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(54) **Communication method and system for exchanging information between guided vehicles**

Kommunikationsverfahren und System zum Informationsaustausch zwischen geführten Fahrzeugen

Procédé et système de communication pour l'échange d'informations entre véhicules guidés

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Description

[0001] The present invention concerns a system and a method of communication for the exchange of information between a first guided vehicle and a second guided vehicle.

[0002] The present invention is essentially related to the communication and information exchange between guided vehicles, wherein "guided vehicle" refers to public transport means such as buses, trolleybuses, streetcars, subways, trains or train subunits, 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 route or railway by at least one rail, in particular by two rails.

[0003] Usually, the communication and transmission of information between a first guided vehicle and a second guided vehicle takes place either

- by means of a first communication from the guided vehicle to the ground, i.e. to wayside devices capable of communicating with said first guided vehicle, and a second communication from the wayside device to the second guided vehicle generally via a control center; or
- by means of a Global System for Mobile communications - Railways (GSM-R) or a Communications-Based Train Control (CBTC) radio, each allowing the guided vehicle driver to communicate with the control center in order to provide or receive information about the second guided vehicle.

[0004] In both cases, the communication "guided vehicle to guided vehicle" involves complex devices and/or actions directly performed by the guided vehicle driver.

[0005] An objective of the present invention is to propose a system and a method of communication between guided vehicles that is simple, cheap, automatic, and in particular free of any intervention of a guided vehicle driver.

[0006] For achieving said objective, the present invention proposes to use Radio-Frequency Identification (RFID) techniques and systems for the communication between guided vehicles. The document US 2005/0088320 discloses a transmission system and method applying such RFID-techniques for communication between street vehicles.

[0007] Indeed, the present invention concerns an RFID system configured for being installed on-board a guided vehicle in order to allow the latter to automatically exchange information with another guided vehicle comprising also said RFID system, the RFID system according to the invention comprising an Information Collector Module (hereafter ICM), an RFID reader and an RFID tag. The present invention also concerns a method of communication for automatically exchanging information between a guided vehicle and another guided vehicle characterized in that an RFID technique is used for automatically exchanging said information when said guided vehicle and said another guided vehicle cross each other.

[0008] In order to help for the comprehension of the present invention and also for simplification purpose, the guided vehicle will be called the "first guided vehicle", said another guided vehicle will be called the "second guided vehicle"; the RFID system configured for equipping the first guided vehicle will be called "the RFID system C_A", the RFID system configured for equipping the second guided vehicle will be called "the RFID system C_B"; the RFID reader, RFID tag and ICM of the RFID system C_A and respectively C_B will be called respectively, the RFID reader R_A, RFID tag T_A, ICM I_A, and RFID reader R_B, RFID tag T_B, ICM I_B. In the present description, when an ICM, RFID tag, RFID reader, or RFID system is not specified by respectively I_A or I_B, T_A or T_B, R_A or R_B, C_A or C_B, it means that it can be anyone of them and/or both of them. For example, "the RFID tag may comprise a memory" means "the RFID tag T_A and/or the RFID tag T_B may comprise a memory".

[0009] The present invention concerns thus an RFID system C_A, as defined by claim 1. It is configured for being installed in a first guided vehicle in order to allow the latter to automatically exchange information with a second guided vehicle comprising an RFID system C_B that is for example identical to the RFID system C_A, the RFID system C_A comprising:

- an RFID reader R_A and an RFID tag T_A, wherein the RFID reader R_A and the RFID tag T_A are configured for being installed/mounted on the first guided vehicle in a place/location allowing the RFID tag T_A and the RFID reader R_A to communicate with respectively the RFID reader R_B and the RFID tag T_B of the RFID system C_B installed/mounted on the second guided vehicle, the exchange of information taking place in particular only when said first guided vehicle and said second guided vehicle cross each other, i.e. when the RFID reader and RFID tag of the respective guided vehicles are close enough for interacting with each other. For example the RFID reader R_A and the RFID tag T_A of the RFID system C_A according to the invention might be mounted/installed on a side of the first guided vehicle in order to allow an automatic communication and exchange of information with an RFID reader R_B and an RFID Tag T_B installed on a side of the second guided vehicle when said guided vehicles are crossing each other, for example because they are running in opposite direction or because they are passing one another, said side being directly adjacent to the RFID reader R_A and RFID tag T_A;
- an ICM I_A configured for being mounted/installed on-board the first guided vehicle, wherein the ICM I_A is

  o configured for being connected to at least one

on-board device of the first guided vehicle for collecting/acquiring data from said on-board device and/or transmitting data to said on-board device and/or to another on-board device of said first guided vehicle;

o connected to the RFID reader R_A for getting additional data that might be acquired by the RFID reader R_A when reading the RFID tag T_B, said additional data being notably data selected by the ICM I_B of the RFID system C_B, and transmitted to the ICM I_A through the communication of the RFID reader R_A with the RFID tag T_B;

◦ connected to the RFID tag T_A for providing the latter with the selected data, said selected data being in particular data selected by the ICM I_A from said collected/acquired data, for instance after analyzing the collected/acquired data by means of the ICM I_A and designed for being transmitted to the RFID reader R_B when the latter reads the RFID tag T_A. The selected data are thus the data selected by the ICM I_A for being transmitted by means of the RFID tag T_A to the RFID reader R_B when the first and second guided vehicles cross each other. Once the RFID reader R B receives said selected data, it transmits said selected data as "additional data" to the ICM I_B.

