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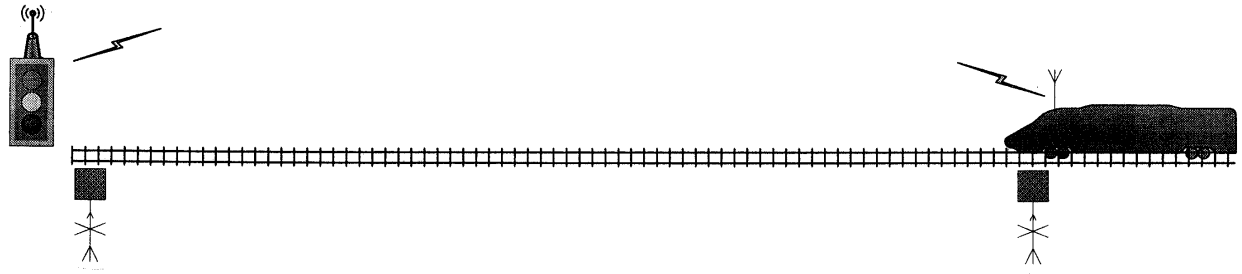
(54) Method and assembly for securing a train travelling along a railway track

(57) A method for securing a train travelling along a railway track provided with railway signs, comprises the steps of establishing a radio contact between the train and a specific railway signal which the train is approaching; transmitting a mode of the railway signal to the train by means of said radio contact; when the mode of the railway signal requires a braking of the train, determining whether such a braking is initiated by the driver of the train; and when, in such a case, no braking is initiated by the train driver, initiating an automated braking of the train. Also an assembly for carrying out said method is provided.



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Description

[0001] The invention firstly relates to a method for securing a train travelling along a railway track provided with railway signs.

[0002] For enhancing the safety of railway transport system it is important to incorporate methods defining a safety-backup for the drivers of trains. One of the goals of such methods is to achieve an automated braking of the train when the train is approaching a railway signal indicating that the train should stop or slow down, but the driver of the train does not act correspondingly (for whatever reason). In one such known method information about the mode of the railway signals is injected into the rails of the railway track in the form of control currents and transmitted to the train by means of a magnetic coupling. In the train this information is translated into control signals for influencing the velocity of the train in an automated manner. However, currently the safe function of such a known method is only guaranteed at train velocities above 40 km/h.

[0003] Therefore it is an object of the present invention to provide an improved method of the type referenced to above.

[0004] Thus, in accordance with a first aspect of the present invention a method is provided for securing a train travelling along a railway track provided with railway signs, comprising the steps of establishing a radio contact between the train and a specific railway signal which the train is approaching; transmitting a mode of the railway signal to the train by means of said radio contact; when the mode of the railway signal requires a braking of the train, determining whether such a braking is initiated by the driver of the train; and when, in such a case, no braking is initiated by the train driver, initiating an automated braking of the train.

[0005] According to the present invention a method is provided which also functions very well at low train velocities, specifically at train velocities under 40 km/h. However, it should be noted that the inventive method basically may be used at the entire practical velocity range of the train, if desired.

[0006] In a preferred embodiment of the method according to the invention, the step of establishing a radio contact between the train and the railway signal, is initiated by a beacon positioned alongside the railway track at a predetermined distance ahead of the railway signal. For example, such a beacon could be positioned at a distance of 200 meters from the specific railway signal (in case of a method meant for use at low train velocities as stated above). A receiver in the train receives a signal from the beacon, as a result of which appropiate means aboard of the train start establishing the radio contact with the specific railway signal.

[0007] In such a case it is preferred, that the beacon sends information to the train based upon which the radio contact with the specific railway signal is established. As a result it is guaranteed that the train establishes the radio contact with the the appropiate railway signal, and not with another railway signal (for example when there are a number of railway tracks extending alongside each other each being provided with their own railway signals).

[0008] It is noted that the radio contact may have a limited range, such that there is no risk that a radio contact is established with another railway signal alongside the same railway track.

[0009] For example, the information specifies the railway signal by means of a property of the radio contact, such as a frequency at which a contact with the specific railway signal can be established. This means that the beacon informs appropiate means within the train (such as, for example, a radio modem) about the frequency at which a radio contact with the specific railway signal can be established.

[0010] In a preferred embodiment of the method according to the present invention only a mode allowing the train to maintain its velocity is transmitted to the train. This creates a safe system, because in case of failure of the method (for example no radio contact) the automated braking is initiated.

[0011] The safe functioning of the method may be improved further when along with the mode also an identification of the specific railway signal is transmitted to the train. As a result the establishment of a radio contact with a wrong railway signal can be prevented even better.

