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(54) SYSTEM AND METHOD FOR AUTOMATIC TRACK ELEMENT APPROACH

(57) The present invention concerns an ATP system (1) and a method for controlling a guided vehicle (2) approaching a bumper (4), said ATP system (1) comprising:
- a control unit (11) configured for controlling the guided vehicle speed according to a first speed profile (FSP), wherein the first speed profile (FSP) defines a maximum authorized speed for the guided vehicle (2) in function of its position compared to the position (B) of the bumper (4), the maximum authorized speed for positions of the guided vehicle (2) falling within a predefined security distance (DS) from the position (B) of the bumper (4) being zero;

characterized in that
- the control unit (11) is configured for automatically determining a second speed profile (SSP) for the guided vehicle (2), wherein the second speed profile (SSP) defines a speed limit for the guided vehicle (2) in function of its position compared to the position (B) of the bumper (4), wherein the second speed profile (SSP) prevails over the first speed profile (FSP) for triggering an emergency brake.

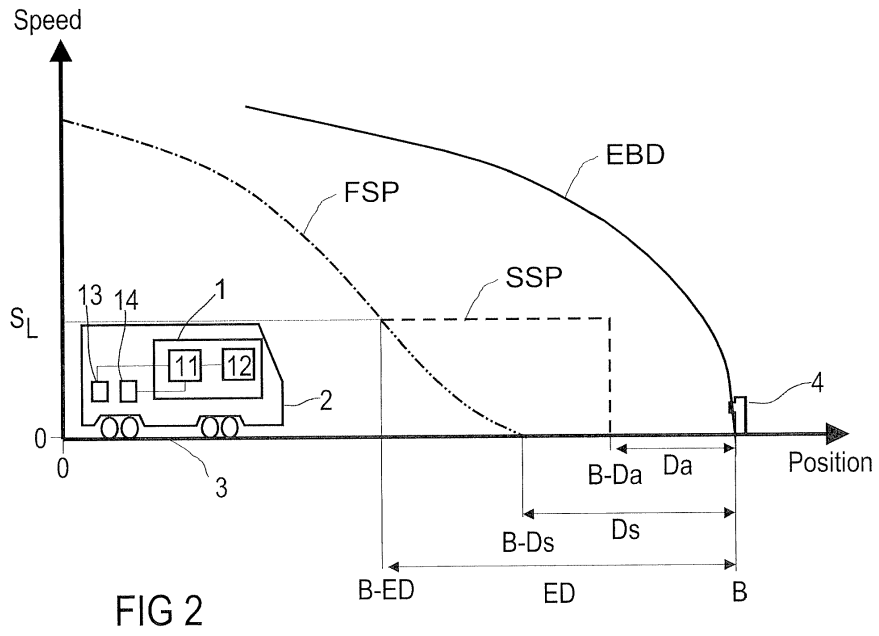

FIG 2

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Description

[0001] The present invention concerns a system and a method for automatically controlling a guided vehicle approaching a track element.

[0002] The present invention is directed to a method and a system configured for controlling the automatic approach of a guided vehicle in direction of a track element, e.g. a bumper, until a stop of the guided vehicle close to said track element. The track element is preferentially a bumper, i.e. a device known in the art that prevents guided vehicles from overrunning the bumper position, e.g. a dead-end of a stub track. "Guided vehicle" according to the present invention refers to public transport means such as subways, trains or train units, etc., as well as load transporting means such as, for example, freight trains, for which safety is a very important factor and which are guided along a railway or track by at least one rail, in particular by two rails, wherein tracks might be equipped with a bumper installed at a predefined position, e.g. at a track dead-end, in order to prevent an overrun of said predefined position by the guided vehicle.

[0003] Usually, a guided vehicle is authorized by its Automatic Train Protection (ATP) system to approach a track element up to a predefined security distance that defines the minimum distance separating the track element from the guided vehicle once the latter is at standstill. For this purpose, the ATP system is configured for controlling the speed of the guided vehicle in function of the distance separating said guided vehicle from the position of the track element, and if said speed exceeds a limit speed defined by a deceleration curve, then the ATP system automatically triggers an emergency brake in order to prevent e.g. a collision with a bumper. The ATP system prevents thus the guided vehicle to stop within a distance from the bumper that is smaller than the predefined security distance.

