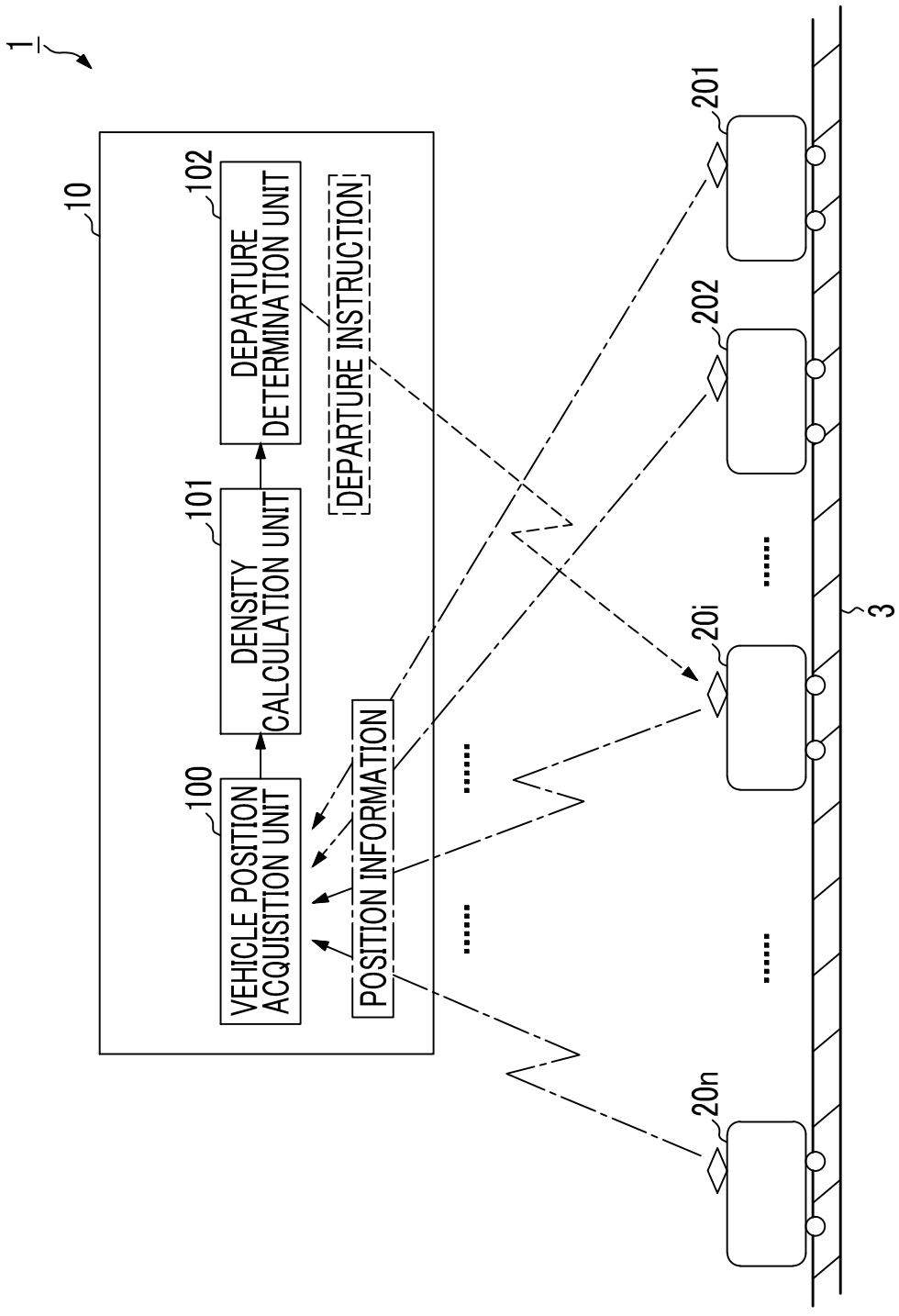

1
10
100
VEHICLE POSITION ACQUISITION UNIT
101
DENSITY CALCULATION UNIT
102
DEPARTURE DETERMINATION UNIT
POSITION INFORMATION
DEPARTURE INSTRUCTION
201
202
20i
20n
3

FIG. 7

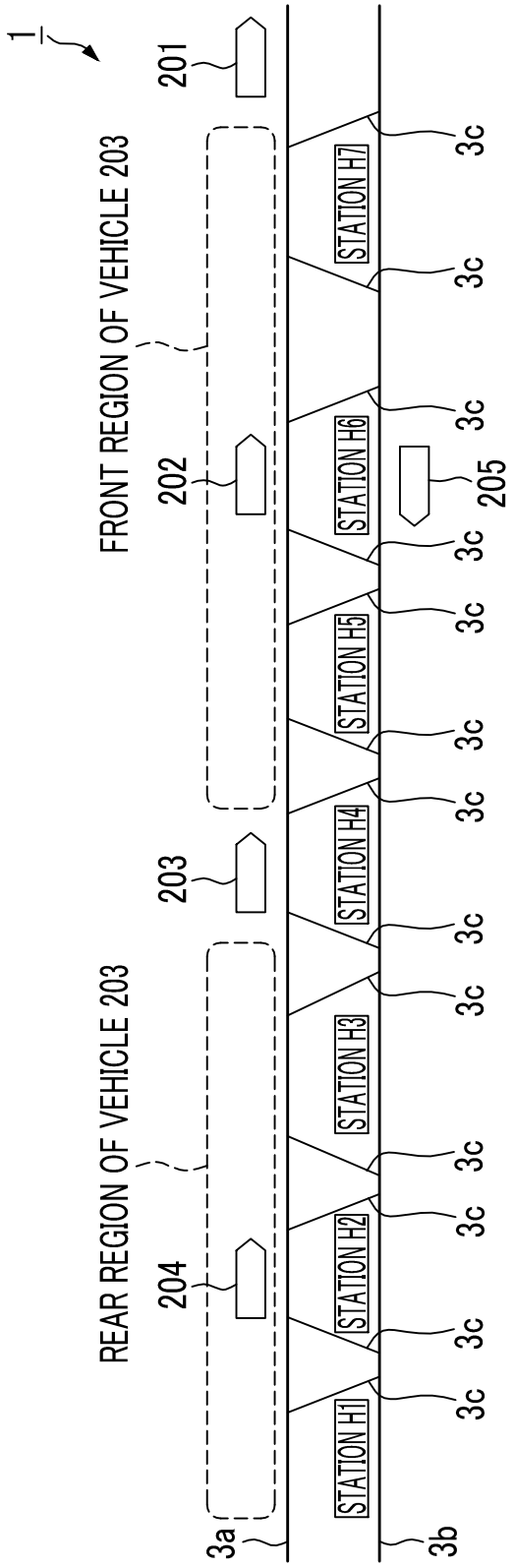

1
201
FRONT REGION OF VEHICLE 203
202
205
203
REAR REGION OF VEHICLE 203
204
STATION H1
STATION H2
STATION H3
STATION H4
STATION H5
STATION H6
STATION H7
3a
3b
3c

