EUROPEAN PATENT SPECIFICATION

Date of publication and mention of the grant of the patent: 04.03.2009 Bulletin 2009/10

Application number: 02791822.6

Date of filing: 13.12.2002

Int Cl.: B61D 23/00 (2006.01) B61D 1/06 (2006.01)

International application number: PCT/EP2002/014245


FLIGHTS OF STAIRS ARRANGEMENT IN A PASSENGER VEHICLE
TREPPENANORDNUNG IN EINEM MEHRSTÖCKIGEN PERSONENFAHRZEUG
ARRANGEMENT D’ESCALIER DANS UN VEHICULE A VOYAGEURS

Designated Contracting States: AT BE BG CH CY CZ DE DK EE ES FI FR GB GR IE IT LI LU MC NL PT SE SI SK TR

Priority: 24.12.2001 DE 10164045

Date of publication of application: 22.09.2004 Bulletin 2004/39

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DE-A- 4 423 243 GB-A- 233 617
GB-A- 270 892

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Description

[0001] The present invention relates to a passenger vehicle having a stairway for passengers, in particular a vehicle having a plurality of decks or floors, especially a double-decker vehicle such as a train.

[0002] In order to accommodate an increasing number of passengers, it is now becoming more common for passenger vehicles to comprise two or more decks or floors for providing passenger compartments. One example is the use of train carriages having two floors, one arranged above the other: so-called “double-decker” carriages. While such arrangements allow for an increased number of passengers to be accommodated, such an arrangement of decks or floors is not without its problems. One particular problem is to arrange access to both floors or decks from a single entrance level. Traditionally, movement from one level to another within a vehicle, such as a carriage of a train, has been made possible by the use of stairs. However, it has become increasingly difficult to arrange the stairs, so that passengers entering and leaving the upper and lower floors or decks can move swiftly, easily and unhindered to the exit level. The problem is particularly acute during peak travel periods.

[0003] Known arrangements for flights of stairs are composed exclusively of straight or slightly curved stepped segments. Depending upon the arrangement of the entry doors (high-level entry or low-level entry), arrangements with two flights of stairs or three flights of stairs are generally provided in different ways in double-decker passenger carriages, in order to connect the upper deck and lower deck.

[0004] One design of rail carriage has an entry leading into an entry area. The entry is arranged 760 mm above the track. This is a so-called low-level entry design. While attempts to provide access from the low-level entry area to respective upper and lower decks, these have not been without their problems.

[0005] DE 44 23 243 C2 discloses an arrangement and design of flights of stairs in double-decker rail vehicles, in which an off-set stand is provided. The stand is elliptical in shape and half its height is provided between the upper deck flight of stairs and lower deck flight of stairs. The off-set stand follows the shape of the internal contour of the slightly twisted upper-deck and lower-deck flights of stairs. The flight of stairs leading to the upper deck, which starts with an off-centre displacement in the direction of the lower-deck flight of stairs has, over its full width, a stepped angle of the upper step of less than or equal to 20 degrees with respect to the transverse axis of the car.

[0006] A disadvantage with this arrangement of the flight of stairs is that the flow of passengers into the single-decker entry region and into the upper deck can pass only via the two-lane flights of stairs so that the flow of passengers is subject to congestion at the lower-deck flight of stairs. This is particularly the case when passengers are leaving the upper deck and the single-decker region. The speedy movement of passengers into and out of this double-decker railcar is therefore possible only to a limited degree, having an adverse affect on the stop times at stations and on the travel times in general.

[0007] DE 94 21 249 U1 discloses a double-decker rail vehicle in which an entry region is embodied as a standard entry with a possibility of access via a flight of stairs to the lower deck and a flight of stairs to the upper deck. An alternative entry region is embodied as a low-level entry with a possibility of access to the upper deck via the single-decker region by means of a system with three flights of stairs.

[0008] In this arrangement, it is disadvantageous that as the passengers walk they generally head directly for the straight series of steps and walk on them at a right angle, which adversely affects the flow of passengers. In the single-decker region, the flow of passengers is greatly restricted by a direct reversal of direction through 180° when a straight flight of stairs is employed.

[0009] DE 295 07 057 U1 discloses a double-decker rail vehicle with low-level entries, in particular for double-decker centre cars or driving trailers, in which rail vehicle an entry height into the entry regions of a maximum of 760 mm from the upper edge of the rail is provided. The ceiling of the upper deck is extended directly as far as the inner contour of the car roof line above the entry regions, and the floor of the upper deck and the floor of the lower deck approximately following the dimension by which the ceiling of the upper deck is raised in this region.