[0004] A known problem arises when a guided vehicle needs to be stopped at a distance from a track element that is smaller than the predefined security distance, for instance because of civil work layout. In this case, nominal safety conditions which are defined for avoiding a collision of the guided vehicle with the track element and for ensuring said predefined security distance cannot be respected anymore. In order to overcome this issue, prior art techniques propose for example to remove the guided vehicle propulsion ahead of the track element, which has the adverse effect that if the guided vehicle stops short, then it cannot restart.

[0005] An objective of the present invention is to propose a system and a method that allows a guided vehicle to approach a track element, e.g. a bumper, closer than the predefined security distance controlled by the ATP system, the system and method according to the invention being simple, cost effective, and able to prevent any damages when colliding with said track element while said predefined security distance is exceeded/overrun.

[0006] The invention provides an ATP system for controlling a track element (e.g. bumper) guided vehicle approach, said ATP system comprising:

- Optionally, a database comprising data defining or characterizing a first speed profile, or enabling the determination or calculation of said first speed profile, for an approach of a track element installed on a track section, wherein the first speed profile defines a maximum authorized speed for the guided vehicle in function of its position compared to the position of the track element, the maximum authorized speed for positions of the guided vehicle falling within a predefined security distance from the track element position being zero. According to the present invention, "a position falling within a predefined distance from another position" means that the relative distance, e.g. measured on the track or track section, separating the position from said another position is smaller or equal to the predefined distance. Thus the first speed profile defines for a position x of the guided vehicle a maximum authorized speed for said guided vehicle in function of the relative distance, e.g. measured on the track or track section, separating the position x from the position of the track element;
- a control unit configured for controlling the guided vehicle speed according to said first speed profile, for example for controlling if said guided vehicle speed at said position x exceeds the maximum authorized speed defined in the first speed profile for the position x, wherein the control unit is in particular able to automatically collect guided vehicle speed data and guided vehicle position data. Preferentially, the control unit is able to automatically compare, for each position x of the guided vehicle, the speed of said guided vehicle with the maximum authorized speed defined by the first speed profile for said position x;

characterized in that

- the control unit is configured for automatically determining a second speed profile for the guided vehicle, wherein the second speed profile defines a speed limit for the guided vehicle in function of its position compared to the position of the track element, said second speed profile defining in particular for at least one position x of the guided vehicle a speed limit that is greater than the maximum authorized speed for said position x, and wherein the second speed profile prevails over the first speed profile for controlling the guided vehicle speed by means of the control unit when triggering an emergency brake.

[0007] Preferentially the second speed profile is only defined/calculated by the control unit for positions of the guided vehicle comprised/falling within an engaging distance from the track element, wherein the engaging distance is greater than or equal to the predefined security

distance. In particular, the second speed profile defines for each position x of the guided vehicle comprised within the engaging distance from the track element position a speed limit in function of the position of the track element, wherein the second speed profile comprises at least one speed limit defined for a position x that is greater than the maximum authorized speed defined for said position x in the first speed profile. Preferentially, the second speed profile comprises speed limits in function of the position of the guided vehicle, wherein for at least one set of positions x of said guided vehicle comprised within the engaging distance, the speed limit is greater than the maximum authorized speed defined by the first speed profile for the positions x of the guided vehicle comprised in this set of positions. Said set of positions is for example the positions of the guided vehicle within the engaging distance for which the maximum authorized speed is defined as strictly positive by the first speed profile. According to the present invention and preferentially, the second speed profile defines the speed limit in function of the guided vehicle position compared to the track element position on said track, wherein, for a same guided vehicle position, said speed limit is greater than the maximum authorized speed until the guided vehicle position falls within a predefined approach distance from the track element. The predefined approach distance is the distance between the position of the track element and the position of the guided vehicle in said second speed profile from which the speed limit continuously equal to zero until the position of the guided vehicle coincides with the position of the track element. The speed limit for positions of the guided vehicle within the predefined approach distance is thus preferentially zero, the predefined approach distance being smaller than the predefined security distance.

[0008] Preferentially, in order to implement a second speed profile prevailing over a first speed profile for triggering an emergency brake, the control unit is further configured for controlling if the guided vehicle speed exceeds either the speed limit defined in the second speed profile or the maximum authorized speed defined in the first speed profile and for automatically triggering an emergency brake if and only if

- the guided vehicle speed measured for a position x of the guided vehicle exceeds at least the speed limit defined in the second speed profile, or exceeds the speed limit AND the maximum authorized speed defined by the first speed profile (FSP), for said position x if/as soon as such a speed limit is defined for said position x in the second speed profile; or
- the guided vehicle speed measured for a position x of the guided vehicle exceeds the maximum authorized speed for said position x if/as soon as the second speed profile does not define a speed limit for said position x.

