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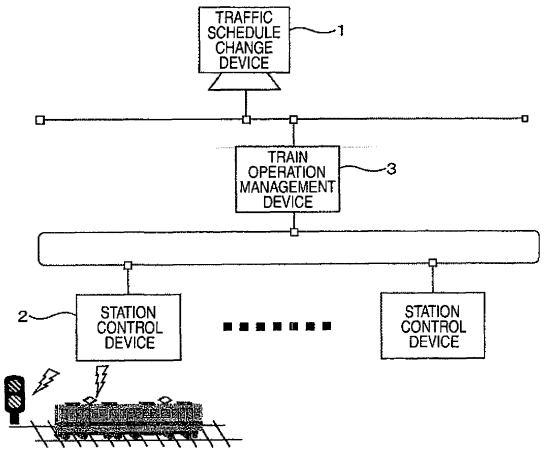
(54) DATA INPUT SUPPORT DEVICE AND DATA INPUT SUPPORT METHOD

(57) A data input device is capable of displaying the control state of a traffic signal on a train diagram by acquiring train operation information from a diagram information database (201), creating a train line, displaying the train line on an operation arrangement input device (1), and bringing the train diagram and the control state of a traffic signal to be controlled next by the train into correspondence from control state determination processing (209) and indication display position determination processing (210). As a result, the content of operation arrangement can be determined simply by looking at the display on the operation arrangement input device, thereby making it possible to achieve the prevention of input errors in the operation arrangement, and the input of urgent operation arrangement.

FIG.1



EP 2 409 892 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to a data entry support device and a data entry support method for displaying graphic data such as the train lines (lines) in a train operation diagram, and more particularly to a data entry support device and a data entry support method that display a route control status on a train line to reduce the time required for judging the entry contents of a traffic schedule change and to allow an operator to readily enter a traffic schedule change that need immediate processing.

BACKGROUND ART

[0002] A conventional train traffic management system, which controls trains based on a diagram, judges the contents of an entered diagram change based on the information from the traffic schedule change entry screen, on which graphic data such as the train lines of the train operation diagram are displayed, and on the information from the operation control display screen on which graphic data, such as the train locations and the route control status, is displayed in the interlocking table.

[0003] In this case, the operator must search the operation control display screen for the number of a train to which a traffic schedule change is to be applied, check the control status of the route on which the train is to travel and, after that, enter a traffic schedule change from the traffic schedule change entry screen. To do so, the operator must compare the information displayed on multiple screens for comprehensively checking information necessary for the traffic schedule change processing and, so, the operator sometimes makes an entry error in which case re-entry operation is necessary- Another problem is that judging the contents of an entered traffic schedule change takes long and so, during the traffic schedule change processing that needs immediate processing, the train may pass the location, to which a traffic schedule change is to be applied, before data is entered.

[0004] One way to solve this problem is to add information, other than train lines, to the traffic schedule change entry screen. One of conventional traffic schedule change entry screens is disclosed, for example, in Patent literature 1. In this method, a location is specified on the train schedule diagram, and the predicted route map screen display data, which indicates the predicted train operation corresponding to the time and the location on the route calculated by the location specification unit, is displayed on the traffic schedule change entry screen, on which the train schedule diagram is displayed, as the predicted route map screen in the route map format.

[0005] Another method is disclosed in Patent literature 2. In this method, when the travel result of the train schedule diagram is displayed, the travel result is captured for each track circuit and the result diagram, in which the length of each track circuit is reflected, is displayed to allow the operator to identify the location of the train on the train schedule diagram.

CITATION LIST

PATENT LITERATURE

[0006]

Patent literature 1: JP-A-2004-230958
Patent literature 2: JP-A-2005-319927

SUMMARY OF INVENTION

TECHNICAL PROBLEM

[0007] In the method disclosed in Patent literature 1, because a location is specified on the train schedule diagram to acquire information necessary for changing the traffic schedule, the control status display range is limited to a part of the range for which the dispatcher is responsible. In addition, displaying both the train schedule diagram and the predicted route map on the same screen requires the dispatcher to compare the displays, sometimes preventing the dispatcher from taking action for a traffic schedule change that need immediate processing.

[0008] In the method disclosed in Patent literature 2, the location of the train can be identified on the train schedule diagram but the route control status at each station is not displayed on the train diagram display device. This requires the dispatcher to reference the operation control display screen to understand the route control status, sometimes preventing the dispatcher from taking action when the train is in the control range of a station and a traffic schedule change must be entered immediately.

[0009] It is an object of the present invention to provide a data entry support device and a data entry support method that display information, necessary for judging the entry contents of a traffic schedule change, on one display device to reduce the time required before entering the traffic schedule change to solve a train schedule disruption problem.

