



EUROPEAN PATENT APPLICATION

(43) Date of publication:
14.02.2018 Bulletin 2018/07

(51) Int Cl.:
B61D 1/00 (2006.01) B61D 19/02 (2006.01)

(21) Application number: **16306047.8**

(22) Date of filing: **11.08.2016**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD

• **ARNDT, Thomas**
14772 Brandenburg (DE)
• **POLKEHN, Christoph**
38176 Wendenburg (DE)

(74) Representative: **Lavoix**
Bayerstrasse 83
80335 München (DE)

(71) Applicant: **ALSTOM Transport Technologies**
93400 Saint-Ouen (FR)

Remarks:
Amended claims in accordance with Rule 137(2) EPC.

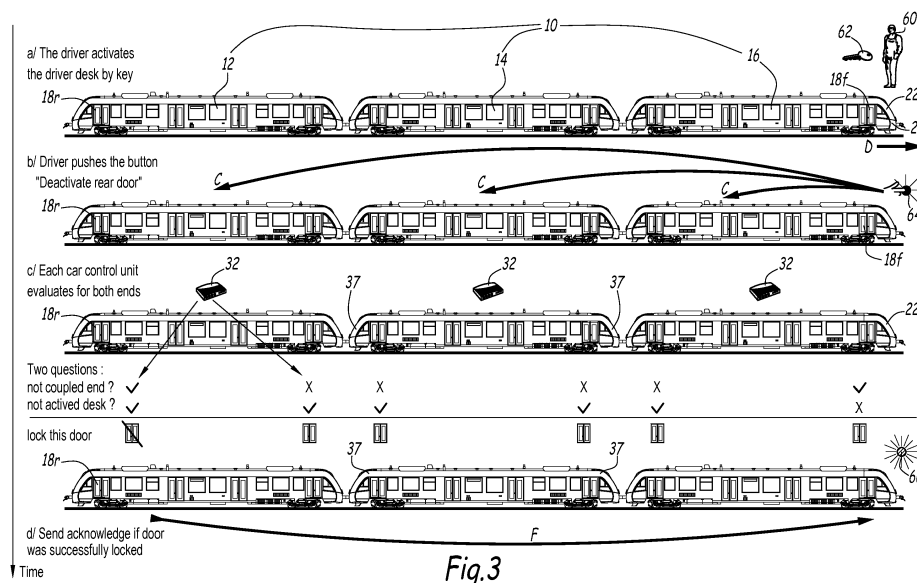
(72) Inventors:
• **FELLER, Reiner**
38116 Braunschweig (DE)

(54) **RAILWAY VEHICLE WITH END DOORS RELEASE INHIBITION**

(57) A railway vehicle (10) for passenger transport, comprising:

- a first end, a second end (26) and a central section;
- a first end door (18r) in the first end, a second end door (18f) in the second end (26), central doors in the central section, the doors allowing passengers to enter and exit the railway vehicle (10), wherein all the doors (18) are on the same side of the railway vehicle;

- a doors controlling system for locking said doors (18) during travel and for releasing the doors (18) when stopping at a platform;
- an end doors release inhibiting system for inhibiting the release of one or both of the end doors (18r, 18f), while not interfering with the release of the central doors, when stopping at a platform and it is detected that one or both of the end doors (18r, 18f) is not covered by the platform.



Description

[0001] The present invention concerns a railway vehicle for passenger transport and the control of the release of the passenger doors of this railway vehicle during stops at railway stations.

[0002] The length of a station platform often varies between different railway stations. Some railway stations may have very short platforms. A railway vehicle stopping at such a short platform may have a length that is longer than the platform length. In such a case, there may be no platform in front of the doors at the front and/or the rear end of the railway vehicle during passenger exchange. This can lead to a dangerous situation for passengers alighting the railway vehicle when the front and/or rear doors that do not face any platform are released.

[0003] This kind of problem occurs in particular during high traffic volume where the train operators often use railway vehicles consisting of a set of several coupled cars so that the passenger capacity can be raised and the timetable optimised.

[0004] Figure 1 illustrates this problem with three examples a), b) and c). Figure 1 shows a railway vehicle 10 consisting of three cars 12, 14 and 16. The railway vehicle 10 is preferably an electric multiple unit but may also be a diesel multiple unit. It is preferably used as a suburban or regional train for passenger transport. An example of such a train type is the Coradia Continental manufactured by the Applicant.

[0005] Each car 12, 14 and 16 has two pairs of end doors 18 and two pairs of central doors 20. The two doors of each pair are located on opposite sides of the railway vehicle 10. Since Fig. 1 only shows one side of the railway vehicle 10, one of the two doors of each pair is hidden from view.

[0006] In the examples shown in Fig. 1, the railway vehicle 10 travels from left to right in the direction indicated by the arrow D. The staffed and active driver's cab is identified by the reference number 22. Based on the direction of travel D, one can define a rear end 24, a central section 25 and a front end 26 of the railway vehicle 10. The rear end 24 has a pair of rear doors 18r. The front end 26 has a pair of front doors 18f. The central section 25 comprises, for example, the other doors of the railway vehicle 10. The central section 25 joins the rear end 24 to the front end 26.

[0007] As can be seen in example a), the length of the railway vehicle 10 is adapted for long platforms PI. When the railway vehicle 10 stops at a long platform PI, all doors 18, 20 on the railway vehicle's side facing the platform PI, and in particular the rear door 18r and the front door 18f, face the platform PI. Hence, all doors 18, 20 can be released once the railway vehicle has stopped without any risk to passengers alighting the railway vehicle 10.

[0008] However, as shown in examples b) and c), when the railway vehicle 10 stops at a short platform Ps (example c)) or a very short platform Pvs (example b)), the

rear door 18r or the rear door 18r and the front door 18f do not face the platform Ps/Pvs. As a consequence, when the doors are released, an inadvertent passenger might alight the railway vehicle 10 at one of the doors 18r or 18f that are not covered by the platform and fall onto the track, as indicated by the pictograms PG.