[0009] Indeed, according to the present invention and in particular, the second speed profile prevails over the first speed profile means that as soon as said second speed profile is determined by the control unit for a position of the guided vehicle, then the triggering of an emergency brake for a guided vehicle speed exceeding the maximum authorized speed defined in the first speed profile for said position is cancelled or withdrawn and replaced by a triggering of an emergency brake for guided vehicle speed exceeding the speed limit defined in the second speed profile for said position, and this for each position of the guided vehicle for which a speed limit and a maximum authorized speed are respectively defined by the second and first speed profile.

[0010] According to the present invention, the first speed profile is the nominal/regular/normal speed profile defined for a guided vehicle approaching a track element until a predefined security distance is reached and the second speed profile is specific to a track element approach overrunning the predefined security distance, the second speed profile defining thus a "close track element approach" for the guided vehicle approaching said track element. Preferentially, the track element is a bumper.

[0011] Accordingly, the present invention concerns also a method for controlling the displacement of a guided vehicle approaching a track element, in other words a guided vehicle approach of a track element, the method according to the invention comprising the steps:

- determining, or defining, e.g. in a database, a first speed profile for an approach of the track element installed on a track section wherein said guided vehicle is moving, said first speed profile defining a maximum authorized speed of the guided vehicle in function of its position on the track section compared to the position of the track element on said track section, the maximum authorized speed for positions of the guided vehicle falling within a predefined security distance from the track element being zero;

the method according to the invention being characterized by

- automatically determining a second speed profile for the guided vehicle, said second speed profile defining guided vehicle speed limits in function of the guided vehicle position compared to the track element position on said track. Preferentially, for each position x of the guided vehicle, the second speed profile defines a speed limit that is greater than the maximum authorized speed defined by the first speed profile until the guided vehicle position falls within a predefined approach distance from the track element position;
- optionally, for each position of the guided vehicle for which a speed limit and a maximum authorized speed are defined in respectively the second and first speed profile, preferentially cancelling the triggering of an emergency brake for guided vehicle

speed exceeding the maximum authorized speed defined in the first speed profile and replacing it by a triggering of an emergency brake for guided vehicle speed exceeding the speed limit defined in the second speed profile;

- controlling, by means of a control unit of an ATP system, if the guided vehicle speed exceeds the maximum authorized speed defined in the first speed profile or the speed limit defined in the second speed profile;
- automatically triggering an emergency brake of the guided vehicle, wherein the second speed profile (SSP) prevails over the first speed profile (FSP) for said triggering. In particular, an emergency brake is triggered if the guided vehicle speed measured for a guided vehicle position exceeds either the speed limit defined for said position if such a speed limit is defined by the second speed profile for said position, or the maximum authorized speed for said position if the second speed profile does not define a speed limit for said position.

[0012] According to the present invention, the step "controlling if the guided vehicle speed exceeds the maximum authorized speed defined in the first speed profile or the speed limit defined in the second speed profile" comprises in particular automatically collecting guided vehicle speed data and guided vehicle position data, e.g. from a speed measuring device and/or a positioning device of the guided vehicle, and comparing, for each position of the guided vehicle, its speed with the maximum authorized speed and/or the speed limit in order to determine if the guided vehicle speed exceeds the speed limit defined in the second speed profile and/or the maximum authorized speed defined in the first speed profile