[0010] This known solution for a low-floor entry with 760 mm entry height and a known system with two flights of stairs has a number of disadvantages. The need to comply with the predefined vehicle delimitation profile and fulfilment of the ergonomic requirements (headroom/height of the space) requires all the vehicle levels to rise at the same rate, as a result of which the ceiling of the upper deck must be made to extend directly to the body shell of the vehicle. The necessary slopes in the floor must therefore be made steeper and longer. For this reason, it is not possible to arrange luggage racks in the upper deck in the described region above the entry space. In this region, the ceiling air duct must be arranged in the side wall above the window and then be routed in a complex fashion into the centrally arranged ceiling duct.

[0011] In all three prior art systems of stairs it is equally disadvantageous that the possible height dimensions in the entry space are limited and the flights of stairs can only be accessed at a right angle with respect to the steps of the flights of stairs, which has an adverse affect on the flow of passengers.

[0012] GB 270 892 discloses a double deck passenger vehicle having two stairs between the decks and having separate entrances to the two decks from points outside the vehicle and separate exits from the two decks to points outside the vehicle so arranged that intending passengers for either deck may enter, normally, by way of a side opening, spaced from the exit opening at the same side for passengers from that deck a considerable distance lengthwise of the vehicle, the entry to and exit from
the upper deck at the stair heads being similarly spaced, the arrangement being such that passengers to or from one check do not necessarily and normally intermingle with passengers to or from the other deck. Both separate entrances are lower than the lower deck.

[0013] GB 233 617 discloses a double deck passenger vehicle wherein the seats on the upper deck are arranged to constitute two back-to-back rows that extend lengthwise of the vehicle and the gangway on the lower deck is disposed below the said rows of seats and so as to be parallel with the axis of the vehicle and between two parallel rows of seats placed respectively along the two sides of the lower deck portion. The necessary walking height for the gangway of the lower deck is obtained by utilising the space underneath the two back-to-back rows of seats of the upper deck. The two decks can accommodate approximately the same number of passengers. Access to the upper deck is given by two flights of stairs extending lengthwise of the vehicle on the two sides of a central flight of stairs leading to the central gangway of the lower deck. The width of the central flight of stairs leading to the lower deck has to be limited for obvious security reasons and is roughly equal to the width of the two flights of stairs leading to the upper deck. In other words, this arrangement is disadvantageous because it does not provide the similar access conditions to the lower and upper decks.

[0014] There is therefore a need to configure the internal space of multi decked vehicles, in particular in conjunction with a low entry height, such as 760 mm, in such a way that the problem of inadequate height in the entry space is solved and an unimpeded and directed flow of passengers is obtained in the entry space. Further, it is desirable that direct and unimpeded paths into the large compartments are provided.

[0015] According to the present invention there is provided a vehicle with the features of claim 1.

[0016] The advantage of the arrangement of the present invention is that the double-decker region which can be usefully and economically exploited is made larger and the entry can be adjusted to various station platform heights by means of simple modifications.

[0017] The main flight of stairs is preferably wide enough to accommodate two streams of passengers, passing side by side. This is a so-called "two-lane" staircase. The secondary flight of stairs may be configured to accommodate just a single stream of passengers, or more.

[0018] The entry space is preferably substantially level across its entire width. Countersunk steps may be set into the floor in the region of the entry from the exterior.

[0019] The terrace has an arcuate shape. Such a form allows for easier access for passengers moving across the floor of the entry space from the entry to the foot of the main flight of stairs.

[0020] The stair arrangement of the present invention may be employed in any passenger vehicle requiring access to one or more floors or decks. The arrangement is most suitable for a rail vehicle, such as a train carriage, in particular a low-level entry carriage having an entry at about 760 mm above the rails.

[0021] Embodiments of the present invention will now be described in more detail, by way of example only, having reference to the accompanying drawings, in which:

Fig. 1: shows a side view of a portion of a double-decker rail vehicle according to one embodiment of the present invention;

Fig. 2: shows a cross-sectional view along the line A-A of Fig. 1;

Fig. 3: shows a cross-sectional view along the line B-B of Fig. 1;

Fig. 4: shows a cross-sectional plan view of the entry space of the vehicle of Fig. 1;

Fig. 5: shows a side view of a portion of a double-decker vehicle according to a second embodiment of the present invention;

Fig. 6: shows a cross-sectional plan view of the entry space of the vehicle of Fig. 5; and

Fig. 7: shows a cross-sectional plan view of the entry space of a vehicle according to further embodiment of the present invention.