[0009] It is an object of the present invention to provide a railway vehicle where the just described security risk of passengers falling onto the track during stops at short platforms is securely prevented.

[0010] This object is achieved with a railway vehicle for passenger transport, comprising:

- a first end, a second end and a central section joining the first end to the second end;
- a first end door arranged in the first end, a second end door arranged in the second end, and one or more central doors arranged in the central section, each of said doors allowing passengers to enter and exit the railway vehicle, wherein all the doors are arranged on the same side of the railway vehicle;
- a doors controlling system adapted to lock said doors when the railway vehicle is travelling and to release the doors for opening when the railway vehicle stops at a station platform; and
- an end doors release inhibiting system adapted to selectively inhibit the release of one or both of the end doors by the doors controlling system, while not interfering with the release of the one or more central doors, when the railway vehicle stops at a station platform and it is detected that one or both of the end doors is not covered by the station platform.

[0011] By providing said end doors release inhibiting system, the end doors are not released when the railway vehicles stops at a platform that is shorter than the length of the railway vehicle. Hence, the passengers are forced to leave the railway vehicle via the central doors and cannot inadvertently fall onto the track.

[0012] According to preferred embodiments, the inventive railway vehicle comprises one, several or all of the following features, in all technically possible combinations:

- the doors controlling system has one end door controlling unit for each end door;
- the end doors release inhibiting system has one end door release inhibiting unit for each end door, each end door release inhibiting unit being associated with one end door controlling unit;
- each end door controlling unit has two separate inputs, namely a door release input and a door release inhibiting input, the end door controlling unit being adapted to:

a) release its corresponding end door in a release configuration wherein a signal is present at the door release input and a signal is absent

at the door release inhibiting input; and
 b) lock its corresponding end door in a locking configuration wherein a signal is absent at the door release input and a signal is present at the door release inhibiting input; and

- each end door release inhibiting unit is adapted to switch its associated end door controlling unit between said release configuration and said locking configuration;
- each end door release inhibiting unit is a relay, and in particular a force-guided contacts relay, with one normally closed contact for interrupting the signal at the door release input of its end door controlling unit, and with one normally open contact for providing a signal at the door release inhibiting input of its end door controlling unit;
- the railway vehicle is a multiple unit train with at least two coupled cars;
- each car includes a central car control unit;
- the detection that one or both of the end doors is not covered by the station platform triggers the transmission, to each central car control unit, of a command to inhibit the release of one or both of the end doors; and
- each central car control unit is adapted to, upon receipt of said command:

a) check whether its car comprises the end door whose release is to be inhibited; and
 b) if the check is positive, activate the end doors release inhibiting system;

- each car has a driver's cab at at least one of its extremities; and
- said check includes determining whether one of the car's extremities is uncoupled and whether the car has an active driver's cab;
- each driver's cab includes a driver operated end door release inhibiting push button, said transmission of said inhibition command being triggered by operating the push button;
- the central car control unit, which has activated the end doors release inhibiting system, is adapted to output a confirmation feedback signal confirming that the release of its end door has been inhibited;
- said central car control unit is adapted to output the confirmation feedback signal if at least the following conditions are all met:
- the end doors release inhibiting system indicates that the end door release has been inhibited; and
- the doors controlling system does not indicate that there has been no end door release inhibition;
- a signalling device, such as an indicator light, adapted to signal the presence of said confirmation feedback signal to the driver of the railway vehicle.

[0013] A preferred embodiment of the railway vehicle

according to the invention will now be described in detail with reference to the appended drawings, wherein:

Fig. 1 is an illustration of the technical problem underlying the present invention;

Fig. 2 is a block diagram showing the communication network architecture of said preferred embodiment; Fig. 3 is a flow chart showing the successive steps of the end door release inhibition process of the present invention;

Fig. 4 is a block circuit diagram showing, according to the invention, two end door release inhibiting units that are connected in parallel, with two associated end door controlling units; and

Fig. 5 is a block circuit diagram showing, according to the invention, a part of the electric circuit for generating a confirmation feedback signal confirming that the release of the end doors has been inhibited.

[0014] The explanations made above with respect to the railway vehicle of Fig. 1 fully apply to the railway vehicle according to the invention, which is described in the following. Accordingly, these explanations will not be repeated here.

[0015] However, even if in the example of figure 1 the railway vehicle consists of three cars, in other embodiments of the invention the railway vehicle consists of less than three cars such as one or two cars or more than three cars.

[0016] In the embodiment in which the railway vehicle consists of a single car, this car defines the rear end 24, the central section 25 and the front end 26.

[0017] Figure 2 shows the communication network 28 of the railway vehicle 10. Communication network 28 allows the different control components of the railway vehicle 10 to exchange control signals.

[0018] Communication network 28 includes a train bus 30 running through the entire railway vehicle 10 and allowing communication between the different cars 12, 14 and 16. The train bus may in particular be a so-called Wire Train Bus or WTB.

[0019] Each car 12, 14, 16 has a central car control unit 32 that is connected to the train bus 30. Each central car control unit 32 performs all necessary control tasks for its associated car 12, 14, 16. Each central car control unit 32 is connected to the various subcomponents of its car 12, 14, 16 via a car bus 34. Each car bus 34 may be a so-called Multifunction Vehicle Bus or MVB.

[0020] Each car 12, 14, 16 has a driver's desk 36 at each of its extremities 37. Each driver's desk 36 is connected to the car bus 34.

[0021] Furthermore, each car has a doors controlling device 38 that is also connected to the car bus 34. In the present example, each doors controlling device 38 comprises four individual central door controlling units 40, one for each of the four central doors 20, and four individual end door controlling units 42, one for each of the four end doors 18.