[0013] Preferentially, the database according to the invention comprises track element parameters (such as the position of the track element, a mechanical property of the track element like a length of a bumper actuator and/or its damping coefficient, and/or the maximum kinetic energy it may absorb in case of collision without causing damages to the bumper, etc.) and guided vehicle parameters (like its load, its braking force, its speed, the maximum kinetic energy it may absorb in case of collision without causing damages to the guided vehicle, etc.). In particular, the control unit is configured for determining the second speed profile from said track element parameters and/or guided vehicle parameters. For example, said track element is a bumper and the bumper parameters allow to calculate the maximum kinetic energy that might be absorbed by the bumper in case of a collision of the guided vehicle with said bumper. In particular, the speed limit for a position of the guided vehicle is determined/calculated by the control unit from said track element parameters, guided vehicle parameters, and said maximum kinetic energy. In particular, the minimum kinetic energy among the maximum kinetic energy that might be absorbed by the track element and the maximum kinetic energy that might be absorbed by the guided vehicle is automatically chosen as parameter for the calculation of the second speed profile. For example the speed limit determined/calculated for a position P of the guided vehicle by the control unit is equal to the speed of the guided vehicle at said position P that will generate at the position B of the bumper a kinetic energy equals to said maximum kinetic energy that might be absorbed by the bumper or by the guided vehicle if the guided vehicle triggers an emergency brake from said position P, the smallest of said maximum kinetic energy being chosen for the calculation. Preferentially, the calculation/determination of said speed limit takes into account other parameters such as a reaction time for triggering the emergency brake, and/or a braking force, etc. Of course, the emergency brake may take into consideration passenger safety in order to avoid any brutal braking and passenger injuries. Preferentially, the first speed profile is computed with the assumption that the guided vehicle will never reach position B. And the second speed profile is preferentially computed with the assumption that the guided vehicle which triggers an emergency break at a distance x from the position B (e.g. at the position B-Da - see Fig. 2) because exceeding a speed S_x defined for said position x by the second speed profile would collide with the track element, e.g. the bumper, with a kinetic energy less than the maximum kinetic energy defined for said track element, e.g. bumper, i.e. less than the maximum kinetic energy that can be absorbed by the guided vehicle or the bumper.

[0014] Preferentially, the database comprises a classification of the track elements into classes in function of their parameters, and optionally, the control unit is configured for storing for each class of track elements a second speed profile in function of guided vehicle parameters, said second speed profile characterizing the speed limit in function of the separation distance between the guided vehicle and the track element belonging to that class.

[0015] Further aspects of the present invention will be better understood through the following drawings, wherein like numberals are used for like and corresponding parts:

Figure 1 schematic illustration of a bumper approach according to prior techniques.

Figure 2 schematic illustration of a bumper approach according to the invention.

[0016] Figure 1 and Figure 2 show an ATP system 1 according to the invention installed on-board a guided vehicle 2 which is configured for moving on a track 3 that coincides with the abscissa of the graph. The graph in Figure 1, as well as in Figure 2, represents the speed of the guided vehicle (in ordinate) in function of its position (in abscissa). The track 3 is in particular a stub track equipped with a track element that is a bumper 4. The

position of the bumper 4 on the track is represented by the letter B, and will be refer to hereafter as "position B" of the bumper 4 (or more generally of a track element). While we illustrate the present invention with the particular case of a track element being a bumper, the skilled man will understand that the features disclosed in relation with the bumper also apply to the general case when considering a track element.

[0017] The ATP system 1 according to the invention comprises a control unit 11 and a database 12 connected to each other. Optionally, the control unit 11 may also be connected to a speed measuring device 13 configured for measuring the speed of the guided vehicle and/or to a positioning device configured for measuring/determining the position of the guided vehicle 2 on the track 3.

[0018] Two curves are illustrated in the graph of Fig. 1. The continuous line, called EBD, represents the Emergency Brake Deceleration curve for the guided vehicle 2, to which will refer hereafter by "EBD" for simplicity. The dashed-dotted line, called FSP, represents the first speed profile, i.e. a profile of speed characterizing the nominal/regular/normal speed of the guided vehicle 2 when approaching the bumper 4. We will refer hereafter to the first speed profile by "FSP" for simplicity. The FSP defines a maximum authorized speed of the guided vehicle 2 in function of its position x on the track section or track 3 compared to the position B of the bumper, the maximum authorized speed for positions of the guided vehicle 2 falling within a predefined security distance Ds from the bumper 4 being zero. If the position of the bumper 4 is B, then the FSP shows in particular decreasing maximum authorized speed values when decreasing the distance separating the guided vehicle position from the bumper position, until the curve formed by said values crosses the abscissa at the position B-Ds and has then maximum authorized speed values equal to zero until the position B of the bumper 4 is reached.

[0019] According to prior art techniques, for each position x of the guided vehicle 2, the ATP system 1 is configured for comparing the speed of the guided vehicle 2 at the position x with the maximum authorized speed defined by the FSP for said position x. If the speed of the guided vehicle at said position x is higher than the maximum authorized speed for said position x, then the ATP system 1 automatically triggers an emergency brake for decelerating the guided vehicle 2 according to the EBD. Consequently, the guided vehicle 2 cannot overrun/pass the position B-Ds.