FIG. 8

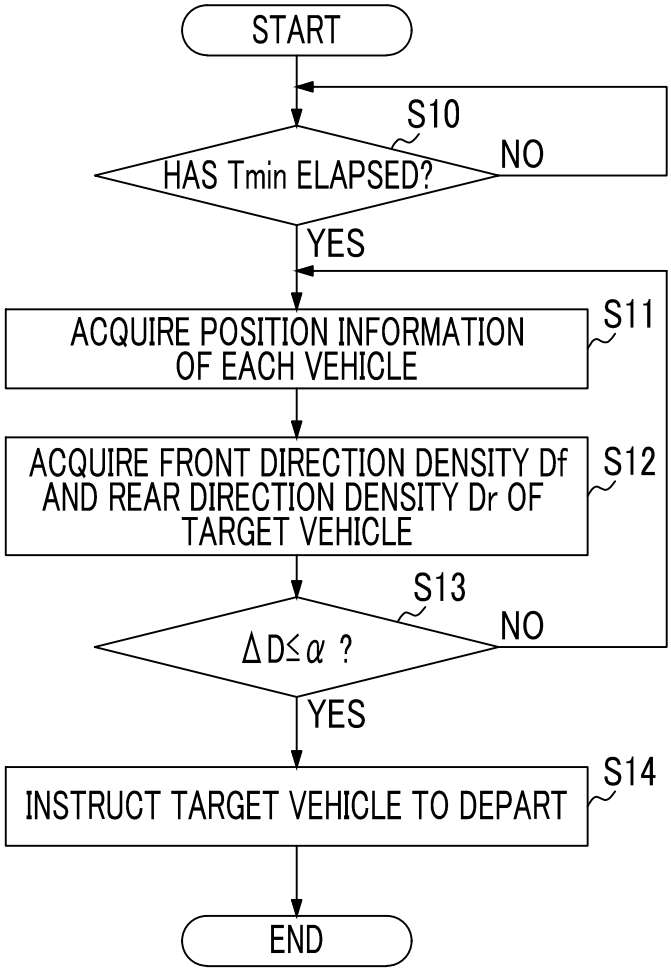

START
S10
HAS Tmin ELAPSED?
NO
YES
ACQUIRE POSITION INFORMATION OF EACH VEHICLE
S11
ACQUIRE FRONT DIRECTION DENSITY Df AND REAR DIRECTION DENSITY Dr OF TARGET VEHICLE
S12
S13
ΔD≤α ?
NO
YES
INSTRUCT TARGET VEHICLE TO DEPART
S14
END

FIG. 9A

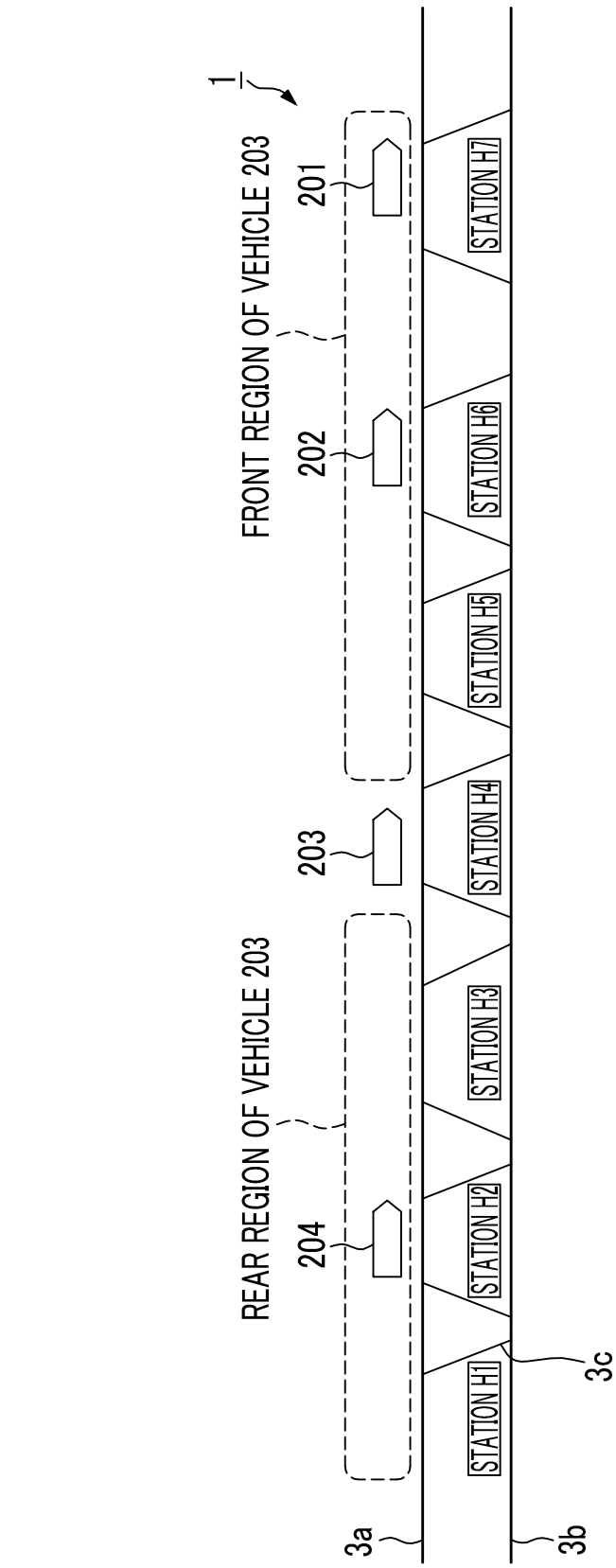

1
FRONT REGION OF VEHICLE 203
REAR REGION OF VEHICLE 203
201
202
203
204
STATION H1
STATION H2
STATION H3
STATION H4
STATION H5
STATION H6
STATION H7
3a
3b
3c

