

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11)

EP 0 855 324 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
09.04.2003 Bulletin 2003/15

(51) Int Cl.7: **B61D 19/02**, E05F 15/00

(21) Application number: **98100745.3**

(22) Date of filing: **16.01.1998**

(54) **Automatic open/close operation system for train door**

Automatisches Steuerungssystem für das Öffnen/ Schliessen von einer Tür eines Zuges

Système de commande automatique pour l'ouverture/la fermeture d'une porte d'un train.

(84) Designated Contracting States:
DE FR GB

(30) Priority: **22.01.1997 JP 909797**

(43) Date of publication of application:
29.07.1998 Bulletin 1998/31

(73) Proprietor: **Hitachi, Ltd.**
Chiyoda-ku, Tokyo 101 (JP)

(72) Inventor: **Sasaki, Tamotsu**
Hitachinaka-shi, Ibaraki-ken (JP)

(74) Representative: **Strehl Schübel-Hopf & Partner**
Maximilianstrasse 54
80538 München (DE)

(56) References cited:

- **PATENT ABSTRACTS OF JAPAN** vol. 016, no. 169 (M-1239), 23 April 1992 (1992-04-23) & JP 04 015159 A (TOSHIBA CORP), 20 January 1992 (1992-01-20)
- **PATENT ABSTRACTS OF JAPAN** vol. 1996, no. 07, 31 July 1996 (1996-07-31) & JP 08 058587 A (OKI ELECTRIC IND CO LTD; HONDA DENSHI GIKEN:KK), 5 March 1996 (1996-03-05)
- **PATENT ABSTRACTS OF JAPAN** vol. 013, no. 258 (M-838), 15 June 1989 (1989-06-15) & JP 01 063470 A (TOSHIBA CORP), 9 March 1989 (1989-03-09)
- **PATENT ABSTRACTS OF JAPAN** vol. 015, no. 267 (M-1133), 8 July 1991 (1991-07-08) & JP 03 090471 A (TOSHIBA CORP), 16 April 1991 (1991-04-16)

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 0 855 324 B1

Description

Background of the Invention

[0001] The present invention relates to an automatic open/close operation system of train's door, and particularly, to an automatic open/close operation system of the train's door which is preferable for reducing burden of a motorman of one-man operated train.

[0002] Conventionally, a motorman of one-man operated train operated a system to close the train's door with confirming no-presence of passenger near the door, who was intending to get on or off the train, by watching a monitor, after such conditions were satisfied that departure time in the train timetable of the train staying at a platform has reached, and that a pre-determined time had been elapsed since said train arrived at the platform, as disclosed, for instance, in JP-A-8-58587 (1996).

[0003] Japanese laying-open patent publication Hei 4-15159 (JP-A-4-15159 (1992)) has proposed a system wherein a door closing operation of individual door is instructed after confirming completion of the passenger's getting on and off by an output signal from a getting on and off sensor provided near the door, with an assumption that the train has a conductor.

[0004] However, in accordance with the above first system, the motorman during operating the one-man train has to watch the monitor continuously for no-presence of the passenger near the door, who is intending to get on or off the train, and to determine an adequate timing capable of closing the door. Therefore, the motorman has been burdened significantly.

[0005] In accordance with the above second system, notwithstanding the assumption that the train has a conductor, the primary door close operation must be performed by any of the motorman or the conductor even if the system is applied to either of the one-man operated train and a case when the train has the conductor. Therefore, decreasing the burden of the motorman and the conductor was limited.

Summary of the Invention

[0006] The object of the present invention is to provide an automatic open/close operation system of train's door, which is practically capable of decreasing the burden of the motorman by detecting automatically a timing capable of closing the train's door and performing automatically a closing operation of the train's door, especially, for one-man operated trains.

[0007] The object is solved by a system according to claim 1. The remaining claims are directed to preferred embodiments of the invention.

[0008] One embodiment of the present invention proposes an automatic open/close operation system of train's door comprising a person recognition apparatus for recognizing the presence of person, who is intending

to get on or off from the train, near the train's door, implementing train timetable control means for controlling operation of the train based on the train timetable information, door close timing detecting means for detecting a timing capable of door close operation based on information from said person recognition apparatus at departure of the train, control output editing means for at least editing control information on the door close operation and outputting an open/close operation control signal to the train's door, and a detected result display apparatus for displaying whether the timing capable of the door close operation has been detected or not.