[0020] In addition to the two curves previously explained for the graph of Figure 1, the graph of Figure 2 comprises a third curve represented by a dashed line and that illustrates the second speed profile, hereafter called SSP for simplicity. The SSP defines, when implemented by the ATP system 1 according to the invention, a close bumper approach, i.e. allows an overrun of the position B-Ds by the guided vehicle 2 when approaching the bumper B while ensuring safety for the guided vehicle 2 if it moves at a speed smaller than a speed limit. The SSP defines thus a speed limit Sx, e.g. a constant speed limit S_L, of the guided vehicle 2 in function of its position x on the track section or track 3 compared to the position B of the bumper. The speed limit Sx for a position x is greater than the maximum authorized speed for said position x, in particular for each position x for which a speed limit is strictly positive. Preferentially, the speed limit for positions of the guided vehicle 2 falling within a predefined approach distance Da from the position of the bumper 4 is zero. In other words, if the position of the bumper 4 is B, then the FSP shows in particular speed limit values that are higher than the values of the maximum authorized speed when decreasing the distance separating the guided vehicle position from the bumper position until the curve formed by the speed limit values reaches the abscissa at the position B-Da (i.e. $S_{x=B-Da} = 0$) and has then speed limit values equal to zero until the position B of the bumper is reached. In other words, the second speed profile defines preferentially at least one set of positions x comprised within the engaging distance for which the speed limit is greater than the maximum authorized speed defined by the first speed profile for said positions x. Such a set of positions is for example the set of positions of the guided vehicle within the engaging distance for which the maximum authorized speed is defined as strictly positive by the first speed profile. Additionally, the second speed profile may define another set of positions x comprised within the engaging distance and for which the speed limit is greater or equal to the maximum authorized speed defined by the first speed profile. For example, the speed limit is strictly greater than the maximum authorized speed for positions comprised in the interval [B-Ds ; B-Da[, and equal, e.g. equal to 0, for positions comprised in the interval [B-Da ; Da] (cf. Fig. 2).

[0021] The SSP is automatically determined by the control unit 11 according to the invention. Preferentially, the SSP is determined/calculated by the control unit 11 from bumper parameters, and/or guided vehicle parameters. For example, the speed limit defined by the SSP for a position x of the guided vehicle is calculated for avoiding a kinetic energy at the bumper position B that overcomes the maximum kinetic energy that might be absorbed by the bumper in case of a collision of the guided vehicle 2 with said bumper 4 at the position B when the guided vehicle triggers an emergency braking at the position x.

[0022] According to the present invention, for each position x of the guided vehicle 2, the ATP system 1 is configured for comparing the speed of the guided vehicle 2 at the position x with the maximum authorized speed defined by the FSP for said position x and/or the speed limit defined by the SSP if such a speed limit has been determined by the control unit 11 for said position x. If the speed of the guided vehicle at said position x is higher than the speed limit defined for said position if such a speed limit has been defined, or higher than the maximum authorized speed for said position x if no speed limit

has been determined for said position x, then the ATP system 1 automatically triggers an emergency brake for decelerating the guided vehicle 2 according to the EBD. Consequently, the guided vehicle 2 can overrun/pass the position B-Ds that was imposed by the FSP until reaching a position B-Da that might be defined for example in function of the bumper parameters. By this way, it is advantageously possible to take into account the faculty of the bumper to absorb kinetic energy in case of collision with the guided vehicle 2 for determining an approach distance Da that prevails over the security distance Ds that is nominally defined. Preferentially, the control unit 11 determines said SSP if and only if the database comprises track element, e.g. bumper, parameters, in particular if and only if said bumper parameters allow to determine said maximum kinetic energy.