[0022] The three doors controlling devices 38 together form a doors controlling system 44.

[0023] Each car 12, 14, 16 also comprises an end doors release inhibiting device 46, which is connected to the car bus 34. In the present example, each end doors release inhibiting device 46 comprises four individual end door release inhibiting units 48, one for each of the four end doors 18.

[0024] The three end doors release inhibiting devices 46 together form an end doors release inhibiting system 50.

[0025] With reference to Fig. 4, there is shown how the end door release inhibiting units 48 are implemented. Each end door release inhibiting unit 48 is associated with one end door controlling unit 42.

[0026] Each end door controlling unit 42 has two separate inputs, namely a door release input 52 and a door release inhibiting input 54. As a function of the signals that are present at the two inputs 52, 54, the end door controlling unit 42 can be in two different configurations.

[0027] In a release configuration, the end door controlling unit 42 releases its corresponding end door 18 so that it may be opened by a passenger. The end door controlling unit 42 is in the release configuration when a signal is present at the door release input 52 and a signal is absent at the door release inhibiting input 54.

[0028] In a locking configuration, the end door controlling unit 42 locks its corresponding end door 18. The end door controlling unit 42 is in the locking configuration when a signal is absent at the door release input 52 or a signal is present at the door release inhibiting input 54.

[0029] Each end door release inhibiting unit 48 can switch its associated end door controlling unit 42 between said release configuration and said locking configuration. To this end, the end door release inhibiting unit 48 is preferably a switch that can interrupt and establish a signal at the two inputs 52 and 54 of the end door controlling unit 42.

[0030] As illustrated in Fig. 4, each end door release inhibiting unit 48 is preferably a relay, and in particular a force-guided contacts relay, with one normally closed contact 56 for interrupting the signal at the door release input 52 of its end door controlling unit 42, and with one normally open contact 58 for providing a signal at the door release inhibiting input 54 of its end door controlling unit 42.

[0031] One will note that the circuit of Fig. 4 shows two relays 48 connected in parallel with their corresponding end door controller 42. This kind of circuit is implemented twice in each car 12, 14, 16 and serves to inhibit the release of one pair of end doors 18 located on opposite sides of the car.

[0032] Turning now to Fig. 3, there is shown how a driver 60 of the inventive railway vehicle 10 can deactivate the pair of rear doors 18r when stopping at a short platform Ps.

[0033] First, in step a), the driver 60 enters the driver's cab 22 at the railway vehicle's front end 26 and activates

the driver's desk with her key 62. The driver 60 can then depart and drive the railway vehicle 10 until it reaches a short platform Ps.

[0034] When stopping at the short platform Ps, the driver 60 will detect that the rear door 18r is not covered by platform. In order to prevent passengers from alighting via the rear door 18r and falling onto the track, the driver 60 triggers the transmission, to each central car control unit 32, of a command C to inhibit the release of the rear door 18r, cf. step b). The command reaches each central car control unit 32 via the MVB 34 (car 16), or via the MVB 34 and then the WTB 30 (cars 12 and 14).

[0035] In the present example, the driver 60 triggers said command by pushing a dedicated Illuminated Push Button or IPB 64 that is arranged on the driver's desk 36. Preferably, a second IPB for deactivating the front doors 18f is also arranged on the driver's desk 36.

[0036] Upon receiving the command C, each central car control unit 32 checks whether its car comprises the rear door 18r whose release is to be inhibited, and, if the check is positive, activates the end doors release inhibiting system 50.

[0037] Preferably, said check involves two questions, namely determining whether one of the car's extremities 37 is uncoupled and whether the car has an inactive driver's desk 36, cf. step c). If both conditions are met, the central car control unit 32 sends a door release inhibition command to the end doors release inhibiting device 46 and thus to the rear doors release inhibiting circuit (cf. Fig. 4) of the rear doors 18r via the MVB 34.

[0038] Once the release of the rear door 18r has been inhibited, the central car control unit 32 outputs a confirmation feedback signal F confirming that the release of its end door has been inhibited, cf. step d).

[0039] The central car control unit 32 outputs the confirmation feedback signal F if at least the following conditions are met:

- i. the end doors release inhibiting system 50 indicates that the release of the rear door 18r has been inhibited; and
- ii. the doors controlling system 44 does not indicate that there has been no inhibition of the release of the rear door 18r.

[0040] Figure 5 shows how condition i can be implemented as an additional normally open contact 65 in the relays 48.

[0041] Preferably, the following conditions must also be met:

- iii. A coupler of the relevant car indicates that it is mechanically uncoupled;
- iv. None of the two driver's desks 36 of the relevant car indicates that it is active.

[0042] The confirmation feedback signal F travels back via the MVB 34 and possibly the WTB 30 to the active

driver's desk 36 at the front end 26 of the railway vehicle 10.

[0043] A signalling device 66, such as an indicator light, which is preferably integrated in the push button 64, signals the presence of said confirmation feedback signal F to the driver of the railway vehicle 10. 5

[0044] The inhibition of the release of the front doors 18f generally follows the same procedure shown in Fig. 3 for the rear doors. However, to deactivate the front doors 18f, the driver 60 must push the second IPB instead of the first IPB 64. Contrary to the inhibition of the rear doors 18r, the driver 60 triggers a command only to the car control unit 32 in the front car 16 in which the driver 60 is located to inhibit the front doors 18f. In difference to the rear doors 18r, the car control unit 32 then determines which extremity 37 of the front car 16 comprises the front doors whose release is to be inhibited by checking for each extremity 37 whether it is uncoupled and whether it has an active driver's desk 36. 10 15

[0045] If both the front door 18f and the rear door 18r are not covered by the platform, the driver 60 will then push both IPBs. 20