FIG. 9B

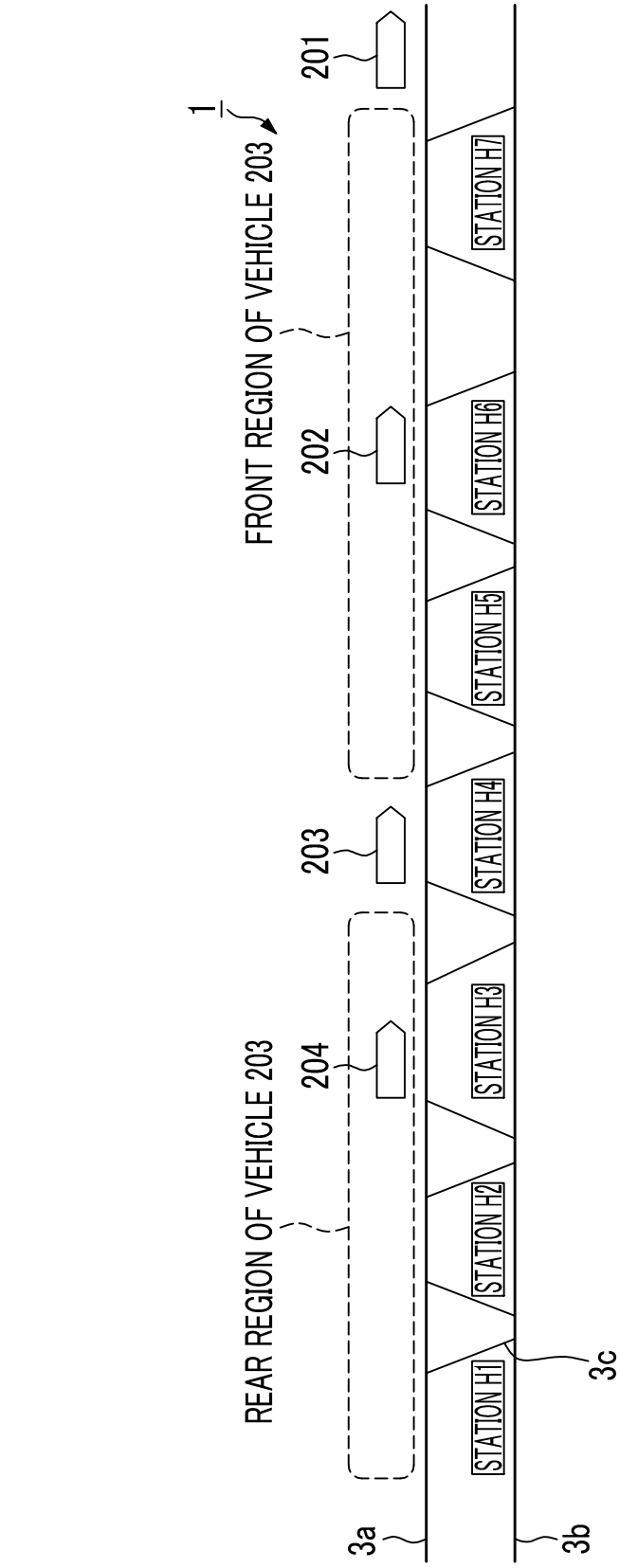

1
FRONT REGION OF VEHICLE 203
REAR REGION OF VEHICLE 203
201
202
203
204
STATION H1
STATION H2
STATION H3
STATION H4
STATION H5
STATION H6
STATION H7
3a
3b
3c

FIG. 10A

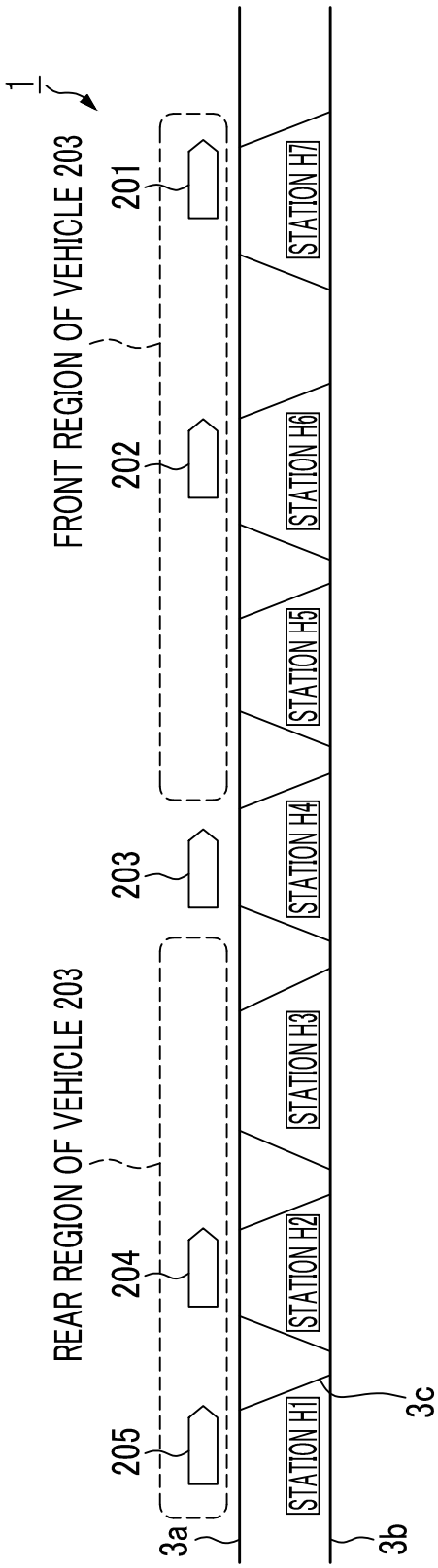

1
FRONT REGION OF VEHICLE 203
REAR REGION OF VEHICLE 203
201
202
203
204
205
STATION H1
STATION H2
STATION H3
STATION H4
STATION H5
STATION H6
STATION H7
3a
3b
3c

FIG. 10B

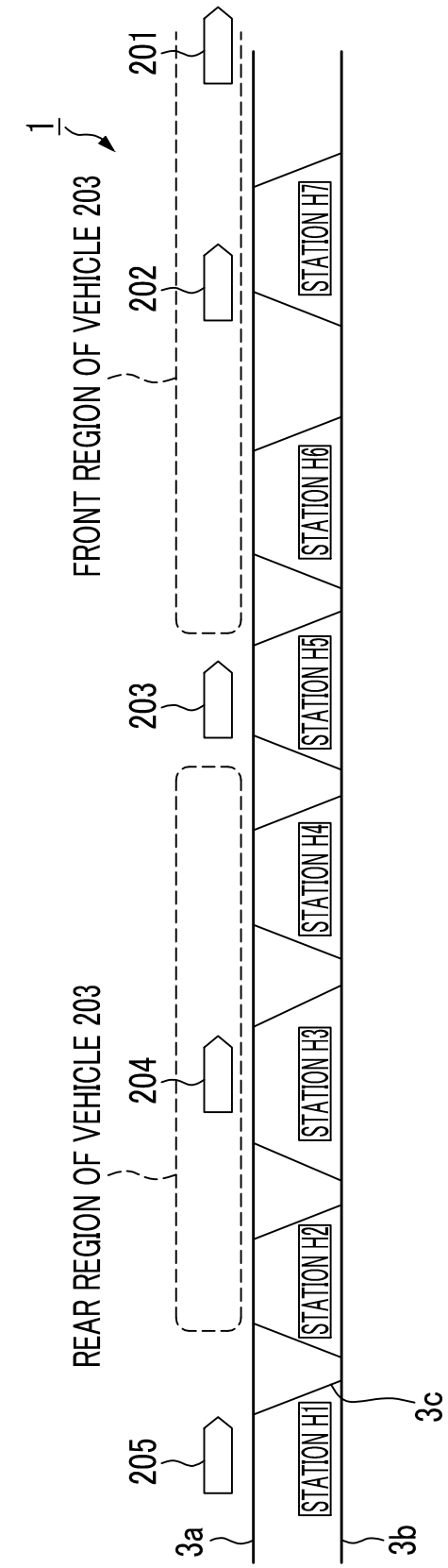

1
201
202
203
204
205
FRONT REGION OF VEHICLE 203
REAR REGION OF VEHICLE 203
STATION H1
STATION H2
STATION H3
STATION H4
STATION H5
STATION H6
STATION H7
3a
3b
3c