[0010] Preferentially, said place/location wherein the RFID tag and RFID reader are installed/mounted is a side of the guided vehicle. In particular, the RFID tag and RFID reader are installed/mounted on each side of the guided vehicle that might face a side of another guided vehicle when said guided vehicle and said another guided vehicle cross each other. In particular, the distance separating an RFID tag T_A, respectively an RFID reader R_A, and the running surface of the first guided vehicle is identical to the distance separating an RFID reader R_B, respectively an RFID tag T_B, and the running surface of the second guided vehicle in order to improve the exchange of information between the RFID systems equipping the guided vehicles, the running surface being the plane defined by the contact "rail - guided vehicle wheels".

[0011] The present invention concerns thus a method of communication for automatically exchanging information between a first guided vehicle and a second guided according to claim 8, wherein RFID systems as previously described and equipping each of said first and second guided vehicles automatically exchange information between said first guided vehicle and said second guided vehicle when they cross each other. In particular, the method according to the invention comprises the following steps for transmitting information from the first guided vehicle to the second guided vehicle:

- using the ICM I_A for collecting/acquiring data from an on-board device mounted/installed on-board said first guided vehicle;
- determining, by means of the ICM I_A and from the collected/acquired data, a set of data to be transmitted by means of an RFID tag T_A connected to the ICM I_A to an RFID reader R_B installed/mounted on the second guided vehicle, said set of data, called "selected data", comprising thus data selected by the ICM I_A. The selected data might be in particular determined after analysis of the collected data by the ICM I_A and/or classification of the collected/acquired data in function of their importance regarding the security of the guided vehicle network;
- using the RFID tag T_A for transmitting the selected data to the RFID reader R_B of the RFID system C_B equipping said second guided vehicle, the transmission of the selected data taking place when the first guided vehicle and the second guided vehicle cross each other. The selected data received by the RFID reader R_B from the RFID tag T_A are then preferentially transmitted by the RFID reader R_B to the ICM I_B as additional data for further processing.

[0012] In particular, the method according to the invention comprises the following steps for allowing the first guided vehicle to receive information from the second guided vehicle:

- using the RFID reader R_A of the first guided vehicle for automatically reading and acquiring additional data provided by an RFID tag T_B of the second guided vehicle, wherein the additional data are data selected by the ICM I_B equipping the RFID system C_B installed on-board said second guided vehicle and transmitted by means of the RFID tag T_B to the RFID reader R_A when the first guided vehicle and the second guided vehicle cross each other;
- transmitting the additional data to the ICM I_A equipping the RFID system C_A of the first guided vehicle;
- optionally analyzing the additional data by means of said ICM I_A;
- triggering an action in function of the additional data, for example transmitting data to an on-board device of the first guided vehicle, the transmitted data being said additional data and/or new data determined in function of the received additional data.

[0013] The method according to the invention proposes thus a wireless use of electromagnetic fields, i.e. the RFID technique, for automatically transferring selected data between the first guided vehicle and the second guided vehicle, and vice versa, said transfer of selected data between the guided vehicles taking place and being possible only when said guided vehicles cross each other. The method steps described from the point of view of the first guided vehicle apply mutatis mutandis when described from the point of view of the second guided ve-

hicle.

[0014] Finally, the present invention is also directed to a guided vehicle comprising the previously described RFID system, and to a communication system between guided vehicles wherein said communication system comprises several RFID systems, each configured for equipping one guided vehicle. Of course, a single guided vehicle may comprise one or several RFID systems according to the invention, wherein each of said system is for example dedicated to the exchange of specific information or has a function of redundancy.

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

Figure 1 schematic representation of a top view of two guided vehicles crossing each other and exchanging information according to the invention.

Figure 2 schematic representation of a side view of a guided vehicle comprising two RFID systems according to the invention.

[0016] Figure 1 shows a preferred embodiment of the communication method and RFID system according to the invention. A first guided vehicle A comprising several cars or guided vehicle units is shown crossing a second guided vehicle B comprising also several cars or guided vehicle units. Each of said first and second guided vehicles A, B is equipped with an RFID system 1 according to the invention. In this preferred embodiment, the guided vehicles A, B are running in opposite direction as illustrated by the arrows F. Of course, they can also cross each other when running in a same direction if their speed is different. Each guided vehicle A, B comprises at least one RFID system 1 according the invention, but may also comprise several or redundant RFID systems according to the invention. For instance, the first guided vehicle A comprises at least one RFID system C_A for example a first RFID system equipping the first car of the first guided vehicle A, and a second RFID system equipping the last car of the first guided vehicle A. Similarly, the second guided vehicle B may comprise at least one RFID system C_B, for instance a first RFID system installed in the first car and a second RFID system installed in the last car of the second guided vehicle B. In this case, the cars situated between the first car and the last car of each guided vehicle are for example free of any RFID system according to the invention.