SOLUTION TO PROBLEM

[0010] To achieve the object described above, a data entry support device and a data entry support method of the present invention comprehensively display information, necessary for judging the contents of a traffic schedule change, on the traffic schedule change entry screen by displaying a route control status, which will be controlled next by a train, on the train line on the traffic schedule change entry screen.

ADVANTAGEOUS EFFECTS OF INVENTION

[0011] The present invention prevents an entry error when a traffic schedule change is entered and reduces the time required for judging the contents of the entry, thus allowing the dispatcher to process a traffic schedule change that needs immediate processing and to enter a traffic schedule change without delay.
Other objects, features and advantages of the present invention will become apparent from the following description of the embodiments according to the invention taken in conjunction the accompanying drawings.

BRIEF DESCRIPTION OF DRAWINGS

[0012]

FIG. 1 is a diagram showing the configuration of a train traffic management system that manages the train operation in one embodiment of the present invention.
FIG. 2 is a processing block diagram showing a traffic schedule change device in the embodiment.
FIG. 3 is a diagram showing an example of a train operation screen.
FIG. 4 is a processing flow showing control status judgment processing and signal aspect display location judgment processing.
FIG. 5 is a diagram showing processing in which a train number is related to the arrival track, the train location, and the route to the arrival track corresponding to the train.

DESCRIPTION OF EMBODIMENTS

[0013] One embodiment of the present invention will be described with reference FIG. 1 to FIG. 5 using an example of a traffic schedule change device on which a train operation diagram is displayed.
[0014] FIG. 1 is a diagram showing the configuration of a train traffic management system that manages train operation. As shown in FIG. 1, the train traffic management system in this embodiment comprises a traffic schedule change device 1 that displays a train operation diagram, receives a train operation change, and displays a train operation result on the train operation diagram, station control devices 2 such as station systems each of which controls the routes at a station or on rail tracks or controls the train operation, and a train operation management device 3 that manages the train operation, relays data between the traffic schedule change device 1 and the station control device 2, and checks data consistency. Those devices are connected via a network.
[0015] The traffic schedule change device 1 receives information on the train operation and displays the information on the display as the train operation diagram to support the entry of a train operation change (also called a traffic schedule change). The contents of a change in the train operation entered into the traffic schedule change device I are sent to the station control device 2 via the train operation management device 3. The station control device 2 controls the operation of the routes and trains based on a train operation change received from the train operation management device 3.
[0016] FIG. 2 is a processing block diagram of the traffic schedule change device in this embodiment FIG.2 shows an example of the required configuration and other components may be added as necessary.
[0017] As shown in FIG. 2, the traffic schedule change device 1 has a train operation information database 201, a train location information database 202, a train route information database 203, and a signal aspect information database 204, and comprises a control information reception unit 205 that receives control information from the station control device 2, a train operation information reception unit 206 that receives train operation information from the train operation management device 3, a train operation change processing unit 207 that changes the train operation based on received traffic schedule change information, a train schedule diagram data creation processing unit 208 that creates train schedule diagram data from the train operation information, a control status judgment processing unit 209, a signal aspect display position judgment processing unit 210, and a display processing unit 211 that displays data on a display 212.
[0018] The train operation information database 201 stores train operation information received by the train operation information reception unit 206, and the train location information database 202 stores received train traveling locations. The signal aspect information database 204 stores control information received by the control information reception unit 205.
[0019] The control status judgment processing unit 209 judges the route control status (signal aspect), which will be controlled next by a train being processed, based on the information in the train location information database 202, train route information database 203, and signal aspect information database 204.
[0020] The signal aspect display position judgment processing unit 210 calculates a position in the train schedule diagram data, created by the train schedule diagram data creation processing unit 208, where the route control status of a train determined by the control status judgment processing unit 209 is displayed.
[0021] FIG. 3 is a diagram showing an example of the screen of the display 212. On the display 212, the operation plan information is displayed as train lines 30 with station names on the vertical axis and the time on the horizontal axis, and a route control status 31 is displayed on the train line 30 to support the dispatcher in the traffic schedule change operation.
[0022] The route control status 31 indicates, in color, the control status of a route which is one of the arrival routes or departure routes to be controlled next by each train and which is near to the location of the train. This display allows the operator to immediately understand

the status of a train to which a traffic schedule change is to be applied.

[0023] In this embodiment, the train schedule diagram managed by the traffic schedule change device 1 on a train basis is made to correspond to the control status of a route, which is a facility in the field, to allow the route control status to be displayed on the train schedule diagram. The following describes the flow of processing for establishing the correspondence between the train schedule diagram and the route control status with reference to FIG. 4.

[0024] FIG. 4 shows the outline of the processing flow of the control status judgment processing unit 209 that judges the signal aspect that will be controlled by a train to be processed and the processing flow of the signal aspect display position judgment processing unit 210 that judges the location at which the route control status is displayed on the train schedule diagram.