FIG. 11

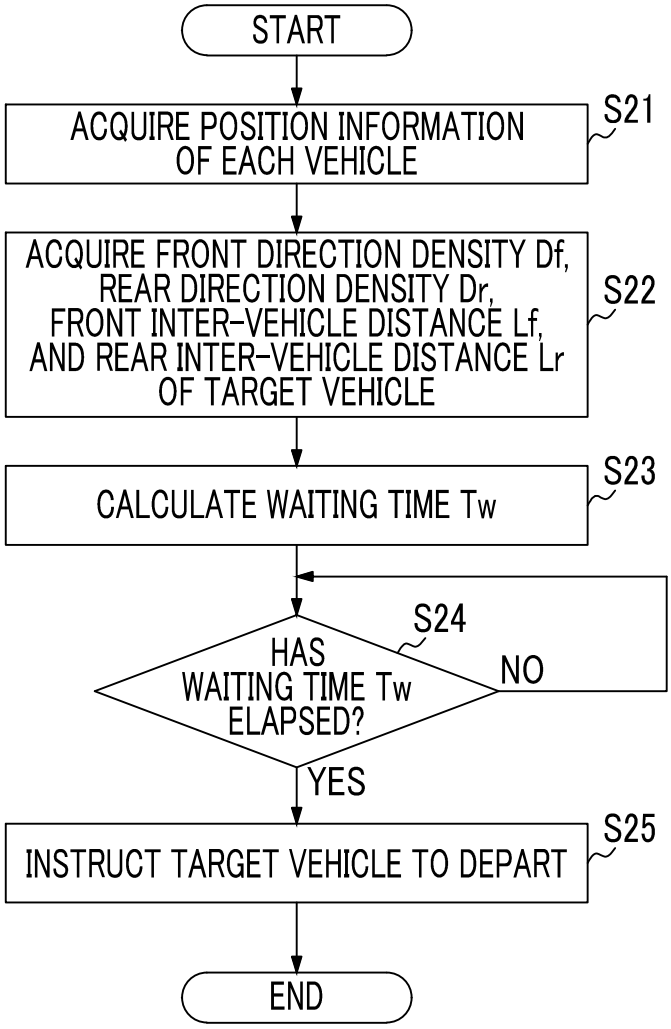

START
ACQUIRE POSITION INFORMATION OF EACH VEHICLE
S21
ACQUIRE FRONT DIRECTION DENSITY Df, REAR DIRECTION DENSITY Dr, FRONT INTER-VEHICLE DISTANCE Lf, AND REAR INTER-VEHICLE DISTANCE Lr OF TARGET VEHICLE
S22
CALCULATE WAITING TIME Tw
S23
S24
HAS WAITING TIME Tw ELAPSED?
NO
YES
INSTRUCT TARGET VEHICLE TO DEPART
S25
END

FIG. 12

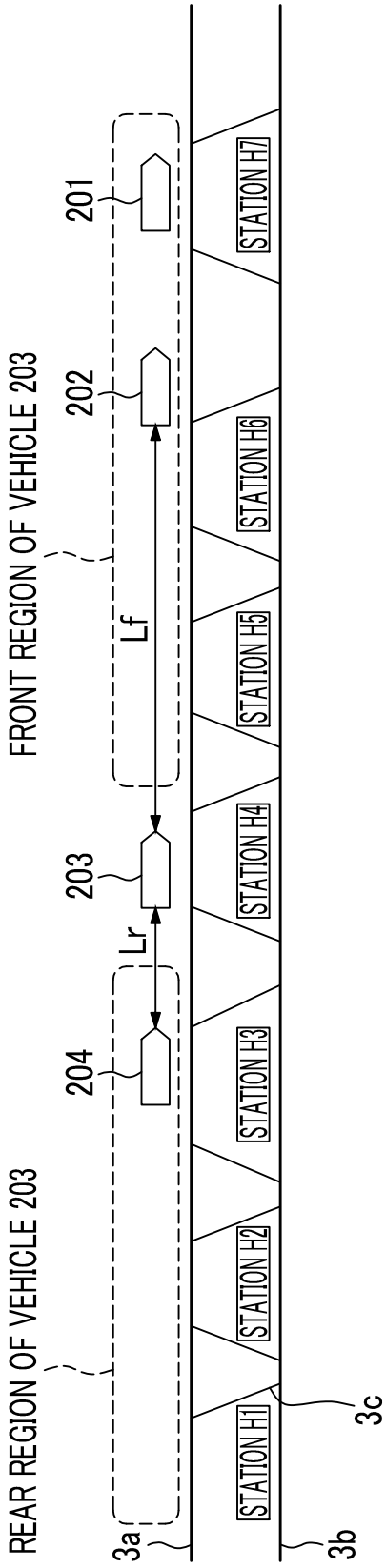

REAR REGION OF VEHICLE 203
FRONT REGION OF VEHICLE 203
201
202
203
204
Lf
Lr
STATION H1
STATION H2
STATION H3
STATION H4
STATION H5
STATION H6
STATION H7
3a
3b
3c