[0009] The implementing train timetable control means is a means for detecting conditions that a departure time in the implementing train timetable of the train staying at platform has reached, and that a pre-determined time has been elapsed since said train has arrived at the platform.

[0010] The control output editing means is a means for editing information from said door close timing detecting means, and outputting a control signal of the open/close operation of the train's door based on said information.

[0011] In any cases, the control output editing means can be a means for outputting a signal to display impossibility to detect a door close timing and a proposal to close the door manually by the train's motorman to the detected result display apparatus, when the control output editing means can not detect a timing capable of closing the door even if the departure time of the train has been past and a pre-determined time has been elapsed since the train arrived at the platform, because of the presence of person near the train's door, who is intending to get on or off the train.

[0012] The control output editing means can output a signal to close the door by half to said train's door during detecting the timing capable of closing the door.

[0013] In accordance with the present invention, the person recognition apparatus is installed at the platform near the train's door, and outputs information on the presence of person near the train's door to the door close timing detecting means. The implementing train timetable control means detects information whether the departure time of the train in the implementing train timetable has reached and a predetermined time has been elapsed since the train has arrived at the platform, and outputs the information to the door close timing detecting means. The door close timing detecting means analyses the information on the presence of person near the train's door from the person recognition apparatus after receiving information on the capability of the train departure from the implementing train timetable control means. In a case when a timing of the absence of person is detected, the train's door is closed automatically. On the contrary, when a timing of the absence of person can not be detected even if the predetermined time has been elapsed, the train's door can be closed by half in order to warn of the closing door to passengers. When

a predetermined re-try number is exceeded after repeating the warning several times, information on impossibility of automatic detection is output to the detected result display apparatus. Therefore, only in the case, for example, when the passengers are crowded, a manual door closing operation is proposed to the motorman. Consequently, the burden of the motorman of one-man operated trains can be decreased significantly with ensured safety of the passengers.

Brief description of the drawings

[0014]

FIG. 1 is a block diagram indicating a system composition of an embodiment of the automatic open/close operation system of train's door relating to the present invention;

FIG. 2 is a flow chart indicating the steps of door close operation of an one-man operating train by the automatic open/close operation system of train's door indicated in FIG. 1;

FIG. 3 is an example of installing condition of the person recognition apparatus using for the automatic open/close operation system of train's door relating to the present invention;

FIG. 4 is a flow chart indicating the steps of door close operation, wherein a door half-close operation step for warning previously of closing the door to the passengers is added to the middle of the door close operation steps indicated in FIG. 2;

Detailed Explanation of the Preferred Embodiment

[0015] FIG. 1 is a block diagram indicating the composition of an embodiment of the automatic open/close operation system of train's door relating to the present invention. The automatic open/close operation system of train's door relating to the present invention is fundamentally composed of a person recognition apparatus 1, a station control apparatus 2, and a detected result display apparatus 3. The station control apparatus 2 comprises an implementing train timetable control means 21, a door close timing detecting means 22, and a control output editing means 23. The person recognition apparatus 1 is installed near the train's door, and detects the presence of person who is intending to get on or off the train by, for example, a pattern recognition. The station control apparatus 2 controls integrally information such as implementing train timetable, station facilities, and the like. The implementing train timetable control means 21 in the station control apparatus 2 detects whether the departure time in the implementing train timetable of the train at the platform has reached and a predetermined time has been elapsed since the train has arrived at the platform. The door close timing detecting means 22 detects a timing capable of closing operation of the door based on information from the per-

son recognition apparatus 1 and the implementing train timetable control means 21. The control output editing means 23 outputs control signals based on the detected result of the door close timing detecting means 22. The detected result display apparatus 3 displays execution mode of the door close operation, that is, automatic mode/manual mode, and the like. The train's door 4 is operated to close automatically when the control output editing means 23 outputs a signal of automatic mode to the detected result display apparatus 3.