[0022] Referring to Figs 1 to 4, the interior of a double-decker vehicle is shown, having a two-lane main staircase 1 leading from the entry space 2 into an upper deck 3. The floor of the entry space 2 is level over its entire width. Single-lane secondary flights of stairs 4, respectively to the left and right of the main flight of stairs 1, lead to a lower deck 5. The stepped approach to the main flight of stairs 1 is displaced into the entry space 2 in such a way that a terrace having a first step 6 is arranged in the region of a central imaginary entry line 7 of the entry space 2. The entry line 7 virtually halves the depth of the entry space 2 and leads approximately from the centre of one entry to the centre of the opposite entry. The first part of the flight of stairs, the first step 6, a second step 8, and a third step 9 are embodied so as to be virtually circular and in the form of terraces. The following steps of the main staircase are straight.

[0023] With this arrangement and design of the first segments of the flights of stairs in the entry space 2, a generously dimensioned access which can be accessed from a plurality of sides and which has sufficient degrees of freedom is ensured. The flow of passengers is guided in a fan-fashion to the flights of stairs from a broad access space without impedance. This is in contrast to the known, virtually straight series of steps of the prior art, in which the flight of stairs is approached directly at a right
angle. The available length of the double-decker region which can be economically used is utilized to a maximum degree by means of the centrally arranged main flight of stairs 1, which projects into the entry space 2 in a generously dimensioned fashion. With this arrangement and design of the flights of stairs it is possible to vary the height in the entry space 2 and to dispense with disruptive slopes in the floor in the entry space 2.

[0024] The secondary flights of stairs 4 to the right and left of the main flight of stairs 1 are preferably arranged at an angle to the transverse axis of the car and thus direct the flow of passengers in a targeted fashion to the entry doors and to the central aisle of the lower deck 5.

[0025] In an alternative embodiment, as shown in Figure 7, the secondary flights of stairs 4 have arcuate steps and can have, viewed from the lower deck 5, a circular access 13 to the flight of stairs, which is uninterrupted by the main flight of stairs 1. The passengers can thus move from the entry directly into all the regions of the vehicle (upper deck, lower deck, single-decker region) of the double-decker car. That is to say it is possible to pass from the entry to the main flight of stairs 1, from the entry to the secondary flight of stairs 4, from the entry directly through the entry space 2 to the opposite side, to the secondary flight of stairs 4 lying opposite. The access to the flights of stairs always takes place in a fan-like fashion.

[0026] The arrangement of the flights of stairs also permits the end regions of the cars to be generously equipped with seats. The technical equipment can be arranged in the roof space 10, as shown in Fig. 1. This arrangement of technical equipment is not illustrated in more detail in the associated drawings, but a person skilled in the art is completely familiar with its implementation.

[0027] The transparent configuration of the interior space of the double-decker car is significantly improved by means of the generous ceiling height of approximately 2700 mm in the entry space 2 which is now possible, at the same time permitting a uniform overview of the adjoining passenger spaces, such as the upper deck and lower deck 3 and 5 and of the single-decker region.

[0028] The new solution provides a more flexible integration into the access system through the arcuate and terrace-shaped step segments in the entry space 2. The passengers are permitted to access the main flight of stairs 1 from a plurality of sides. Access from the lower deck 5 to the entry space 2 via the secondary flights of stairs 4, which are arranged to the left and right of the main flight of stairs 1 at an angle with respect to the transverse angle of the car, also permits a directed flow of passengers to the entry doors or to the central aisle of the lower deck 5.

[0029] As shown in Figs 5 and 6, in vehicles with entry heights of 600 mm, the level floor of the entry space 2 is provided in the door region with a countersunk step 12 so that 550 mm high station platforms can also be accommodated.

[0030] The embodiments of the present invention described above and shown in the accompanying figures relate to a carriage for a train. However, the arrangement of stairs and entry space described herein may also be employed in other passenger vehicles, for example buses, where space is also at a premium.

[0031] It will be understood that further and additional modifications to the embodiments shown and described herein are possible without departing from the spirit and scope of the present invention.