[0025] First, the following describes the processing flow of the control status judgment processing unit 209. In step 402, the control status judgment processing unit 209 acquires train numbers from the train operation information database 201 and, in step 403, selects a train number to be processed. In step 404, the control status judgment processing unit 209 acquires the train location information corresponding to the train number selected from the train location information database 202 and, in step 405, acquires the train route information from the train route information database 203.

[0026] In step 406, the control status judgment processing unit 209 judges the train location from the acquired train location information and passes control to one of the three, (1) to (3), according to the train location.

[0027] (1) When the train is at a location between the departure route and the control point, control is passed to step 407 and the signal aspect is set to "red".

[0028] (2) When the train is at a location between the control point and the arrival route, control is passed to step 408 and the route to the arrival track is acquired from the train route information acquired in step 405. The signal aspect status information on the route on the acquired route is obtained from the signal aspect information database 204, and the signal aspect of the arrival route is used as the signal aspect.

[0029] (3) When the train is at a location between the arrival route and the departure route, control is passed to step 410 and the arrival track is obtained from the train route information acquired in step 405. The signal aspect of the departure route corresponding to the acquired track number is obtained from the signal aspect information database 204 and the obtained signal aspect is used as the signal aspect.

[0030] Next, the following describes the processing flow of the signal aspect display position judgment processing unit 210. In step 412 of the processing flow, control of the processing flow is passed to one of the two, (1) and (2), according to the train location acquired from the train location information database 202.

[0031] (1) If the train is at a location between the arrival route and the departure route, control is passed to step 413 and the control status is displayed on the train line that indicates the departure time at the station at which the train is located.

[0032] (2) If the train is at a location not between the arrival route and the departure route, control is passed to step 414 and the control status is displayed on the train line that indicates the arrival time at the next station of the station at which the train is located.

[0033] A check is made in step 415 if there is another train number to be edited. If there is no train number to be edited, control is passed to step 416 to terminate the processing; if there is another train number to be edited, control is passed back to step 403.

[0034] Referring to FIG. 5, the following describes the processing for relating a train number to the arrival track, train location, and the route to the arrival track corresponding to the train based on the train operation information database 201, train location information database 202, and train route information database 203.

[0035] The train operation information database 201 has a train operation information table 501 that manages the stop stations, arrival times, departure times, and arrival tracks for each train number. The train location information database 202 has a train location information table 502 that manages the train-located station name and the track circuits for each train number. The train location information database 202 may be related to the train operation information database 201 by the processing in step 404 in FIG. 4 using the train number as the key.

[0036] The train route information database 203 has a train route information table 503 that manages, for each train number, the track circuits on which the train travels and the facility information and the route names corresponding to the track circuits. The train route information database 203 may be related to the train location information database 202 by the processing in step 405 in FIG. 4 using the train number and the track circuit as the key so that the track circuits on which the train travels, the facility information, and the route names may be acquired. Therefore, executing a sequence of processing from step 404 to step 405 allows the arrival track, the train location, and the route to the arrival track corresponding to a train to be acquired.

[0037] In this embodiment, the train operation is related to the route control status, which will be controlled next by the train, to display the route control status on the train operation diagram. This allows the dispatcher to judge the entry contents of a traffic schedule change, which have conventionally been acquired from multiple terminals, on the traffic schedule change entry screen alone.

[0038] As described above, the traffic schedule change device in this embodiment prevents an entry error and allows the dispatcher to take action on a traffic schedule change that needs immediate processing.

[0039] When this embodiment is applied to a device

on which a train operation diagram is displayed and a traffic schedule change is accepted, the control status of a route can be displayed on a train line. And, so, this configuration allows the dispatcher to judge the contents of a traffic schedule change simply by viewing the display on the traffic schedule change entry device, thus preventing an entry error and making it possible to accept a traffic schedule change that needs immediate processing.

It should be understood by those skilled in the art that although the foregoing description has been made on the embodiments of the present invention, the invention is not limited thereto and various changes and modifications may be made without departing from the spirit and the scope of the appended claims.

REFERENCE SIGNS LIST

[0040]

1	traffic schedule change device
2	station control device
3	train operation management device
30	train line
31	route control status
201	train operation information database
202	train location information database
203	train route information database
204	signal aspect information database

Claims

1. A data entry support device, comprising:

a train schedule diagram data creation processing unit that acquires train operation information on a train from a train operation information database in which information on a train operation plan is stored, creates train schedule diagram data, and displays a train schedule diagram on a train operation screen;
a control status judgment processing unit that selects a train number from train numbers acquired from said train operation information database, acquires train location information, corresponding to the train number, from a train location information database and, train route information, corresponding to the train number, from a train route information database, and judges a signal aspect of a route from the acquired route information on the train number and from a signal aspect information database; and
a signal aspect display position judgment processing unit that judges a position where the signal aspect of the route is displayed on the train schedule diagram
whereby a route control status is displayed on the train schedule diagram.