[0012] In yet another embodiment the automated braking of the train is stopped when, after initiation of such an automated braking, the mode of the railway signal changes to a mode not requiring a braking of the train. Then the train driver again gains control over the train (and, if desired, may initiate an acceleration of the train again).

[0013] Further, it is preferred that the radio contact between the train and the railway signal is stopped when the train reaches a predetermined position relative to the railway signal. It should be noted, that preferably the radio contact, after being established, is maintained when the mode of the railway signal requires a braking of the train, and that the mode of the railway signal is thereafter monitored continuously by the train. Such monitoring, however, is no longer required and useless when the train has reached a certain position (generally close to the specific railway signal). When at the establishment of the first radio contact the mode of the railway signal does not require the braking of the train, the radio contact may be stopped immediately.

[0014] For example, the radio contact is stopped by a beacon positioned at said predetermined position, such as a beacon positioned at a short distance ahead of the railway signal (in the above referenced low speed situation for example a few meters ahead of the railway signal).

[0015] For further safe-guarding the method, it is possible that the radio contact comprises a coded radio contact.

[0016] In a second aspect the present invention relates

to an assembly for securing a train travelling along a railway track provided with railway signs, comprising means for establishing a radio contact between the train and a specific railway signal which the train is approaching and for transmitting a mode of the railway signal to the train; means for determining whether a braking of the train is initiated by the driver of the train when the mode of the railway signal requires such a braking of the train; and means for initiating an automated braking of the train when, in such a case, no braking is initiated by the train driver.

[0017] Preferably the assembly further comprises a beacon positioned alongside the railway track at a predetermined distance ahead of the railway signal for initiating the establishment of the radio contact between the train and the railway signal.

[0018] In such a case it is preferred that the beacon is devised for sending information to the train based upon which the radio contact with the specific railway signal is established. The risk of establishing a radio contact with a different railway signal can be reduced in this manner.

[0019] In yet another embodiment of the assembly according to the present invention, further means are provided for stopping the radio contact between the train and the railway signal when the train reaches a predetermined position relative to the railway signal, such as, for example, a beacon positioned at a predetermined position.

[0020] Preferably, in such a case, the beacon is positioned at a short distance ahead of the railway signal.

[0021] Hereinafter the invention will be further elucidated while referring to the figure which shows a schematic representation of part of a railway system provided with an embodiment of the assembly in accordance with the present invention.

[0022] In the figure a section 1 of a railway track is represented. Further, this figure shows a railway sign 2 positioned alongside the railway track. For example, in the illustrated embodiment the railway sign 2 is a sign comprising signalling lights with different colours (e.g. red, yellow and green). The railway sign by means of its signalling lights informs the driver of an arriving train 3 about the status of railway track sections ahead of the present railway track section 1 (for example whether or not a preceeding train is present in said railway track sections). Based upon said information the driver will take an appropiate action (for example slowing down or completely stopping the train).

[0023] The present invention provides a method and assembly for ensuring that the appropriate action of the train (e.g. slowing down or stopping) will occur automatically also when the driver of the train does not respond correctly to the railway sign.

[0024] A first beacon 4 is positioned alongside the railway track section 1 at a predetermined distance (e.g. 200 meters) ahead of the railway sign 2. When the train 3 passes this beacon 4, latter informs a radiomodem (not illustrated in detail) aboard the train about a scanning frequency for establishing a radio contact between said radiomodem and the railway sign 2. Based upon this information the radiomodem contacts the railway sign 2 which, in turn, will transmit information about its mode (red light, yellow light or green light) to the train. Preferably, the railway sign 2 also transmits an identification of itself to the train, such that the radiomodem knows that it communicates with the correct railway sign.

[0025] It should be noted that the information about the mode of the railway sign also could be translated into transmitting/not transmitting by the railway sign 2.

[0026] When, for example, the information received by the train 3 indicates that the railway sign has red light, and it is determined (by appropriate means not shown in detail) that the driver does not react correspondingly by slowing down/stopping the train, an automated slowing down of the train 3 will be initiated by appropriate control means (not illustrated). The driver then cannot control the train himself.

[0027] While the train keeps on moving during slowing down, the radiomodem maintains its radio contact with the railway sign 2 and keeps on scanning the mode thereof. If the mode changes (for example to green light) an appropriate respons in the train will follow (for example the slowing down will end and the driver again gains control over the train 3). The radio contact can be ended then. When the mode does not change, the operation of the radiomodem also will continue.

[0028] A second beacon 5 is positioned in the vicinity of the railway sign 2, for example 6 meters ahead of it. When the train passes this second beacon 5, latter will contact the radiomodem aboard the train 3 and will stop the operation thereof.

[0029] The invention is not limited to the embodiment described above which may be varied widely within the scope of the invention as defined by the appending claims.