FIG. 13

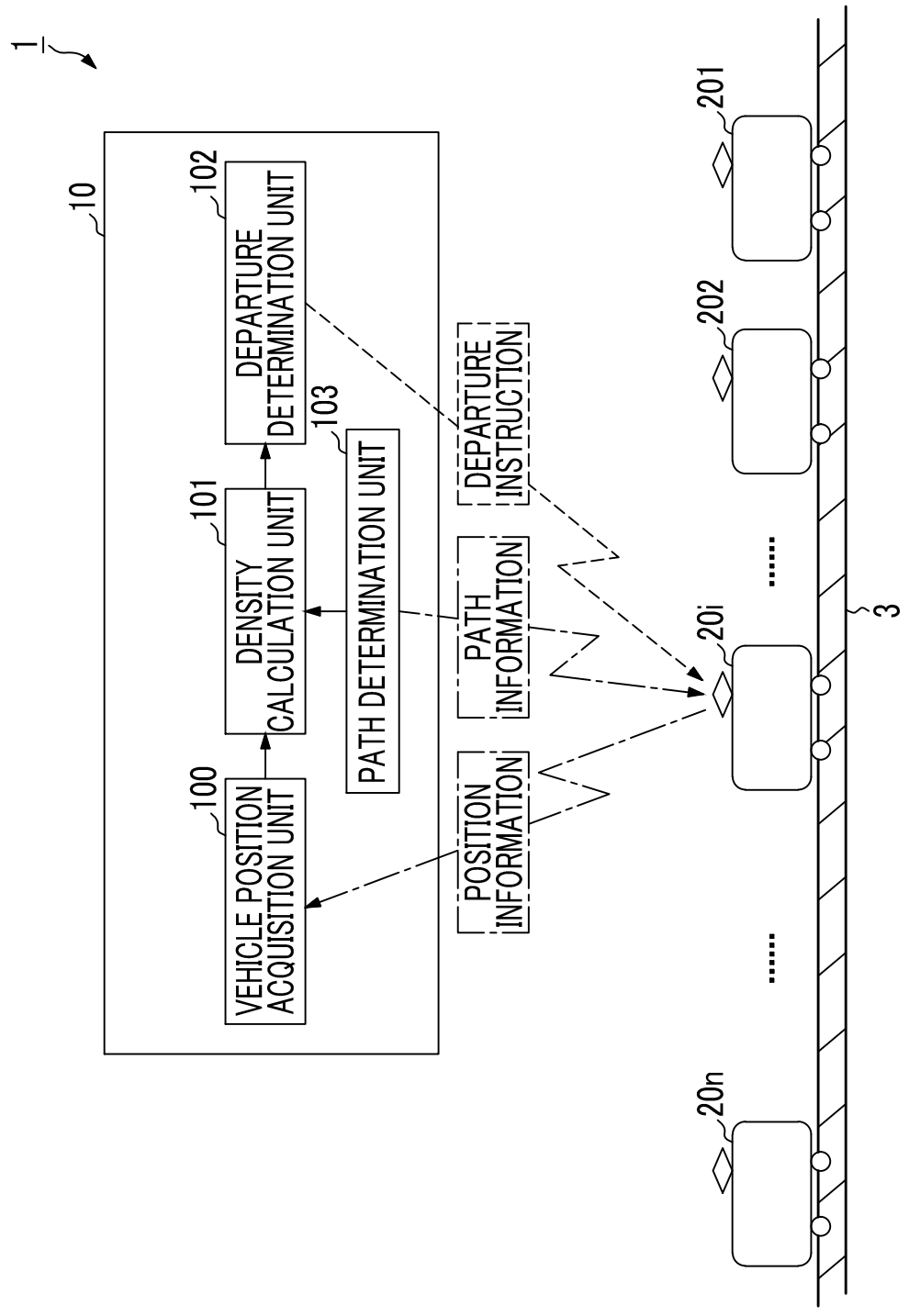

1
10
100
VEHICLE POSITION ACQUISITION UNIT
101
DENSITY CALCULATION UNIT
102
DEPARTURE DETERMINATION UNIT
103
PATH DETERMINATION UNIT
POSITION INFORMATION
PATH INFORMATION
DEPARTURE INSTRUCTION
201
202
20i
20n
3

FIG. 14A

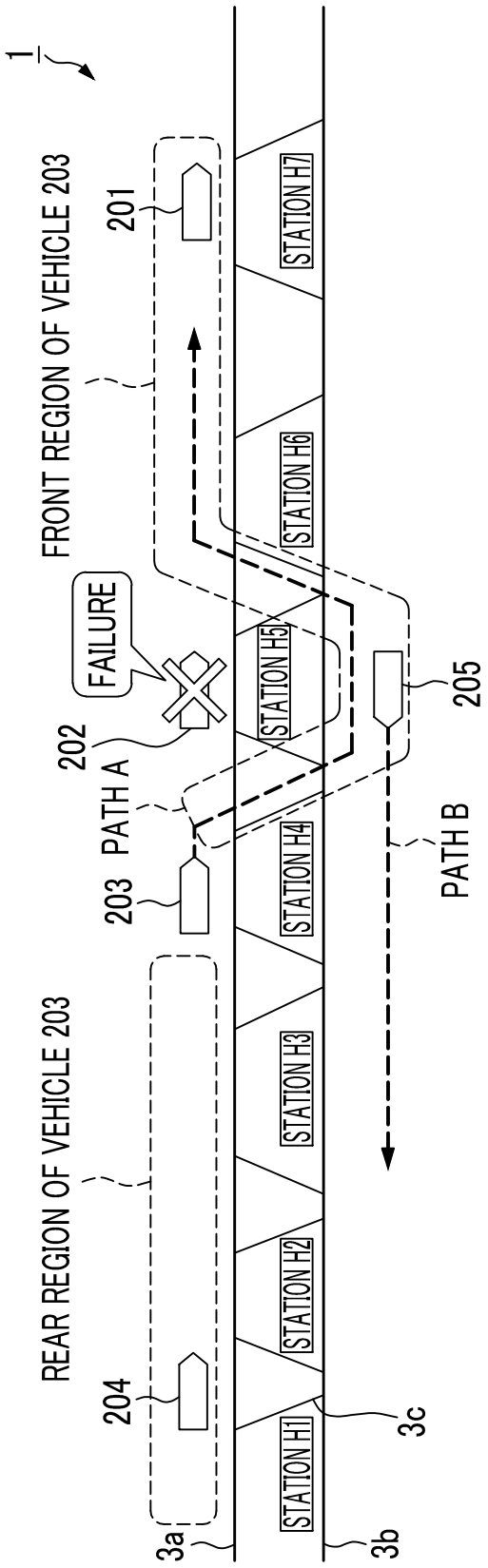

1
FRONT REGION OF VEHICLE 203
201
STATION H7
STATION H6
FAILURE
202
STATION H5
205
PATH A
203
STATION H4
PATH B
REAR REGION OF VEHICLE 203
STATION H3
STATION H2
204
STATION H1
3c
3a
3b

FIG. 14B

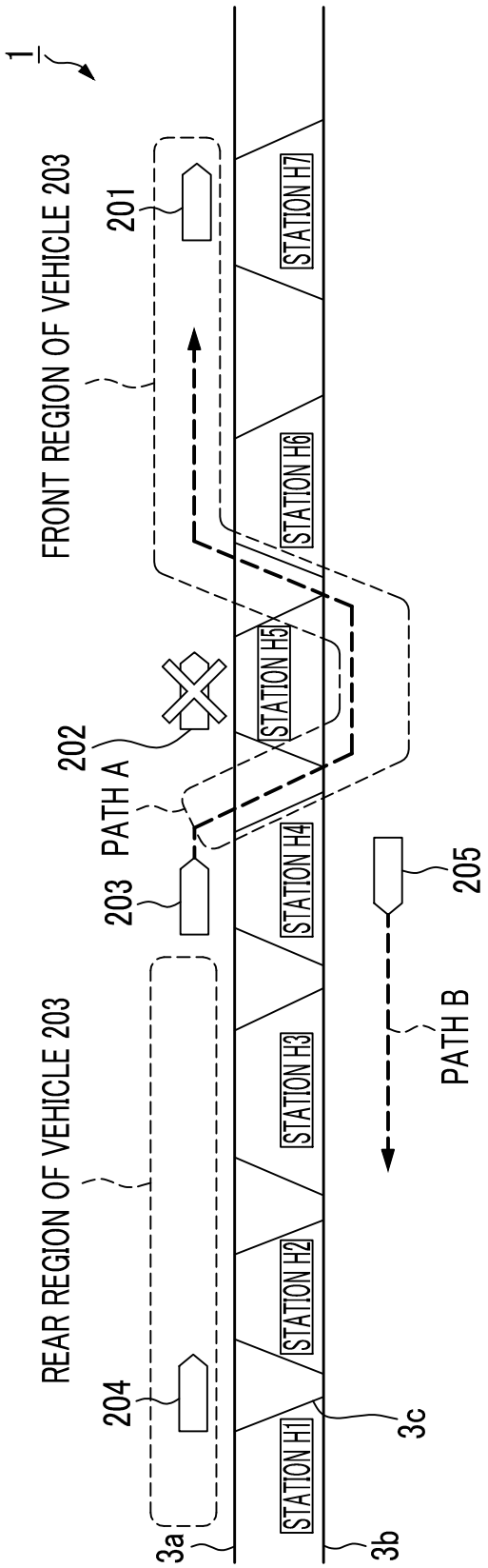

1
FRONT REGION OF VEHICLE 203
201
STATION H7
STATION H6
STATION H5
202
PATH A
203
STATION H4
205
PATH B
REAR REGION OF VEHICLE 203
204
STATION H3
STATION H2
STATION H1
3a
3b
3c