2. The data entry support device according to claim 1 wherein, when a train with the train number is located between an arrival route and a departure route, the route control status is displayed on a train line indicating a departure time at a train-located station.

3. The data entry support device according to claim 1 wherein, when a train with the train number is located not between an arrival route and a departure route, the route control status is displayed on a train line indicating a departure time at a next station of a train-located station.

4. A data entry support method comprising the steps of:

by a train schedule diagram data creation processing unit, acquiring train operation information on a train from a train operation information database in which information on a train operation plan is stored, creating train schedule diagram data, and displaying a train schedule diagram on a train operation screen;
by a control status judgment processing unit, selecting a train number from train numbers acquired from said train operation information database, acquiring train location information, corresponding to the train number, from a train location information database and, based on the train location information, train route information, corresponding to the train number, from a train route information database, and judging a signal aspect of a route from the acquired route information on the train number and from a signal aspect information database; and
by a signal aspect display position judgment processing unit, judging a position where the signal aspect of the route is displayed on the train schedule diagram,
whereby a route control status is displayed on the train schedule diagram.

5. The data entry support method according to claim 4 wherein, when the train is located between a departure route and a control point, the signal aspect of the route is a red signal.

6. The data entry support method according to claim 4 wherein, when the train is located between a control

point and an arrival route, the signal aspect of the arrival route is obtained from a signal aspect information database and is displayed.

7. The data entry support method according to claim 4 wherein, when the train is located between an arrival route and a departure route, the signal aspect of the departure route is obtained from a signal aspect information database and is displayed.