Claims 25

1. A railway vehicle (10) for passenger transport, comprising:

- a first end (24), a second end (26) and a central section (25) joining the first end to the second end; 30
- a first end door (18r) arranged in the first end (24), a second end door (18f) arranged in the second end (26), and one or more central doors (20) arranged in the central section (25), each of said doors allowing passengers to enter and exit the railway vehicle (10), wherein all the doors (18, 20) are arranged on the same side of the railway vehicle; 35 40
- a doors controlling system adapted to lock said doors (18, 20) when the railway vehicle is travelling and to release the doors (18, 20) for opening when the railway vehicle stops at a station platform (Ps); and 45
- an end doors release inhibiting system adapted to selectively inhibit the release of one or both of the end doors (18r, 18f) by the doors controlling system, while not interfering with the release of the one or more central doors (20), when the railway vehicle (10) stops at a station platform (Ps) and it is detected that one or both of the end doors (18r, 18f) is not covered by the station platform. 50

2. The railway vehicle (10) of claim 1, wherein: 55

- the doors controlling system has one end door

controlling unit (42) for each end door (18);

- the end doors release inhibiting system (50) has one end door release inhibiting unit (48) for each end door (18), each end door release inhibiting unit being associated with one end door controlling unit;

- each end door controlling unit (42) has two separate inputs, namely a door release input (52) and a door release inhibiting input (54), the end door controlling unit (42) being adapted to:

- a) release its corresponding end door (18) in a release configuration wherein a signal is present at the door release input (52) and a signal is absent at the door release inhibiting input (54); and

- b) lock its corresponding end door (18) in a locking configuration wherein a signal is absent at the door release input (52) and a signal is present at the door release inhibiting input (54); and

- each end door release inhibiting unit (48) is adapted to switch its associated end door controlling unit (42) between said release configuration and said locking configuration.

3. The railway vehicle (10) of claim 2, wherein each end door release inhibiting unit is a relay (48), and in particular a force-guided contacts relay, with one normally closed contact (56) for interrupting the signal at the door release input (52) of its end door controlling unit (42), and with one normally open contact (58) for providing a signal at the door release inhibiting input (54) of its end door controlling unit. 30 35

4. The railway vehicle (10) of any one of the previous claims, wherein:

- the railway vehicle is a multiple unit train with at least two coupled cars (12, 14, 16);
- each car includes a central car control unit (32);
- the detection that one or both of the end doors (18r, 18f) is not covered by the station platform (Ps) triggers the transmission, to each central car control unit (32), of a command (C) to inhibit the release of one or both of the end doors (18r, 18f); and
- each central car control unit (32) is adapted to, upon receipt of said command:

- a) check whether its car comprises the end door (18r, 18f) whose release is to be inhibited; and

- b) if the check is positive, activate the end doors release inhibiting system (50).

5. The railway vehicle (10) of claim 4, wherein:

- each car (12, 14, 16) has a driver's cab (22) at at least one of its extremities (37); and
 - said check includes determining whether one of the car's extremities (37) is uncoupled and whether the car has an active driver's cab (22). 5
6. The railway vehicle (10) of claim 5, wherein each driver's cab (22) includes a driver operated end door release inhibiting push button (64), said transmission of said inhibition command being triggered by operating the push button. 10
7. The railway vehicle (10) of any one of claims 4 to 6, wherein the central car control unit (32), which has activated the end doors release inhibiting system (50), is adapted to output a confirmation feedback signal (F) confirming that the release of its end door has been inhibited. 15
8. The railway vehicle (10) of claim 7, wherein said central car control unit (32) is adapted to output the confirmation feedback signal (F) if at least the following conditions are all met: 20
- the end doors release inhibiting system (50) indicates that the end door release has been inhibited; and 25
 - the doors controlling system (44) does not indicate that there has been no end door release inhibition. 30
9. The railway vehicle (10) of claim 7 or 8, further comprising a signalling device (66), such as an indicator light, adapted to signal the presence of said confirmation feedback signal (F) to the driver (60) of the railway vehicle. 35

Amended claims in accordance with Rule 137(2) EPC. 40

1. A railway vehicle (10) for passenger transport, comprising: 45
- a first end (24), a second end (26) and a central section (25) joining the first end to the second end;
 - a first end door (18r) arranged in the first end (24), a second end door (18f) arranged in the second end (26), and one or more central doors (20) arranged in the central section (25), each of said doors allowing passengers to enter and exit the railway vehicle (10), wherein all the doors (18, 20) are arranged on the same side of the railway vehicle; 50
 - a doors controlling system adapted to lock said doors (18, 20) when the railway vehicle is travelling and to release the doors (18, 20) for opening 55

ing when the railway vehicle stops at a station platform (Ps); and

- an end doors release inhibiting system adapted to selectively inhibit the release of one or both of the end doors (18r, 18f) by the doors controlling system, while not interfering with the release of the one or more central doors (20), when the railway vehicle (10) stops at a station platform (Ps) and it is detected that one or both of the end doors (18r, 18f) is not covered by the station platform, and wherein:

- the railway vehicle is a multiple unit train with at least two coupled cars (12, 14, 16);
- each car includes a central car control unit (32);
- the detection that one or both of the end doors (18r, 18f) is not covered by the station platform (Ps) triggers the transmission, to each central car control unit (32), of a command (C) to inhibit the release of one or both of the end doors (18r, 18f); and
- each central car control unit (32) is adapted to, upon receipt of said command:

- a) check whether its car comprises the end door (18r, 18f) whose release is to be inhibited; and
- b) if the check is positive, activate the end doors release inhibiting system (50).