FIG. 15A

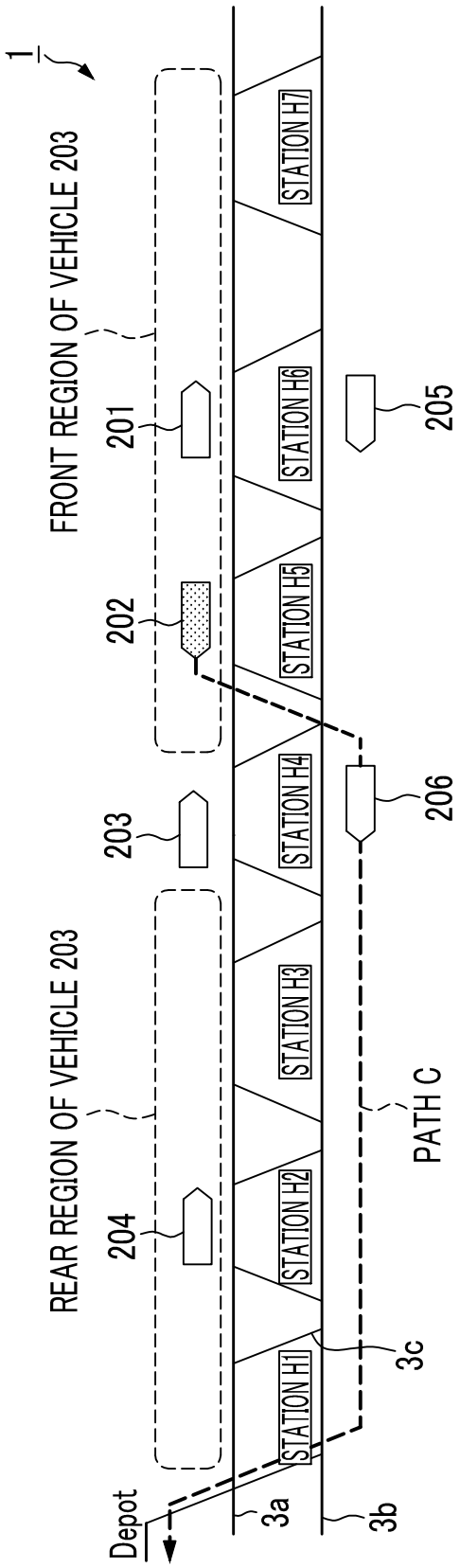

1
FRONT REGION OF VEHICLE 203
REAR REGION OF VEHICLE 203
201
202
203
204
205
206
STATION H1
STATION H2
STATION H3
STATION H4
STATION H5
STATION H6
STATION H7
Depot
3a
3b
3c
PATH C

FIG. 15B

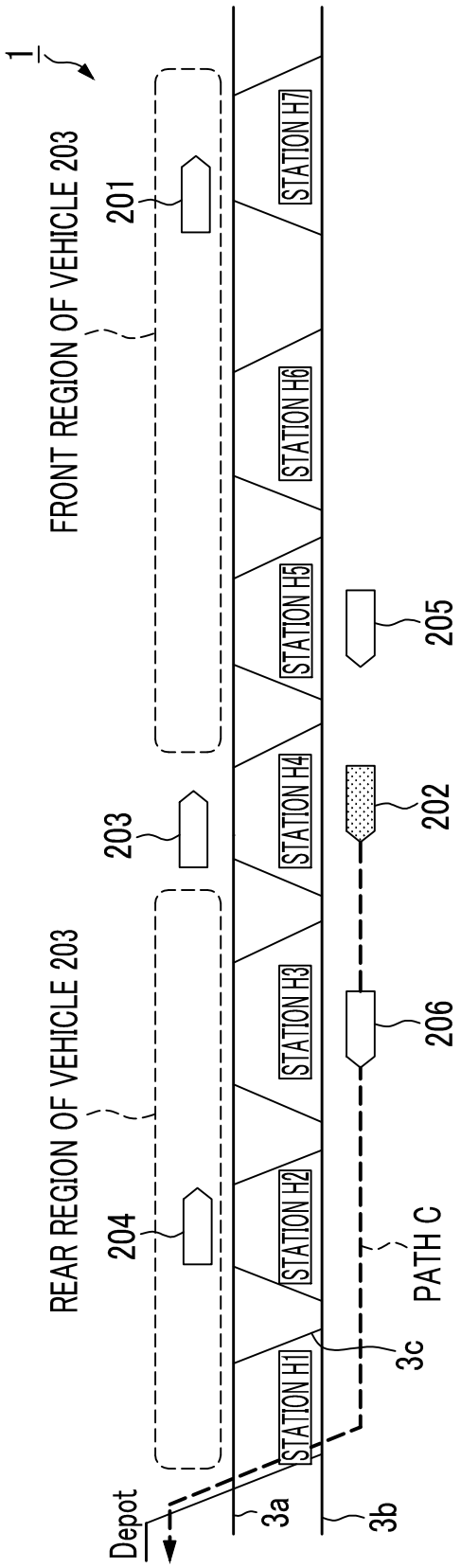

1
FRONT REGION OF VEHICLE 203
201
REAR REGION OF VEHICLE 203
203
204
205
202
206
PATH C
3c
3a
3b
Depot
STATION H1
STATION H2
STATION H3
STATION H4
STATION H5
STATION H6
STATION H7