FIG.1

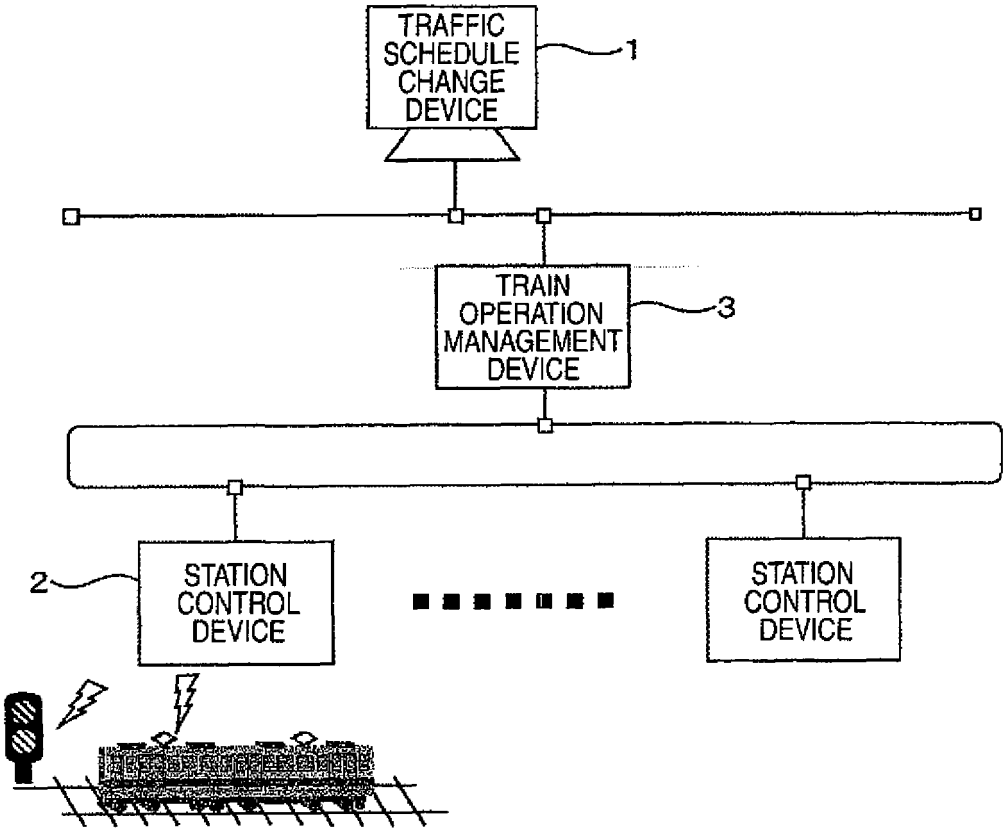

TRAFFIC SCHEDULE CHANGE DEVICE
1
TRAIN OPERATION MANAGEMENT DEVICE
3
2
STATION CONTROL DEVICE
STATION CONTROL DEVICE

FIG.2

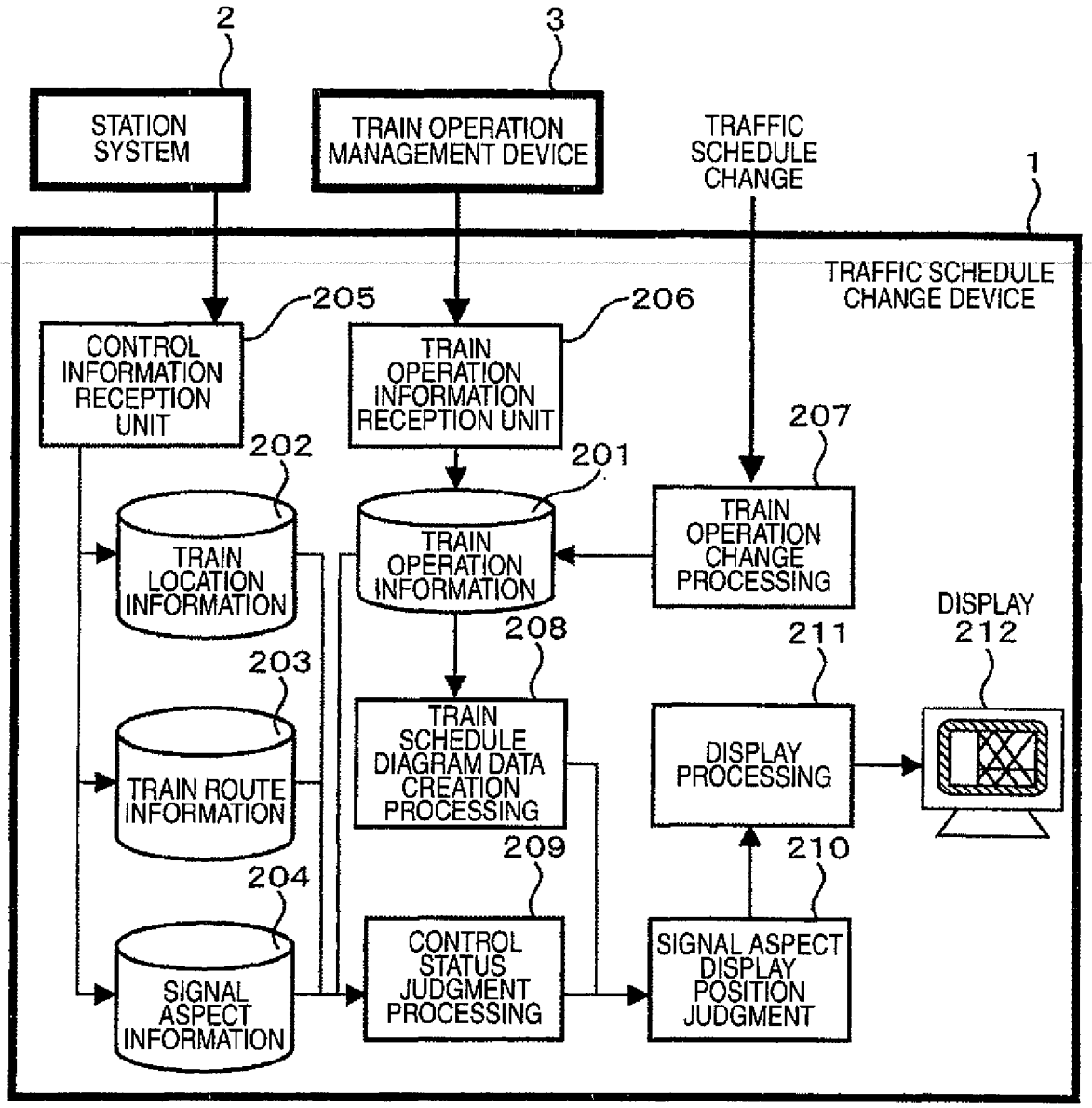

2
3
STATION SYSTEM
TRAIN OPERATION MANAGEMENT DEVICE
TRAFFIC SCHEDULE CHANGE
1
TRAFFIC SCHEDULE CHANGE DEVICE
205
206
CONTROL INFORMATION RECEPTION UNIT
TRAIN OPERATION INFORMATION RECEPTION UNIT
207
202
201
TRAIN LOCATION INFORMATION
TRAIN OPERATION INFORMATION
TRAIN OPERATION CHANGE PROCESSING
DISPLAY
212
208
211
203
TRAIN SCHEDULE DIAGRAM DATA CREATION PROCESSING
DISPLAY PROCESSING
TRAIN ROUTE INFORMATION
209
210
204
CONTROL STATUS JUDGMENT PROCESSING
SIGNAL ASPECT DISPLAY POSITION JUDGMENT
SIGNAL ASPECT INFORMATION