[0016] FIG. 2 is a flow chart indicating steps of door close operation in a one-man operating train by the automatic open/close operation system of train's door indicated in FIG. 1. When the train arrived at the platform, the scheduled departure time of the train is judged in the step 5. That is, whether the time has reached the scheduled departure time in the implementing timetable of the train at the platform or not is judged, and if the time has reached the scheduled departure time, the train staying time is counted in the step 6. Counting the train staying time is performed in order to ensure a minimum staying time of the train. After elapsing the minimum staying time of the train, presence of person, who is intending to get on or off the train, is judged based on output signals from the person recognition apparatus 1 in the step 7.

[0017] FIG. 3 indicates an example of installing condition of the person recognition apparatus used in the automatic open/close operation system of train's door indicated in FIG. 1. The person recognition apparatus 1 is installed between the train's door 4 and the platform door 14, and outputs consecutively information on the presence of person, who is intending to get on or off the train, to the door close timing detecting means 22 indicated in FIG. 1. The present invention is effective in a railway station, wherein only the train's door 4 is usable and the platform door 14 does not exist.

[0018] In the step 7 in FIG. 2, when information that no presence of person, who is intending to get on or off the train, at all the doors of the train is informed from the person recognition apparatus 1, a door close timing is transmitted and displayed at the detected result display apparatus 3 in the step 8 after the above condition of no-presence of person is continued during a pre-determined time, and the door close operation is performed automatically in the step 9.

[0019] On the other hand, in a case when the information of no-presence of person is not transmitted, that is, a case when persons are getting on or off the train continuously, the re-try number is counted in the step 10, and go back to the step 7 until a pre-determined re-try number is reached. If the pre-determined re-try number is exceeded by any reason such as crowded passengers in the step 10, impossibility of automatic detection of door close timing is displayed at the detected result display apparatus 3 in the step 11, and the manual door operation is proposed to the motorman of the one-man operating train in the step 12.

[0020] FIG. 4 is a flow chart indicating the steps, wherein a door half-close operation for warning previously of the door close to the passengers is added to the middle of the door close operation steps indicated in FIG. 2. After repeating the re-try several times, the train's door 4 is closed by half in order to give the passengers near the door a warning of the closing door in the step 13, and the presence of person is judged again in the step 7. In accordance with the door half-close operation 13, getting on or off the train of the passengers near the door can be suppressed or terminated, and the operation is effective as a means to generate a condition of no-presence of person who is intending to get on or off the train in the step 7. Also in this case, a pre-determined re-try number of the half-close operation is set, the re-try number is counted in the step 10, if the pre-determined re-try number is exceeded, impossibility of automatic detection of door close timing is displayed at the detected result display apparatus 3 in the step 11, and the manual door operation is proposed to the motorman of the one-man operating train in the step 12.

[0021] In accordance with the present invention, a timing capable of closing doors at departure of one-man operating train can be detected automatically, and a door close operation can be performed automatically. As a result, a burden of the motorman of the one-man operating train can be decreased significantly. In a case when the automatic door close operation is judged to be impossible because of crowded passengers, and the like, a manual door close operation after confirming the condition of the passenger's getting on or off the train is proposed to the motorman of the one-man operating train. Therefore, safety of the passengers can be ensured sufficiently even in the rush-hour of the passengers.

Claims

1. An automatic open/close operation system for train doors comprising

means (1) for recognising whether a person is near a train door (4),

characterised in that the system further comprises

timetable implementing means (21) for detecting whether a scheduled departure time is reached and a predetermined time has elapsed since the train has arrived at the platform and for determining an intended departure of the train,

means (22) for detecting the timing for closing a door based on information from said person recognising means (1) and said timetable implementing means (21) at said intended departure of the train,

means (23) for editing control information pro-

vided by said door close timing detecting means (22) and outputting to the train door an open/close operation control signal, and

display means (3) for displaying whether or not a timing for closing the door has been detected.

2. The system of claim 1, wherein said control information editing means (23) includes means for outputting a control signal of the open/close operation of the door based on the information from said means (22) for detecting the timing for closing a door.
3. The system of claim 1 or 2, wherein said control information editing means (23) includes means for outputting a signal indicating the impossibility to detect a door close timing and outputting to said display means (3) a proposal to close the door manually by the train operator, when said control information editing means (23) cannot detect a timing for closing the door although the departure time of the train has been reached and a predetermined period has elapsed since the train arrived at the platform, due to the presence of a person near the door.
4. The system of any one of claims 1 to 3, wherein said control information editing means (23) includes means for outputting to said train door a signal to close the door by half at the detection of the timing for closing the door.