2. The railway vehicle (10) of claim 1, wherein:

- the doors controlling system has one end door controlling unit (42) for each end door (18);
- the end doors release inhibiting system (50) has one end door release inhibiting unit (48) for each end door (18), each end door release inhibiting unit being associated with one end door controlling unit;
- each end door controlling unit (42) has two separate inputs, namely a door release input (52) and a door release inhibiting input (54), the end door controlling unit (42) being adapted to:

- a) release its corresponding end door (18) in a release configuration wherein a signal is present at the door release input (52) and a signal is absent at the door release inhibiting input (54); and
- b) lock its corresponding end door (18) in a locking configuration wherein a signal is absent at the door release input (52) and a signal is present at the door release inhibiting input (54); and

- each end door release inhibiting unit (48) is

adapted to switch its associated end door controlling unit (42) between said release configuration and said locking configuration.

3. The railway vehicle (10) of claim 2, wherein each end door release inhibiting unit is a relay (48), and in particular a force-guided contacts relay, with one normally closed contact (56) for interrupting the signal at the door release input (52) of its end door controlling unit (42), and with one normally open contact (58) for providing a signal at the door release inhibiting input (54) of its end door controlling unit. 5
10

4. The railway vehicle (10) of any one of claims 1 to 3, wherein: 15
 - each car (12, 14, 16) has a driver's cab (22) at at least one of its extremities (37); and
 - said check includes determining whether one of the car's extremities (37) is uncoupled and whether the car has an active driver's cab (22). 20

5. The railway vehicle (10) of claim 4, wherein each driver's cab (22) includes a driver operated end door release inhibiting push button (64), said transmission of said inhibition command being triggered by operating the push button. 25

6. The railway vehicle (10) of any one of the preceding claims, wherein the central car control unit (32), which has activated the end doors release inhibiting system (50), is adapted to output a confirmation feedback signal (F) confirming that the release of its end door has been inhibited. 30
35

7. The railway vehicle (10) of claim 6, wherein said central car control unit (32) is adapted to output the confirmation feedback signal (F) if at least the following conditions are all met: 40
 - the end doors release inhibiting system (50) indicates that the end door release has been inhibited; and
 - the doors controlling system (44) does not indicate that there has been no end door release inhibition. 45

8. The railway vehicle (10) of claim 6 or 7, further comprising a signalling device (66), such as an indicator light, adapted to signal the presence of said confirmation feedback signal (F) to the driver (60) of the railway vehicle. 50