FIG. 16

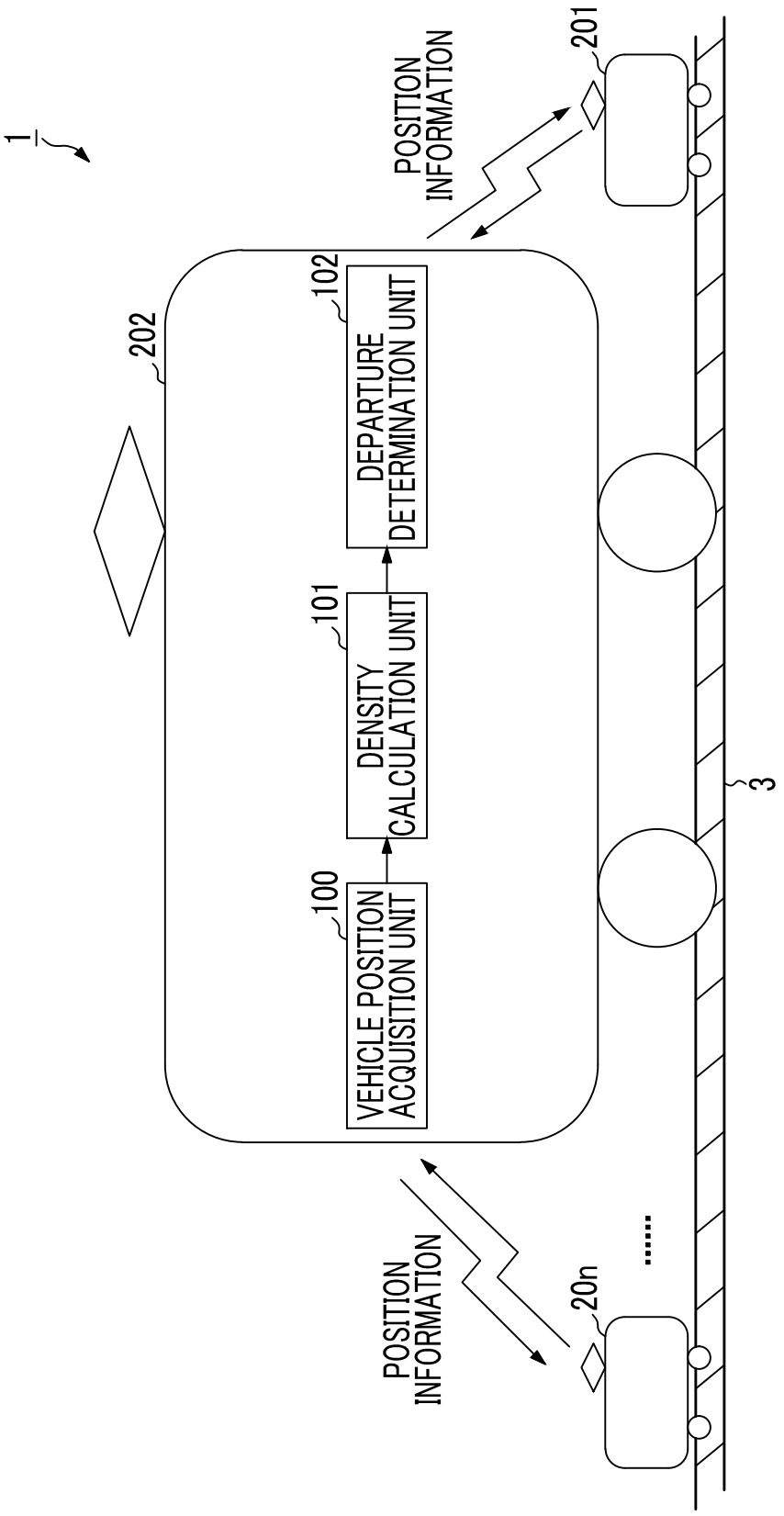

1
POSITION INFORMATION
201
202
102
DEPARTURE DETERMINATION UNIT
101
DENSITY CALCULATION UNIT
100
VEHICLE POSITION ACQUISITION UNIT
3
POSITION INFORMATION
20n
.....

FIG. 17

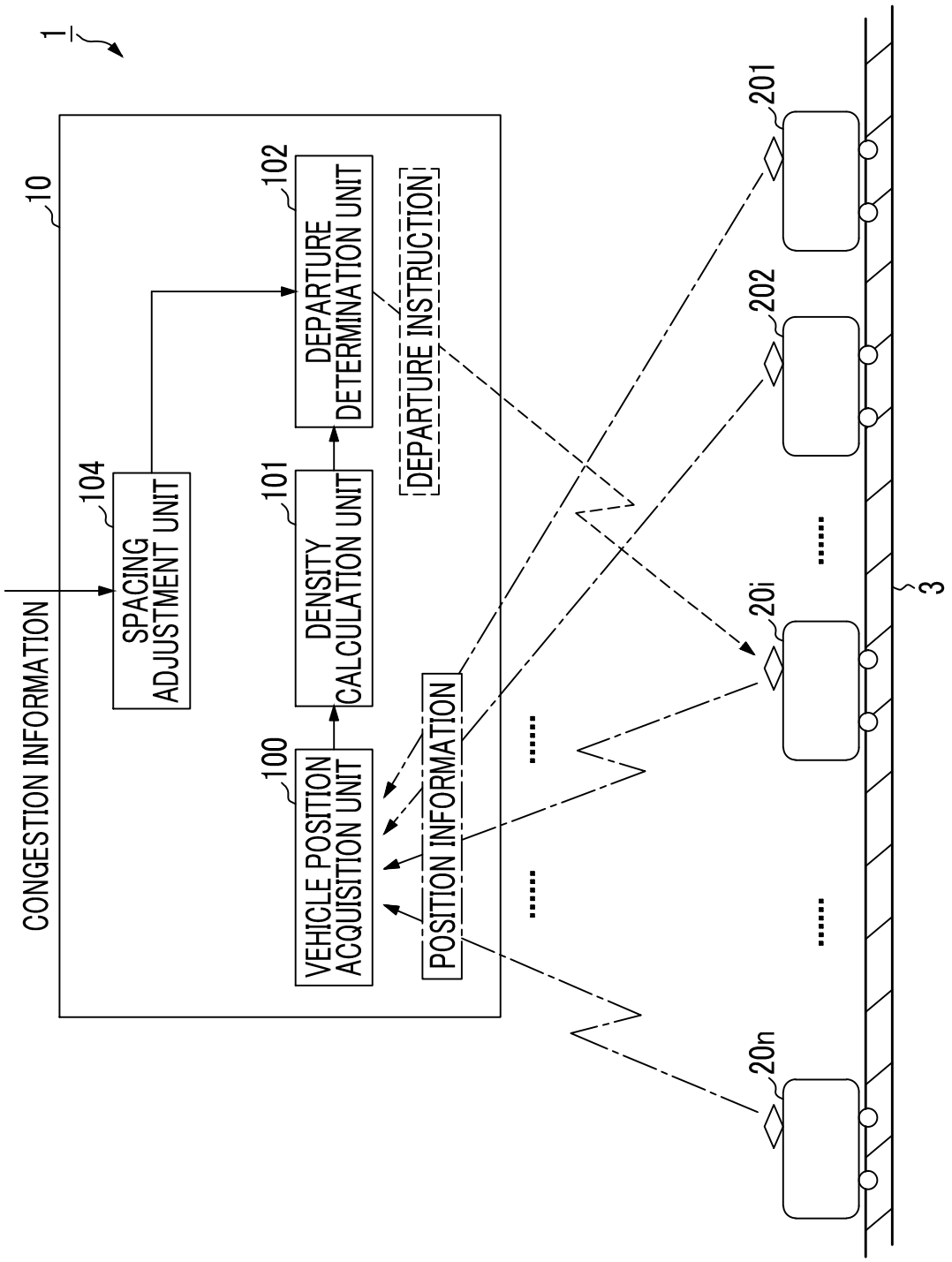

1
10
CONGESTION INFORMATION
SPACING ADJUSTMENT UNIT
104
DENSITY CALCULATION UNIT
101
DEPARTURE DETERMINATION UNIT
102
VEHICLE POSITION ACQUISITION UNIT
100
DEPARTURE INSTRUCTION
POSITION INFORMATION
201
202
20i
20n
3