[0023] The ATP system 1 according to the invention is in particular configured for being installed on-board the guided vehicle 2 and allows a closer approach of bumpers 4 compared to prior art ATP systems. According to the present invention, the control unit 11 is configured for calculating/determining said SSP for positions of the guided vehicle comprised within an engaging distance ED from the bumper position B. In other words, the control unit 11 is in particular configured for calculating a speed limit only for positions of the guided vehicle comprised between B-ED and B, i.e. for a set of positions comprised within the interval [B-ED, B]. According to the graph of Figure 2, the control unit 11 is in particular configured for

- triggering an emergency brake if a guided vehicle speed exceeds the maximum authorized speed if the guided vehicle position x satisfy B-x > ED; and
- triggering an emergency brake if a guided vehicle speed exceeds the speed limit if the guided vehicle position x satisfy B-x $\leq$ ED. Preferentially, the control unit 11 is configured for cancelling the triggering of an emergency brake for a guided vehicle speed exceeding the maximum authorized speed defined in the first speed profile for guided vehicle positions x satisfying B-x $\leq$ ED and replacing it by a triggering of an emergency brake for guided vehicle speed exceeding the speed limit defined in the SSP. In other words, the part of the FSP curve represented in dashed-dotted-dotted line will not be taken into account for triggering an emergency break from the FSP.

[0024] Preferentially, the control unit 11 is configured for storing the calculated/determined SSP in the database 12. Optionally, the control unit 11 is capable of classifying the SSP in function of bumper parameters, so that classes of bumpers are automatically determined, wherein each class might be characterized by one SSP.

[0025] To summarize, the present invention proposes a simple system and method allowing a guided vehicle 2 to overrun a security distance Ds while maintaining a high degree of safety for the guided vehicle 2.

Claims

1. Automatic Train Protection system (1) (hereafter "ATP system") for controlling a guided vehicle (2) approaching a track element (4), said ATP system (1) comprising:

   - a control unit (11) configured for controlling the guided vehicle speed according to a first speed profile (FSP), wherein the first speed profile (FSP) is configured for defining a maximum authorized speed for the guided vehicle (2) in function of its position compared to the position (B) of the track element (4), the maximum authorized speed for positions of the guided vehicle (2) falling within a predefined security distance (DS) from the position (B) of the track element (4) being zero;

   characterized in that

   - the control unit (11) is configured for automatically determining a second speed profile (SSP) for the guided vehicle (2), wherein the second speed profile (SSP) defines a speed limit for the guided vehicle (2) in function of its position compared to the position (B) of the track element (4), wherein the second speed profile (SSP) prevails over the first speed profile (FSP) for triggering an emergency brake.

2. ATP system (1) according to claim 1, wherein the control unit (11) is configured for controlling if the guided vehicle speed exceeds either the speed limit defined in the second speed profile (SSP) or the maximum authorized speed defined in the first speed profile (FSP), and for automatically triggering an emergency brake if and only if the guided vehicle speed measured for a position x of the guided vehicle (2) exceeds

   - either the speed limit defined in the second speed profile (SSP) for said position x, if a speed limit is defined for said position x in the second speed profile (SSP);
   - or the maximum authorized speed defined by the first speed profile (FSP) for said position x if a speed limit is not defined for said position x in the second speed profile (SSP).

3. ATP system (1) according to claim 1 or 2, wherein the second speed profile (SSP) is only defined for positions of the guided vehicle (2) falling within an engaging distance (ED) from the track element position (B), wherein the engaging distance (ED) is greater than or equal to the predefined security distance (Ds).

4. ATP system (1) according to claim 3, wherein the second speed profile (SSP) defines for a position x comprised within the engaging distance (ED) at least one speed limit that is greater than the maximum authorized speed defined by the first speed profile (FSP) for said position x.

5. ATP system (1) according to claims 3 or 4, wherein the second speed profile (SSP) defines a speed limit greater than the maximum authorized speed for a set of positions of the guided vehicle (2) that are comprised within the engaging distance (ED) and have maximum authorized speed defined as strictly positive by the first speed profile (FSP).

6. ATP system (1) according to one of the claims 1-5, wherein the speed limit for positions of the guided vehicle (2) falling within a predefined approach distance (Da) from the track element position (B) is zero.

7. ATP system (1) according to claim 6, wherein the speed limit for guided vehicle positions x for which the distance separating said position x from the track element position (B) is greater than the predefined approach distance (Da) and smaller than the engaging distance (ED) is strictly positive.

8. ATP system (1) according to one of the claims 1-7, wherein the triggering of an emergency brake for a guided vehicle speed exceeding the maximum authorized speed defined in the first speed profile (FSP) for a guided vehicle position x is cancelled and replaced by a triggering of an emergency brake for guided vehicle speed exceeding the speed limit defined in the second speed profile (SSP) for said position x as soon as said second speed profile (SSP) is determined and defines a speed limit for said position x.