Patentansprüche

1. Automatisches Öffnungs-/Schließsystem für Zugtüren, aufweisend:

eine Einrichtung (1) zur Erfassung, ob sich eine Person in der Nähe einer Zugtür (4) befindet,

dadurch gekennzeichnet, daß das System außerdem aufweist:

eine Fahrplan-Einbringungseinrichtung (21) zur Erkennung, ob eine planmäßige Abfahrtszeit erreicht ist und eine vorbestimmte Zeit seit der Ankunft des Zugs am Bahnsteig abgelaufen ist, und zur Bestimmung einer gewünschten Abfahrt des Zugs,

eine Einrichtung (22) zur Erkennung des Zeitpunkts zum Schließen einer Tür aufgrund von Informationen von der Personenerfassungseinrichtung (1) und der Fahrplan-Einbringungseinrichtung (21) zur gewünschten Abfahrt des Zugs,

eine Einrichtung (23) zur Bearbeitung einer von der Erkennungseinrichtung (22) für den Türschließzeitpunkt gelieferten Steuerinformation

und zur Ausgabe eines Öffnungs-/Schließsteuersignals an die Zugtür, und eine Anzeigeeinrichtung (3) zur Anzeige, ob ein Zeitpunkt zum Schließen der Tür erkannt wurde oder nicht.

5

2. System nach Anspruch 1, wobei die Steuerinformations-Bearbeitungseinrichtung (23) eine Einrichtung zur Ausgabe eines Steuersignals zum Öffnen/Schließen der Tür aufgrund von Informationen von der Einrichtung (22) zur Erkennung des Zeitpunkts zum Schließen der Tür enthält. 10
3. System nach Anspruch 1 oder 2, wobei die Steuerinformations-Bearbeitungseinrichtung (23) eine Einrichtung beinhaltet, um ein Signal, das die Unmöglichkeit, einen Türschließ-Zeitpunkt zu erkennen, angibt, und auf der Anzeigeeinrichtung (3) einen Vorschlag zum manuellen Schließen der Tür durch das Zugbetriebspersonal auszugeben, wenn die Steuerinformations-Bearbeitungseinrichtung (23) einen Zeitpunkt zum Schließen der Tür nicht erkennen kann, obwohl die Abfahrtszeit des Zugs erreicht ist und eine vorbestimmte Zeitspanne seit Ankunft des Zugs am Bahnsteig abgelaufen ist, weil sich eine Person in der Nähe der Tür befindet. 20 25
4. System nach einem der Ansprüche 1 bis 3 oder, wobei die Steuerinformations-Bearbeitungseinrichtung (23) eine Einrichtung zur Ausgabe eines Signals zum halben Schließen der Tür bei Erkennung des Zeitpunkts zum Schließen der Tür beinhaltet. 30

Revendications 35

1. Système d'ouverture/fermeture automatique de portes de train comportant :

des moyens (1) pour reconnaître si une personne est proche d'une porte de train (4), 40

caractérisé en ce que le système comporte en outre :

45

des moyens d'implémentation d'un horaire (21) pour détecter si un moment de départ programmé est atteint et si un temps prédéterminé s'est écoulé depuis que le train est arrivé à quai et pour déterminer un départ prévu du train, 50

des moyens (22) pour détecter la temporisation pour fermer une porte sur la base d'informations provenant desdits moyens de reconnaissance de personne (1) et desdits moyens d'implémentation d'horaire (21) audit départ prévu du train, 55

des moyens (23) pour éditer des informations de commande fournies par lesdits moyens de

détection de temporisation de fermeture de porte (22) et émettant vers la porte du train un signal de commandes d'ouverture/fermeture, et des moyens d'affichage (3) pour afficher si oui ou non une temporisation pour fermer la porte a été détectée.