List of reference numerals

1  - Main flight of stairs (two-lane)
2  - Entry space (with level floor over its entire width and depth)
3  - Upper deck
4  - Secondary flights of stairs (single-lane)
5  - Lower deck
6  - First step
7  - Central entry line (imaginary)
8  - Second step
9  - Third step
10 - Roof space
11 - Access to flights of stairs (from lower deck 5 to the entry space 2)
12 - Step (countersunk)
13 - Secondary flights of stairs (embodied in an arcuate shape)

Claims

1. A vehicle comprising a plurality of floors for accommodating passengers, comprising an entry space (2) accessible from the exterior of the vehicle, a main flight of stairs (1) connecting the entry space with an upper deck (3), two secondary flight of stairs (4) connecting the entry space with a lower deck (5), a first part of the main flight of stairs having an arcuate terrace comprising at least a first step (6), the first step of the terrace being arranged on the floor of the entry space in the region of an imaginary central entry line (7), the two secondary flights of stairs (4) be-
ing arranged on each side of the main flight of stairs (1).

2. The vehicle according to claim 1, wherein the main flight of stairs is wide enough to accommodate two streams of passengers.

3. The vehicle according to claim 1 or 2, wherein each secondary flight of stairs is wide enough to accommodate a single stream of passengers.

4. The vehicle according to any preceding claim, wherein the floor of the entry space is level across its entire width.

5. The vehicle according to claim 4, wherein the floor has countersunk steps in the region of the entrance to the entry space.

6. The vehicle according to any preceding claim, being a rail vehicle.

7. The vehicle according to claim 6, wherein the rail vehicle has a low-level entry into the entry space from the exterior.

8. The vehicle according to claim 7, wherein the entry is 760 mm above the upper edge of the rail upon which the vehicle runs.

Patentansprüche

1. Fahrzeug, das mehrere Stockwerke zur Aufnahme von Passagieren umfasst, umfassend einen Einstiegsraum (2), der von außerhalb des Fahrzeugs her zugänglich ist, eine Haupttreppe (1), die den Einstiegsraum mit einem oberen Stock (3) verbindet, zwei Nebentreppen (4), die den Einstiegsraum mit einem unteren Stock (5) verbinden; wobei ein erster Teil der Haupttreppe eine bogenförmige Terrasse hat, die wenigstens eine erste Stufe (6) umfasst, wobei die erste Stufe der Terrasse auf dem Boden des Einstiegsraums in dem Bereich einer imaginären Einstiegsmittellinie (7) angeordnet ist, wobei die zwei Nebentreppen (4) auf jeder Seite der Haupttreppe (1) angeordnet sind.

2. Fahrzeug nach Anspruch 1, bei dem die Haupttreppe breit genug ist, um zwei Passagierströme aufzunehmen.

3. Fahrzeug nach Anspruch 1 oder 2, bei dem jede Nebentreppe breit genug ist, um einen einzelnen Passagierstrom aufzunehmen.


6. Fahrzeug nach einem der vorhergehenden Ansprüche, das ein Schienenfahrzeug ist.


8. Fahrzeug nach Anspruch 7, bei dem der Einstieg 760 mm über der Oberkante der Schiene, auf der das Fahrzeug läuft, liegt.

Revendications

1. Véhicule comprenant plusieurs étages destinés à accueillir des voyageurs, comprenant un espace d’accès (2) accessible depuis l’extérieur du véhicule, une volée principale d’escalier (1) reliant l’espace d’accès à un pont supérieur (3), deux volées secondaires d’escalier (4) reliant l’espace d’accès à un pont inférieur (5), une première partie de la volée principale d’escalier présentant un palier arceiforme comprenant au moins un premier escalier (6), le premier escalier du palier étant agencé sur le plancher de l’espace d’accès dans la région d’une ligne d’accès centrale imaginaire (7), les deux volées secondaires d’escalier (4) étant agencées de chaque côté de la volée principale d’escalier (1).

2. Véhicule selon la revendication 1, dans lequel la principale volée d’escalier est suffisamment large pour accueillir deux flux de voyageurs.

3. Véhicule selon les revendications 1 ou 2 dans lequel chaque volée secondaire d’escalier est suffisamment large pour accueillir un seul flux de voyageurs.


5. Véhicule selon la revendication 4, dans lequel le plancher possède des marches encastrées dans la région du passage vers l’espace d’accès.

6. Véhicule selon l’une quelconque des revendications précédentes, qui est un véhicule sur rail.

7. Véhicule selon la revendication 6, dans lequel le véhicule sur rail possède un accès de niveau bas dans l’espace d’accès, à partir de l’extérieur.
8. Véhicule selon la revendication 7, dans lequel l’accès se trouve à 760 mm au-dessus du bord supérieur du rail sur lequel circule le véhicule.
REFERENCES CITED IN THE DESCRIPTION

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