9. ATP system (1) according to one of the claims 1-8, wherein the control unit (11) is configured for determining the second speed profile (SSP) from track element parameters and/or guided vehicle parameters.

10. ATP system (1) according to one of the claims 1-8, wherein the control unit (11) is configured for automatically storing the second speed profile (SSP) in a database (12).

11. Guided vehicle (2) comprising the ATP system (1) according to one of the claims 1-10.

12. Method for controlling a guided vehicle approach of a track element (4), the method comprising the following steps:

- determining a first speed profile (FSP) for an approach of the track element (4) by the guided vehicle (2), said first speed profile defining a maximum authorized speed of the guided vehicle (2) in function of its position compared to the position (B) of the track element (4), the maximum authorized speed for positions of the guided vehicle (2) falling within a predefined security distance (Ds) from the track element (4) being zero;

the method being **characterized by**

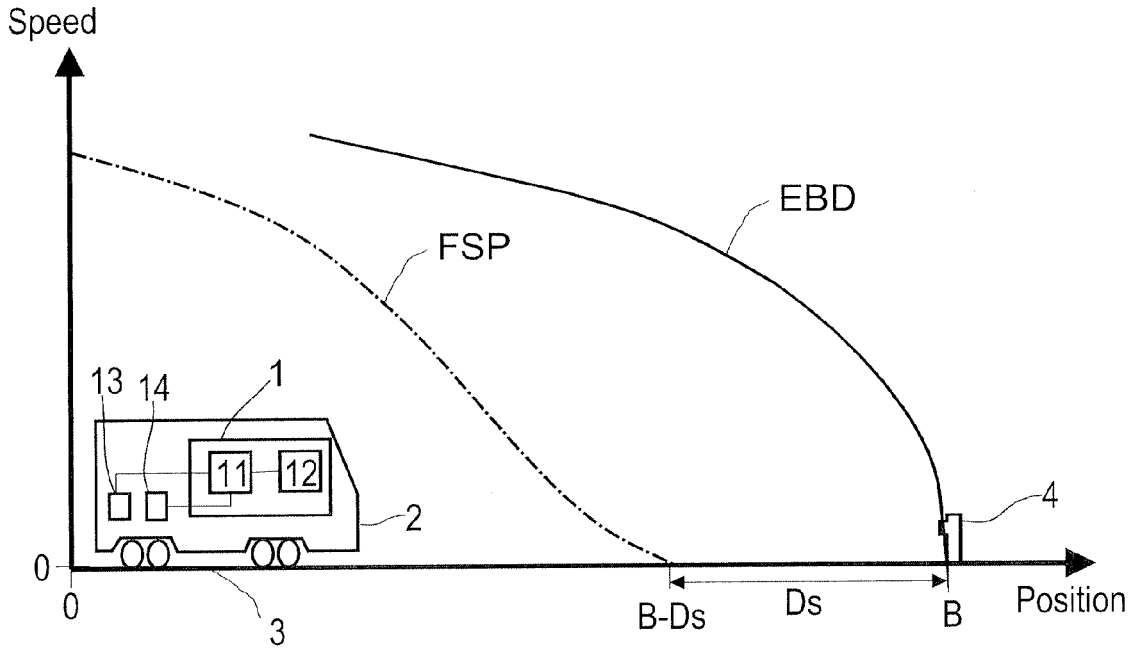
- automatically determining a second speed profile (SSP) for the guided vehicle (2), said second speed profile (SSP) defining a guided vehicle speed limit in function of the guided vehicle position compared to the track element position (B);
- controlling if the guided vehicle speed exceeds the maximum authorized speed defined in the first speed profile or the speed limit defined in the second speed profile;
- automatically triggering an emergency brake of the guided vehicle (2), wherein the second speed profile (SSP) prevails over the first speed profile (FSP) for said triggering.

13. Method according to claim 12, comprising, for each position of the guided vehicle (2) for which a speed limit and a maximum authorized speed are defined in respectively the second speed profile (SSP) and first speed profile (FSP), cancelling the triggering of an emergency brake for guided vehicle speed exceeding the maximum authorized speed defined in the first speed profile (FSP) and replacing it by a triggering of an emergency brake for guided vehicle speed exceeding the speed limit defined in the second speed profile (SSP).