FIG.3

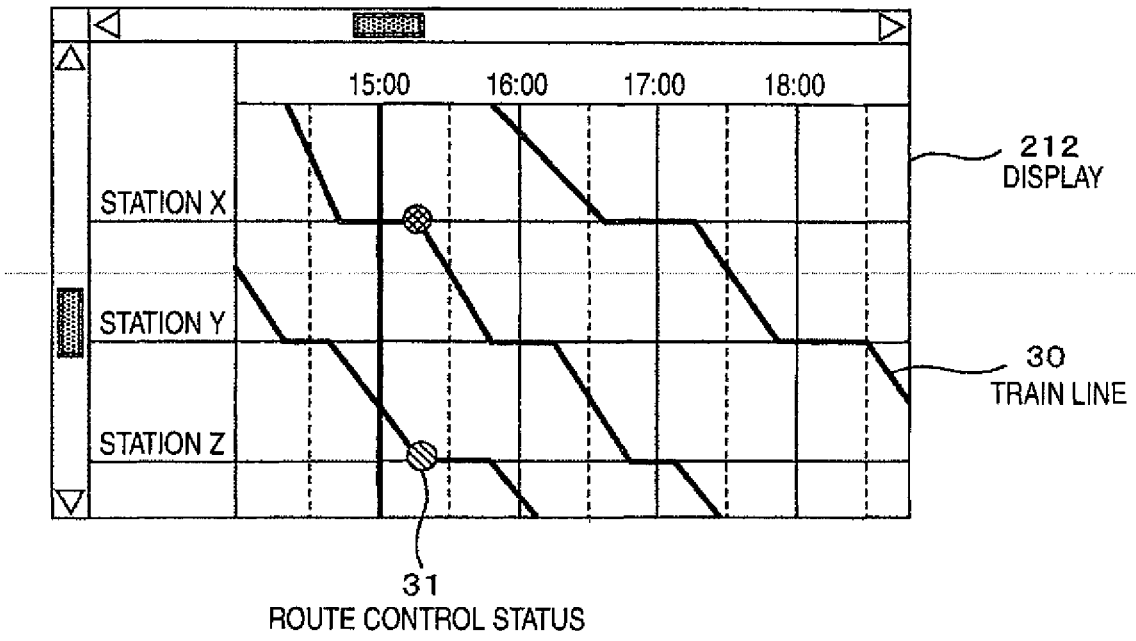

15:00
16:00
17:00
18:00
STATION X
STATION Y
STATION Z
212
DISPLAY
30