2. Système selon la revendication 1, dans lequel lesdits moyens d'édition d'informations de commande (23) comportent des moyens pour émettre un signal de commande d'ouverture/fermeture de la porte sur la base des informations provenant desdits moyens (22) de détection de la temporisation pour fermer une porte.
3. Système selon la revendication 1 ou 2, dans lequel lesdits moyens d'édition d'informations de commande (23) comportent des moyens pour émettre un signal indiquant l'impossibilité de détecter une temporisation de fermeture de porte et émettre vers lesdits moyens d'affichage (3) une proposition de fermeture de la porte manuellement par l'opérateur du train, lorsque lesdits moyens d'édition d'informations de commande (23) ne peuvent pas détecter une temporisation pour fermer la porte alors que le moment de départ du train a été atteint et qu'une période prédéterminée s'est écoulée depuis que le train est arrivé à quai, du fait de la présence d'une personne à proximité de la porte.
4. Système selon l'une quelconque des revendications 1 à 3, dans lequel lesdits moyens d'édition d'informations de commande (23) comportent des moyens pour émettre vers ladite porte de train un signal de fermeture de la porte jusqu'à la moitié à la détection de la temporisation pour fermer la porte.

FIG. 1

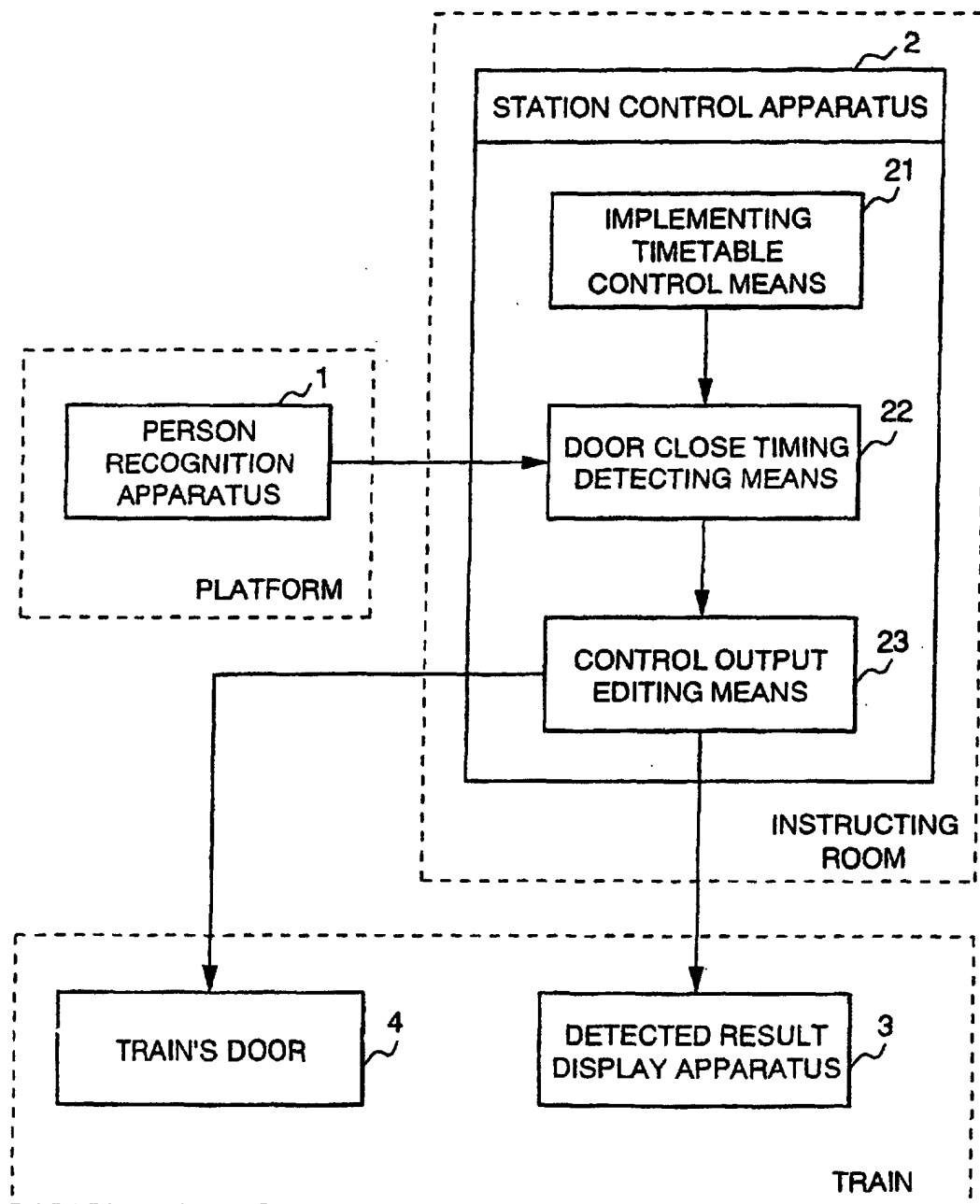


FIG. 2

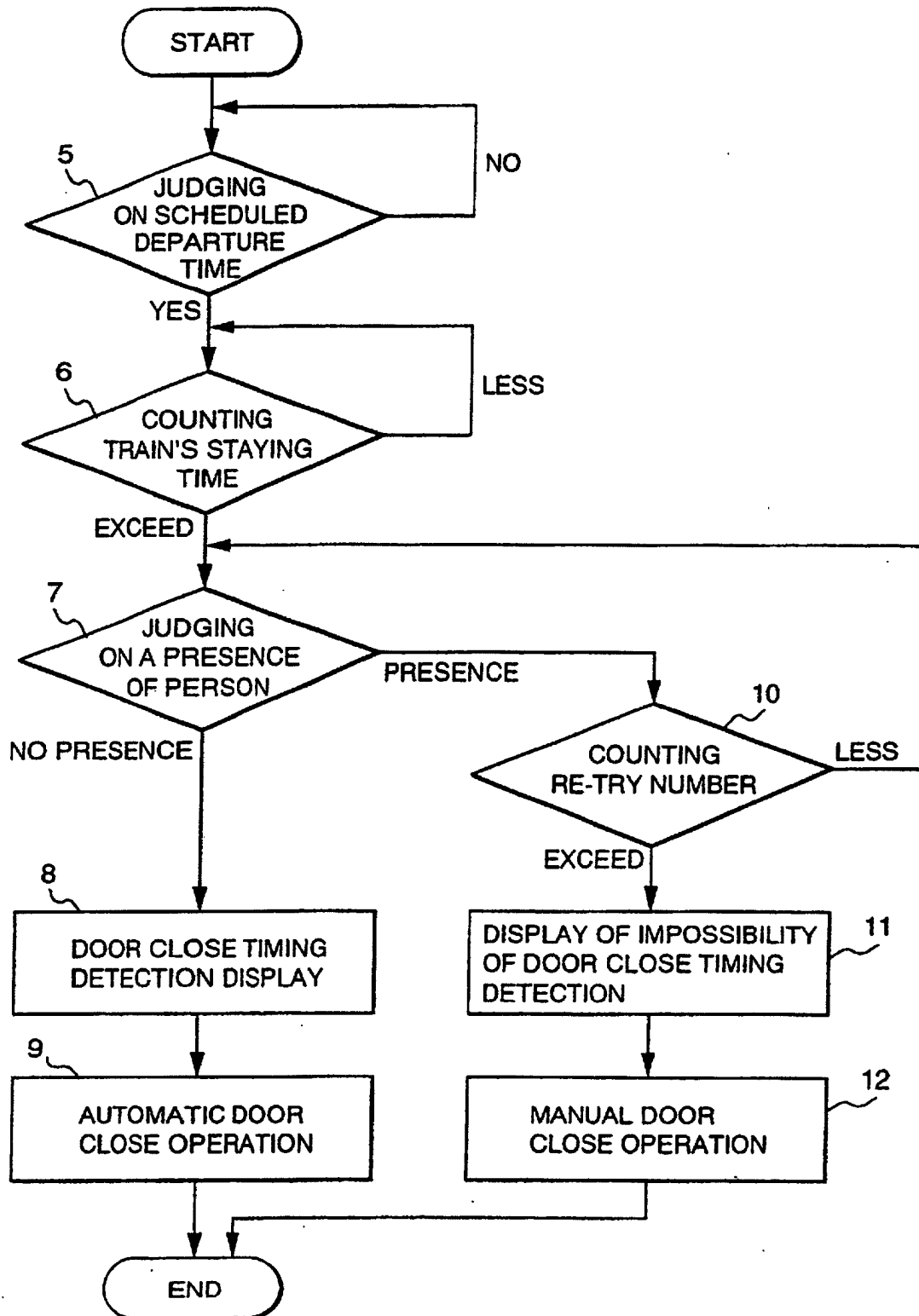


FIG. 3

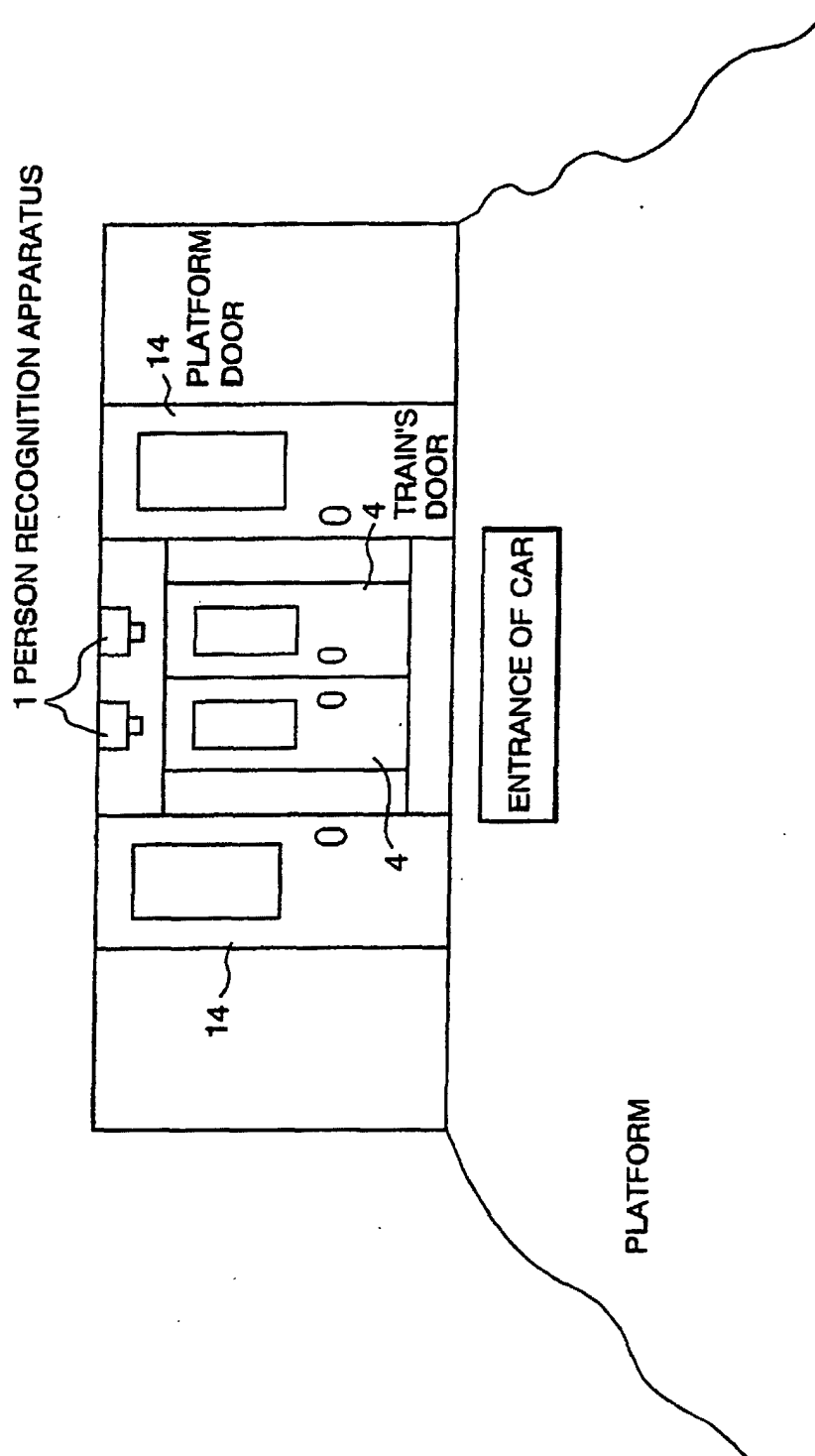


FIG. 4