14. Method according to one of the claim 12 or 13, wherein an emergency brake is triggered if and only if the guided vehicle speed measured for a guided vehicle position exceeds

- either the speed limit defined for said position if such a speed limit is defined by the second speed profile (SSP) for said position;
- or the maximum authorized speed for said position if the second speed profile (SSP) does not define a speed limit for said position.

15. Method according to one of the claims 12-14, comprising determining the second speed profile (SSP) from track element parameters and/or guided vehicle parameters.


Speed
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FSP
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4
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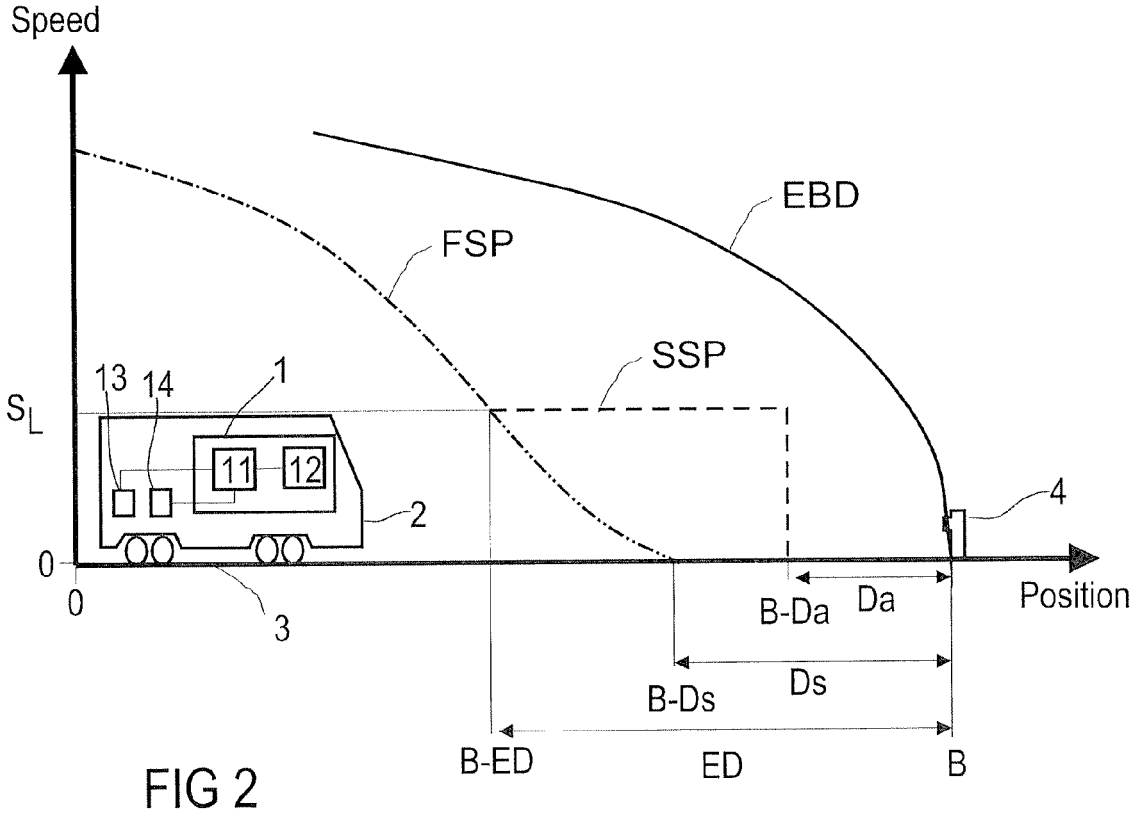
3
B-Ds
Ds
B
Position

FIG 1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FSP
SSP
13
14
1
S_L
11
12
2
4
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3
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Ds
B-ED
ED
B

FIG 2

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EUROPEAN SEARCH REPORT

Application Number
EP 15 29 0125

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	EP 2 832 581 A1 (NIPPON SIGNAL CO LTD [JP]) 4 February 2015 (2015-02-04) * figures 4,5 * * abstract * * paragraphs [0030] - [0043] *	1-15	INV. B61L3/00
A	DE 26 26 617 A1 (SIEMENS AG) 15 December 1977 (1977-12-15) * page 6, line 21 - page 8, line 29; figures 1,2 *	1-15	

TECHNICAL FIELDS SEARCHED (IPC)

B61L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	20 October 2015	Robinson, Victoria

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
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