55

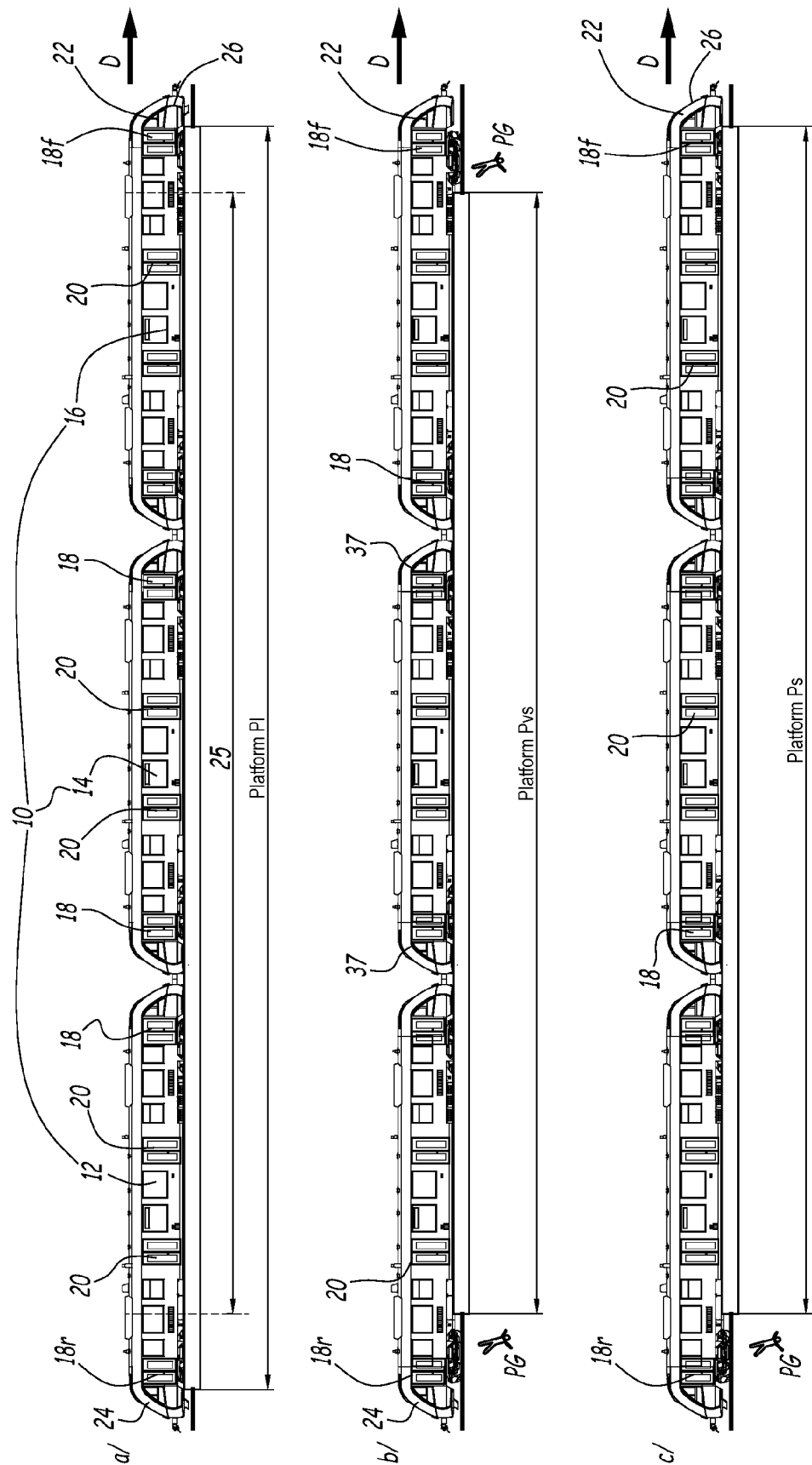


Fig.1