TRAIN LINE
31
ROUTE CONTROL STATUS

FIG.4

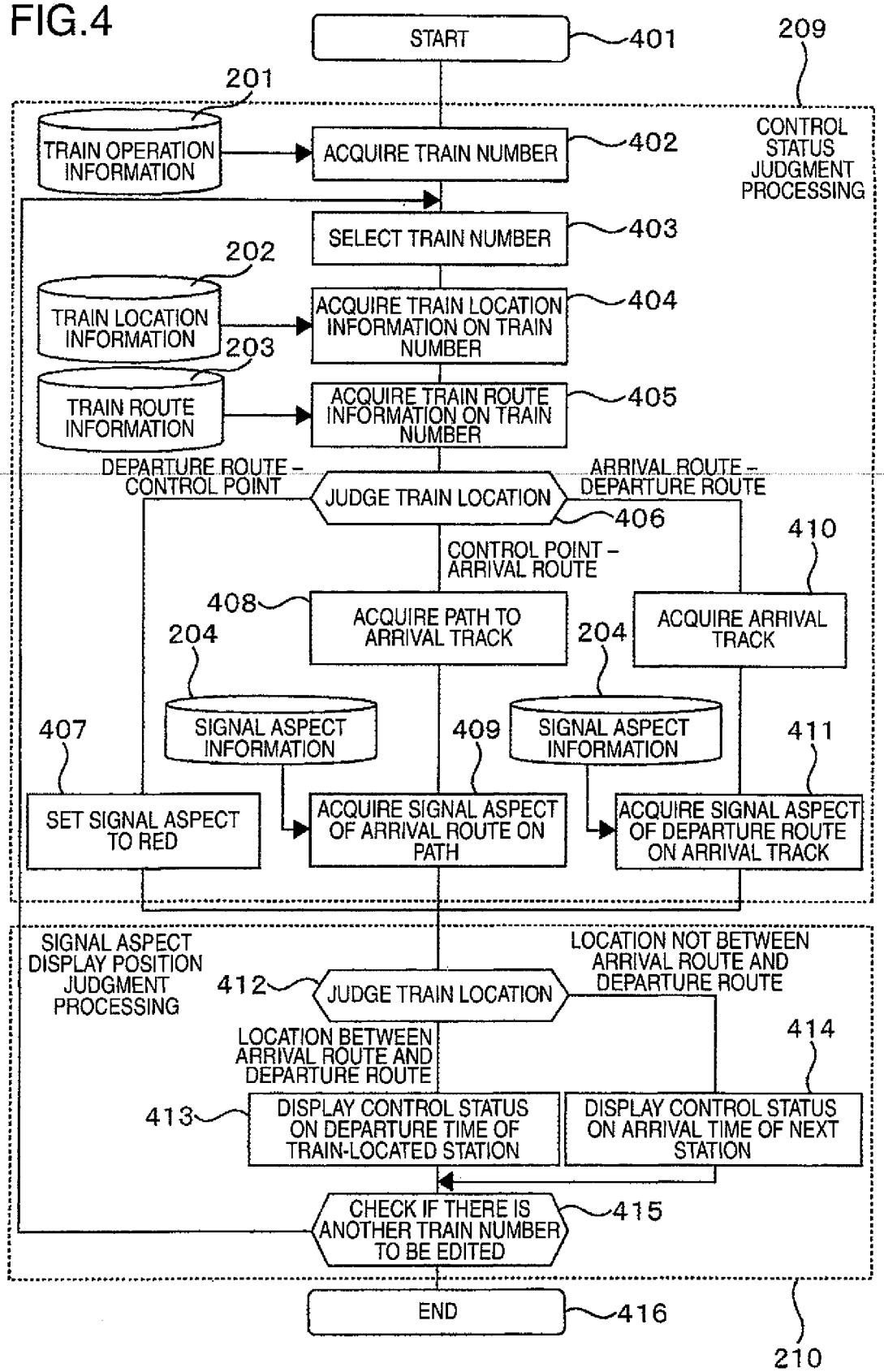
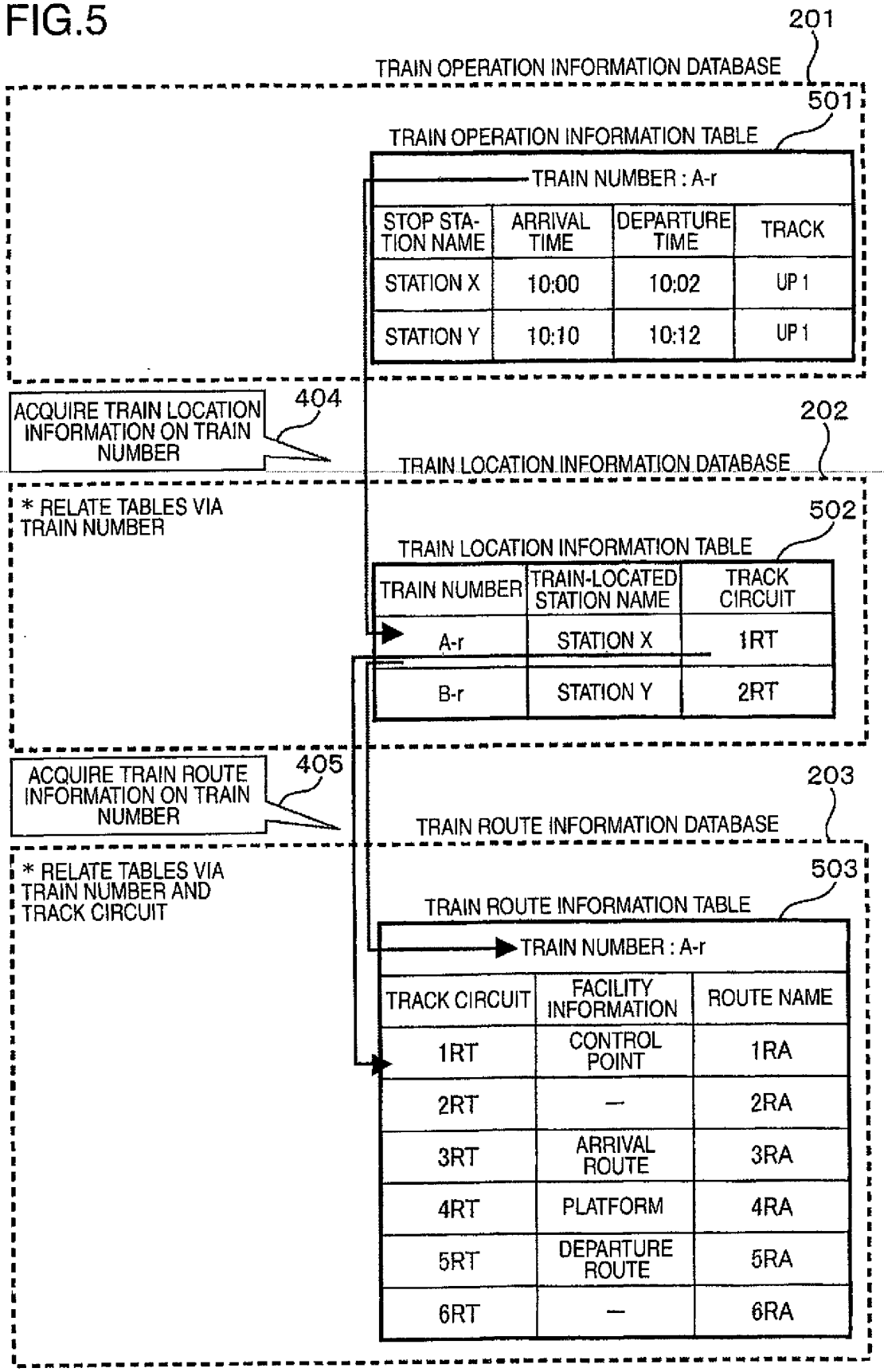