FIG. 18

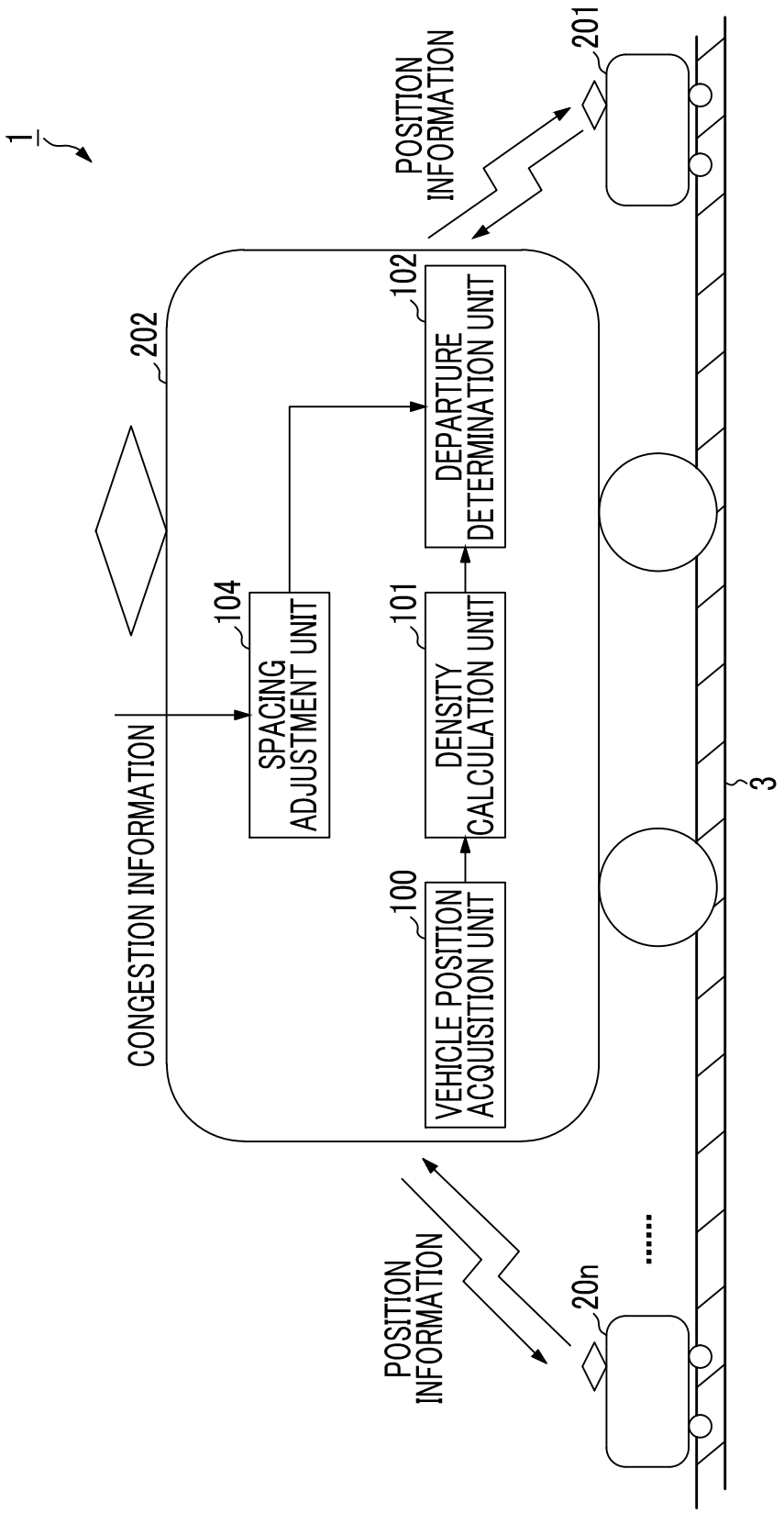
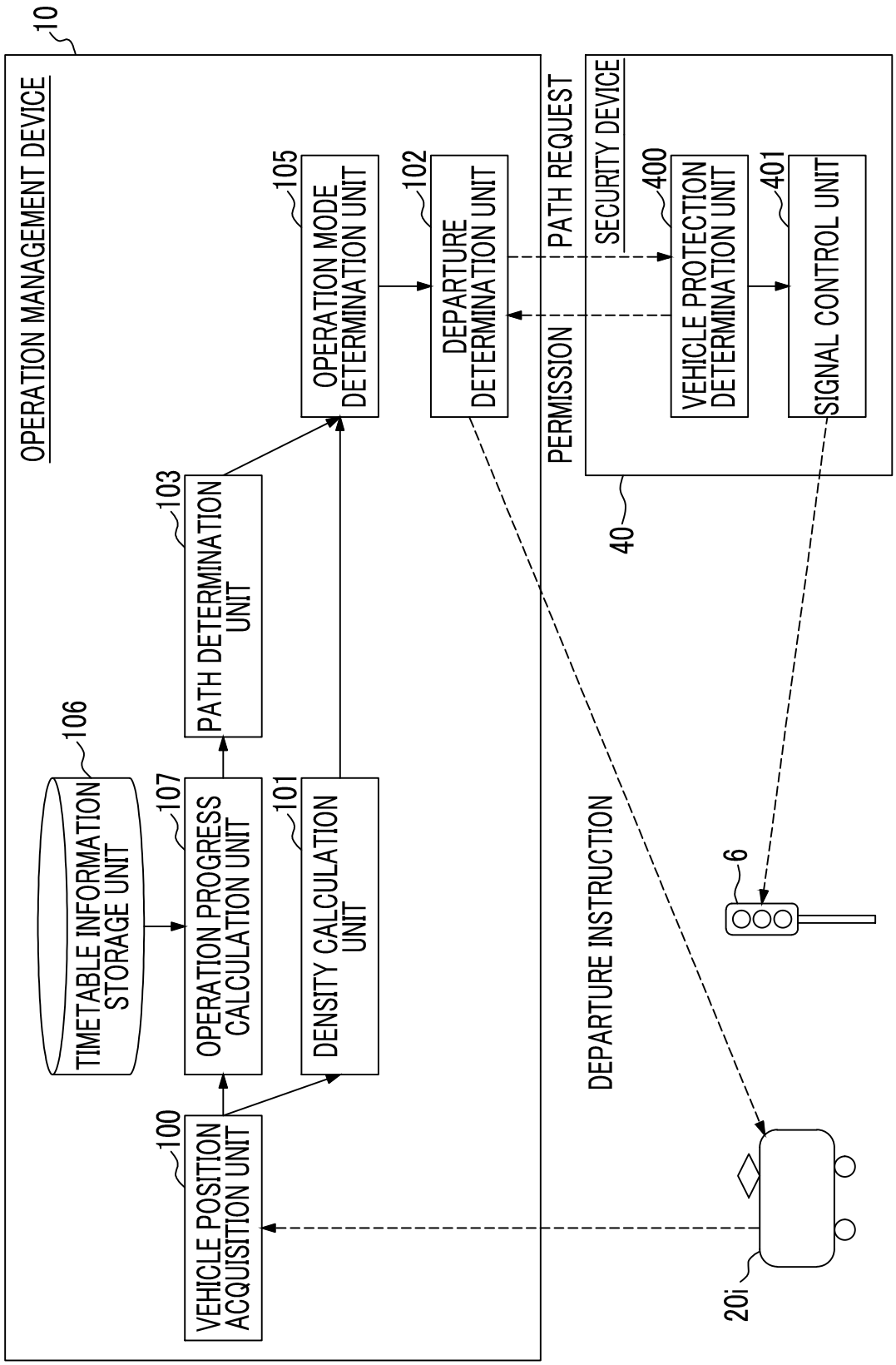

1
POSITION INFORMATION
201
202
102
DEPARTURE DETERMINATION UNIT
104
SPACING ADJUSTMENT UNIT
101
DENSITY CALCULATION UNIT
CONGESTION INFORMATION
100
VEHICLE POSITION ACQUISITION UNIT
3
POSITION INFORMATION
20n
.....

FIG. 19


10
OPERATION MANAGEMENT DEVICE
105
OPERATION MODE DETERMINATION UNIT
102
DEPARTURE DETERMINATION UNIT
PATH REQUEST
PERMISSION
SECURITY DEVICE
400
VEHICLE PROTECTION DETERMINATION UNIT
401
SIGNAL CONTROL UNIT
40
103
PATH DETERMINATION UNIT
106
TIMETABLE INFORMATION STORAGE UNIT
107
OPERATION PROGRESS CALCULATION UNIT
101
DENSITY CALCULATION UNIT
100
VEHICLE POSITION ACQUISITION UNIT
DEPARTURE INSTRUCTION
6
20i