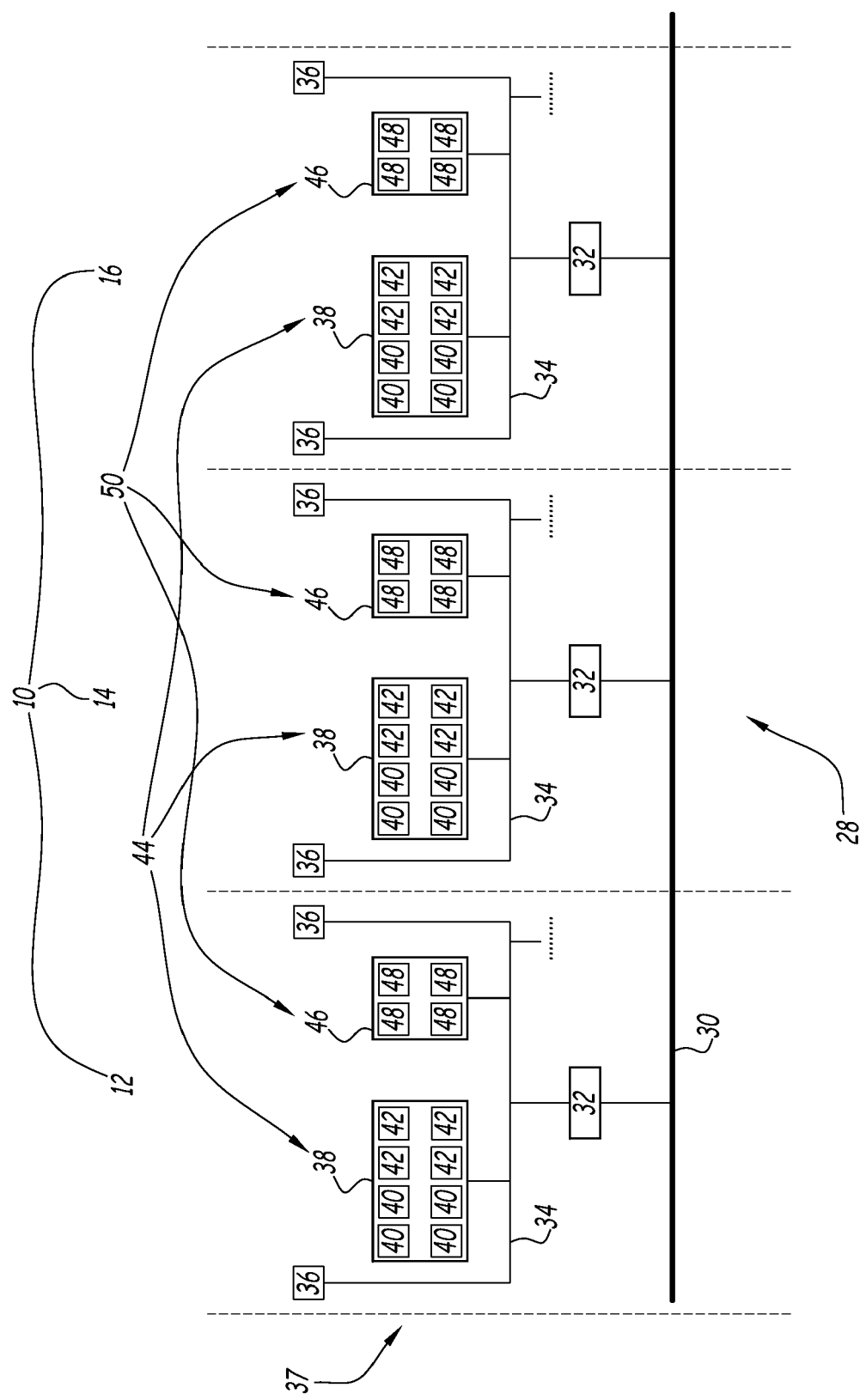
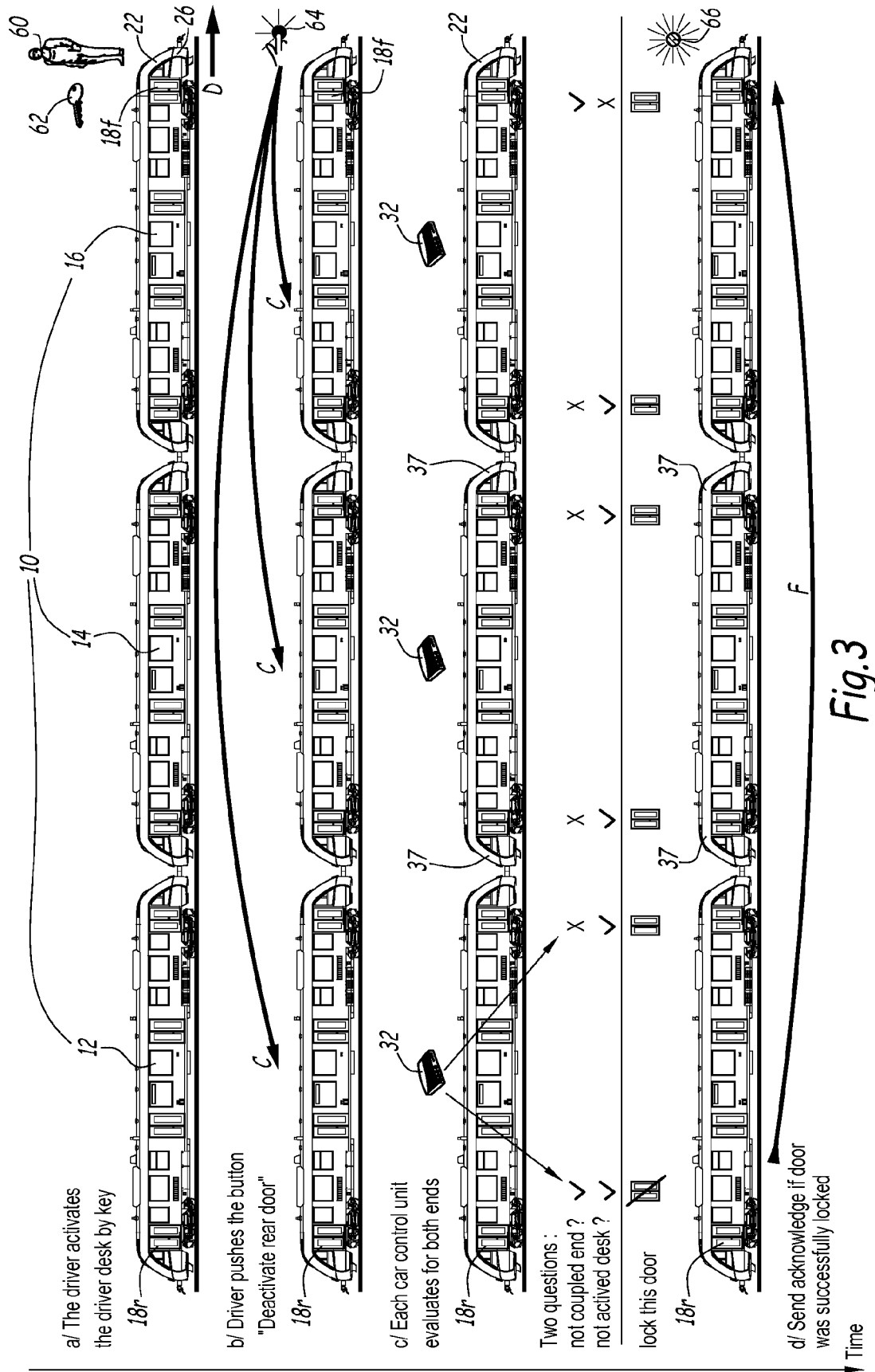