START
401
209
201
TRAIN OPERATION INFORMATION
ACQUIRE TRAIN NUMBER
402
CONTROL STATUS JUDGMENT PROCESSING
SELECT TRAIN NUMBER
403
202
TRAIN LOCATION INFORMATION
ACQUIRE TRAIN LOCATION INFORMATION ON TRAIN NUMBER
404
203
TRAIN ROUTE INFORMATION
ACQUIRE TRAIN ROUTE INFORMATION ON TRAIN NUMBER
405
DEPARTURE ROUTE – CONTROL POINT
JUDGE TRAIN LOCATION
406
ARRIVAL ROUTE – DEPARTURE ROUTE
410
CONTROL POINT – ARRIVAL ROUTE
408
ACQUIRE PATH TO ARRIVAL TRACK
204
204
ACQUIRE ARRIVAL TRACK
SIGNAL ASPECT INFORMATION
SIGNAL ASPECT INFORMATION
407
409
411
SET SIGNAL ASPECT TO RED
ACQUIRE SIGNAL ASPECT OF ARRIVAL ROUTE ON PATH
ACQUIRE SIGNAL ASPECT OF DEPARTURE ROUTE ON ARRIVAL TRACK
SIGNAL ASPECT DISPLAY POSITION JUDGMENT PROCESSING
412
JUDGE TRAIN LOCATION
LOCATION NOT BETWEEN ARRIVAL ROUTE AND DEPARTURE ROUTE
414
LOCATION BETWEEN ARRIVAL ROUTE AND DEPARTURE ROUTE
413
DISPLAY CONTROL STATUS ON DEPARTURE TIME OF TRAIN-LOCATED STATION
DISPLAY CONTROL STATUS ON ARRIVAL TIME OF NEXT STATION
CHECK IF THERE IS ANOTHER TRAIN NUMBER TO BE EDITED
415
END
416
210

FIG.5


201
TRAIN OPERATION INFORMATION DATABASE
501
TRAIN OPERATION INFORMATION TABLE
TRAIN NUMBER : A-r
STOP STATION NAME
ARRIVAL TIME
DEPARTURE TIME
TRACK
STATION X
10:00
10:02
UP 1
STATION Y
10:10
10:12
UP 1
404
ACQUIRE TRAIN LOCATION INFORMATION ON TRAIN NUMBER
202
TRAIN LOCATION INFORMATION DATABASE
* RELATE TABLES VIA TRAIN NUMBER
502
TRAIN LOCATION INFORMATION TABLE
TRAIN NUMBER
TRAIN-LOCATED STATION NAME
TRACK CIRCUIT
A-r
STATION X
1RT
B-r
STATION Y
2RT
405
ACQUIRE TRAIN ROUTE INFORMATION ON TRAIN NUMBER
203
TRAIN ROUTE INFORMATION DATABASE
* RELATE TABLES VIA TRAIN NUMBER AND TRACK CIRCUIT
503
TRAIN ROUTE INFORMATION TABLE
TRAIN NUMBER : A-r
TRACK CIRCUIT
FACILITY INFORMATION
ROUTE NAME
1RT
CONTROL POINT
1RA
2RT
—
2RA
3RT
ARRIVAL ROUTE
3RA
4RT
PLATFORM
4RA
5RT
DEPARTURE ROUTE
5RA
6RT
—
6RA

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2010/054232

A. CLASSIFICATION OF SUBJECT MATTER
B61L27/00(2006.01)i, *B61L25/08*(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B61L27/00, B61L25/08

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2010
Kokai Jitsuyo Shinan Koho 1971-2010 Toroku Jitsuyo Shinan Koho 1994-2010

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2005-153789 A (Hitachi, Ltd.), 16 June 2005 (16.06.2005), entire text (Family: none)	1-7
A	JP 2005-8032 A (Hitachi, Ltd.), 13 January 2005 (13.01.2005), entire text & CN 1573669 A	1-7
A	JP 2004-230958 A (Hitachi, Ltd.), 19 August 2004 (19.08.2004), entire text (Family: none)	1-7

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
10 May, 2010 (10.05.10)	18 May, 2010 (18.05.10)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2010/054232

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2005-319927 A (Hitachi, Ltd.), 17 November 2005 (17.11.2005), entire text & CN 1695998 A	1-7
A	JP 2005-212548 A (Hitachi, Ltd.), 11 August 2005 (11.08.2005), entire text (Family: none)	1-7
A	JP 2006-131123 A (Hitachi, Ltd.), 25 May 2006 (25.05.2006), entire text (Family: none)	1-7

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2004230958 A **[0006]**
- JP 2005319927 A **[0006]**