Claims

1. Method for securing a train travelling along a railway track provided with railway signs, **characterised by** the steps of:

   - establishing a radio contact between the train and a specific railway signal which the train is approaching;
   - transmitting a mode of the railway signal to the train by means of said radio contact;
   - when the mode of the railway signal requires a braking of the train, determining whether such a braking is initiated by the driver of the train; and
   - when, in such a case, no braking is initiated by the train driver, initiating an automated braking of the train.

2. Method according to claim 1, wherein the step of

establishing a radio contact between the train and the railway signal, is initiated by a beacon positioned alongside the railway track at a predetermined distance ahead of the railway signal.

3. Method according to claim 2, wherein the beacon sends information to the train based upon which the radio contact with the specific railway signal is established.

4. Method according to claim 3, wherein the information specifies the railway signal by means of a property of the radio contact.

5. Method according to claim 4, wherein the property of the radio contact is a frequency at which a contact with the specific railway signal can be established.

6. Method according to any of the previous claims, wherein only a mode allowing the train to maintain its velocity is transmitted to the train.

7. Method according to any of the previous claims, wherein along with the mode also an identification of the specific railway signal is transmitted to the train.

8. Method according to any of the previous claims, wherein the automated braking of the train is stopped when, after initiation of such an automated braking, the mode of the railway signal changes to a mode not requiring a braking of the train.

9. Method according to any of the previous claims, wherein the radio contact between the train and the railway signal is stopped when the train reaches a predetermined position relative to the railway signal.

10. Method according to claim 9, wherein the radio contact is stopped by a beacon positioned at said predetermined position.

11. Method according to claim 10, wherein the beacon is positioned at a short distance ahead of the railway signal.

12. Method according to any of the previous claims, wherein the radio contact comprises a coded radio contact.

13. Assembly for securing a train travelling along a railway track provided with railway signs, **characterised by**:

- means for establishing a radio contact between the train and a specific railway signal which the train is approaching and for transmitting a mode of the railway signal to the train;
- means for determining whether a braking of the train is initiated by the driver of the train when the mode of the railway signal requires such a braking of the train; and
- means for initiating an automated braking of the train when, in such a case, no braking is initiated by the train driver.

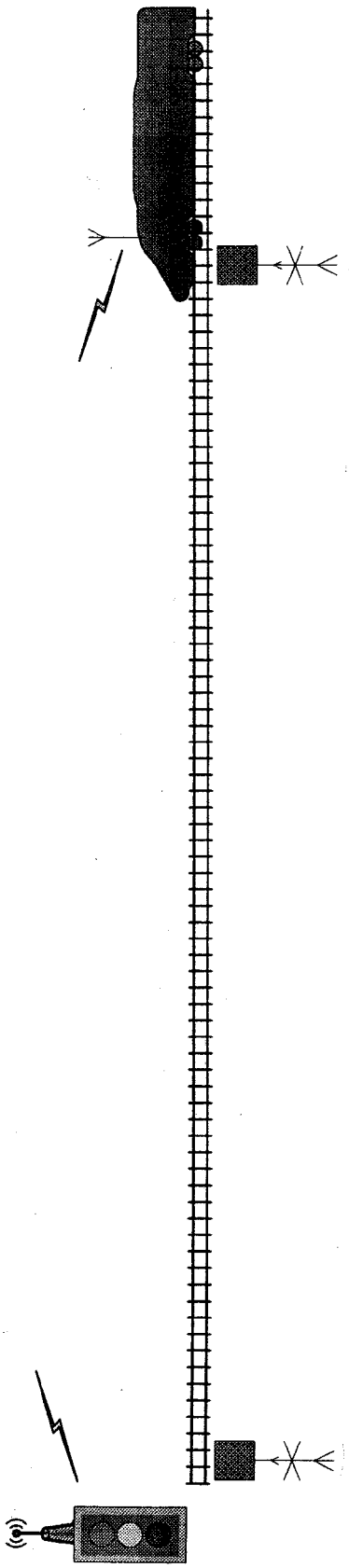
14. Assembly according to claim 13, further comprising a beacon positioned alongside the railway track at a predetermined distance ahead of the railway signal for initiating the establishment of the radio contact between the train and the railway signal.

15. Assembly according to claim 14, wherein the beacon is devised for sending information to the train based upon which the radio contact with the specific railway signal is established.

16. Assembly according to any of the claims 13-15, further comprising means for stopping the radio contact between the train and the railway signal when the train reaches a predetermined position relative to the railway signal.

17. Assembly according to claim 16, wherein said means comprise a beacon positioned at a predetermined position.

18. Method according to claim 17, wherein the beacon is positioned at a short distance ahead of the railway signal.



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EUROPEAN SEARCH REPORT

Application Number
EP 06 11 5608

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			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 November 2006	Seisdedos, Marta

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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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
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