Fig.2



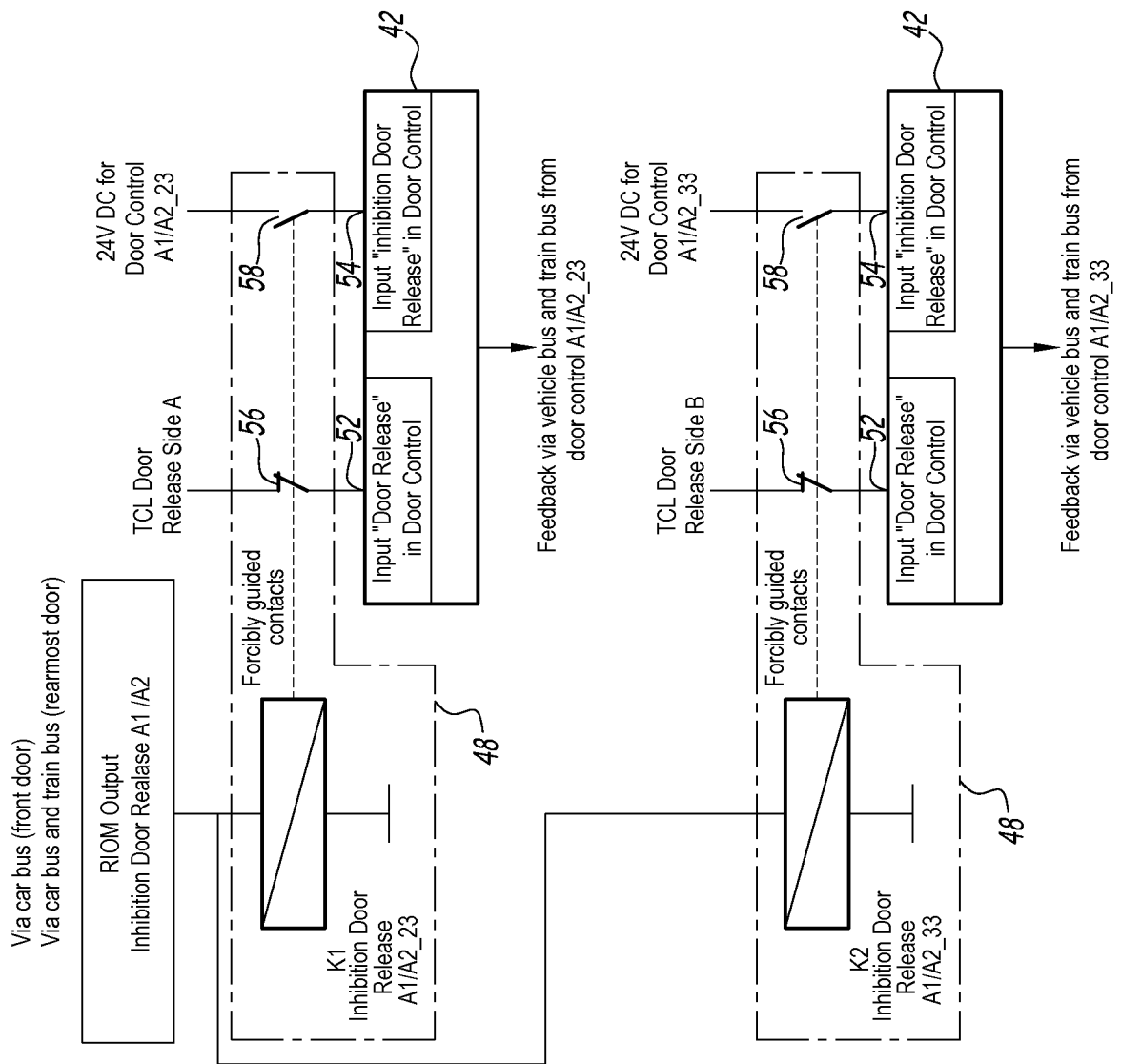


Fig.4

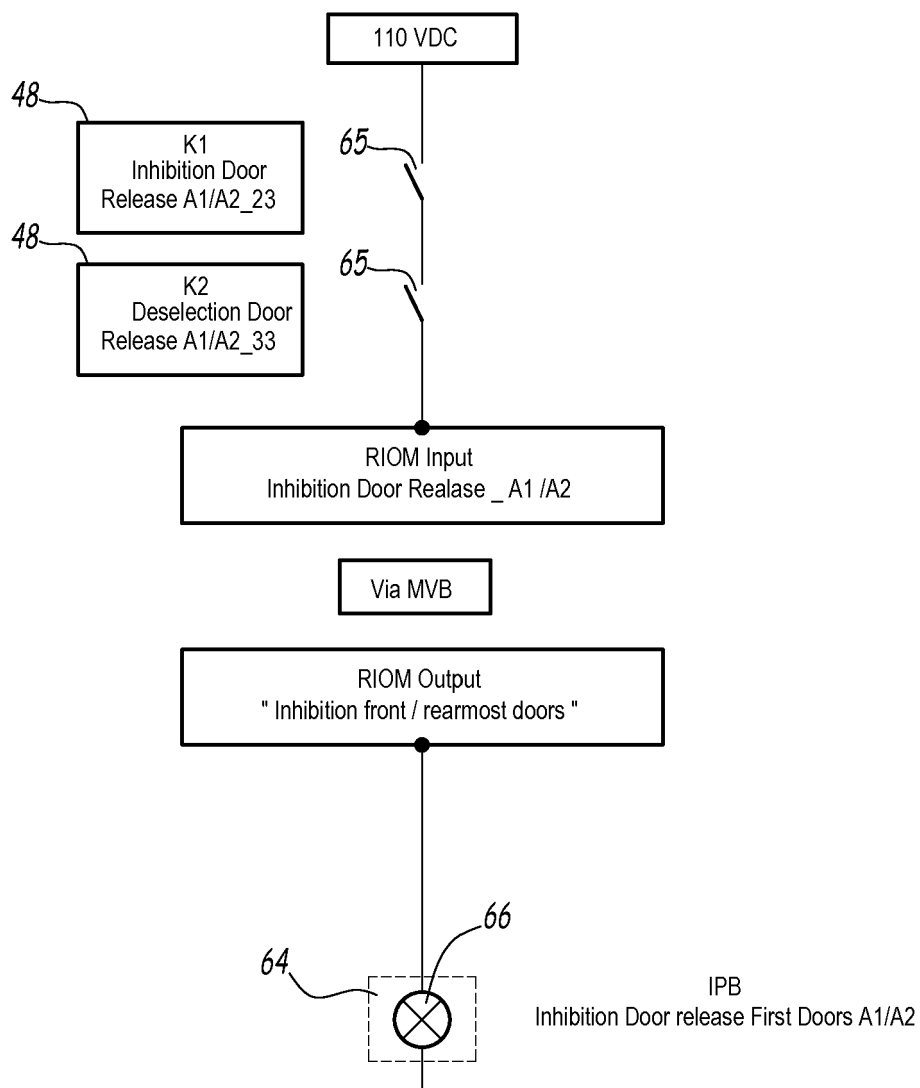


Fig.5



EUROPEAN SEARCH REPORT

 Application Number
 EP 16 30 6047

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	JP 2010 254294 A (KYUSHU RAILWAY CO; FUJIKO KK) 11 November 2010 (2010-11-11) * abstract; figures * * paragraphs [0002], [0018] * -----	1-3	INV. B61D1/00 B61D19/02
X	JP H07 242172 A (TOSHIBA TRANSPORT ENG; TOSHIBA CORP) 19 September 1995 (1995-09-19) * abstract; figures * -----	1-3	
X	JP 2007 302205 A (WEST JAPAN RAILWAY TECHNOS COR) 22 November 2007 (2007-11-22) * abstract; figures * -----	1-3	
X	GB 2 424 288 A (AEA TECHNOLOGY PLC [GB]) 20 September 2006 (2006-09-20) * the whole document * -----	1-3	
A	JP 2006 315605 A (MITSUBISHI ELECTRIC CORP) 24 November 2006 (2006-11-24) * abstract; figures * -----	1	TECHNICAL FIELDS SEARCHED (IPC)
A	US 6 341 563 B1 (GAL ELI [IL] ET AL) 29 January 2002 (2002-01-29) * the whole document * -----	1	B61D
A	EP 1 787 883 A1 (BOMBARDIER TRANSP GMBH [DE]) 23 May 2007 (2007-05-23) * paragraphs [0026], [0033] - [0034], [0047] - [0048] * -----	1	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 3 February 2017	Examiner Schultze, Yves
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 16 30 6047

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

03-02-2017

10

15

20

25

30

35

40

45

50

55

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2010254294 A	11-11-2010	JP 5156787 B2 JP 2010254294 A	06-03-2013 11-11-2010
JP H07242172 A	19-09-1995	NONE	
JP 2007302205 A	22-11-2007	NONE	
GB 2424288 A	20-09-2006	NONE	
JP 2006315605 A	24-11-2006	NONE	
US 6341563 B1	29-01-2002	AU 7672598 A CA 2294600 A1 EP 0990085 A1 IL 121120 A JP 2002505634 A US 6341563 B1 WO 9858148 A1	04-01-1999 23-12-1998 05-04-2000 06-12-2000 19-02-2002 29-01-2002 23-12-1998
EP 1787883 A1	23-05-2007	AT 442983 T EP 1787883 A1	15-10-2009 23-05-2007

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82