[0017] Each RFID system 1 according to the invention comprises:

- an RFID reader 12, for example the RFID reader R_A for the RFID system of the first guided vehicle A and the RFID reader R_B for the second guided vehicle B;
- an RFID tag 13, for example the RFID tag T_A for the first guided vehicle A and the RFID tag T_B for the second guided vehicle B;
- an ICM 11 to which the RFID reader 12 and RFID tag 13 are connected, for example, the ICM I_A for the first guided vehicle and the ICM I_B for the second guided vehicle.

[0018] In particular, each RFID system of the first guided vehicle A comprises at least one RFID reader R_A 12 and at least one RFID tag T_A 13 configured for being installed on a side of the first guided vehicle A. Preferentially, it comprises two RFID readers R_A and two RFID tags T_A, so that each side of the first guided vehicle A that may face a side of the second guided vehicle B might be equipped with at least one RFID reader R_A and at least one RFID tag T_A. Similarly, each RFID system of the second guided vehicle B comprises at least one RFID reader R_B 12 and at least one RFID tag T_B 13 configured for being installed on a side of the first guided vehicle A. Preferentially, it comprises two RFID readers R_B and two RFID tags T_B, so that each side of the second guided vehicle B that may face a side of the first guided vehicle A might be equipped with at least one RFID reader R_B and at least one RFID tag T_B.

[0019] The ICM 11, for example the ICM I_A of the first guided vehicle A, or the ICM I_B of the second guided vehicle B, is configured for being connected to at least one on-board device, said on-board device being for example a control system 2 or a sensor 3 of the guided vehicle it equips, or another ICM 11 installed on-board the same guided vehicle, for example in another car of the guided vehicle. The connection of the IMC to the on-board device might be a wire or wireless communication, the IMC being in particular capable of wirelessly communicating with said on-board device. The sensor 3 might be a speed sensor, or an environmental sensor (weather conditions), or a proximity sensor (for detecting obstacles on the track). In particular, the ICM 11 is configured for collecting/acquiring data from said on-board device. For example, the ICM collected/acquired data might be at least one of the following: the guided vehicle ID, its speed, detected obstacles on the track, guided vehicle delay compared to a schedule, any change of a configuration of the guided vehicle, environmental conditions, alerts, emergency issues, adhesion factor, etc.

[0020] The ICM 11 according to the invention is for example an FPGA. Preferentially, the ICM 11 according to the invention comprises a processor and a memory for analyzing said collected/acquired data and determining at least one set of data, wherein the data composing said set of data are called the "selected data" Ds and are the data transmitted by the ICM to the RFID tag of the RFID system of the guided vehicle for being communicated by said RFID tag to the RFID reader of the RFID system of another guided vehicle. Preferentially, the ICM I_A may determine another set of data, wherein the data composing said another set of data are called the "written data" and are data transmitted by the ICM I_A to the RFID

reader R_A for being written by said RFID reader R_A on a memory of the RFID tag R_B of the RFID system of the second guided vehicle B. Finally, the ICM 11 equipping an RFID system of a guided vehicle is in particular also configured for receiving additional data Da from the RFID reader equipping the RFID system of said guided vehicle, wherein said additional data Da are the data read by the RFID reader when reading a RFID tag of an RFID system equipping another guided vehicle. The selected data Ds might be all data collected by the ICM 11, or part of said data collected by the ICM 11, or new data calculated/determined from at least one of said collected data. The written data might be for example data that have to be communicated to a guided vehicle running on the same track as the guided vehicle whose RFID system created said written data. Advantageously, the RFID system equipping a first guided vehicle A running on a first track might thus use the RFID system installed in a second guided vehicle B running on second track adjacent to said first track for storing the written data and then providing said written data by means of the RFID system installed in said second guided vehicle B to subsequent guided vehicles running on said first track. By this way, the written data might be used for providing information related to a specific track to the guided vehicles running on said specific track, wherein the RFID system of a guided vehicle running on a track adjacent to the specific track is used as a "mobile transporter" of the written data, i.e. of relevant information for said specific track. According to the invention, the selected data transmitted by the RFID tag T_A to the ICM I_B by means of the reading of said RFID tag T_A by the RFID reader R_B might be configured for triggering a reconfiguration of the RFID tag T_B by means of the ICM_B so that the RFID tag T_B transmits said selected data previously received to guided vehicles running on said first track, i.e. on the same track as the track of the guided vehicle whose RFID system transmitted the additional data. In other words, the ICM I_B of the RFID system C_B might be able to configure the RFID tag T_B in function of the additional data, i.e. in function of the selected data received by the RFID reader R_B, said selected data comprising instruction for triggering said configuration of the RFID tag T_B so that the latter transmits at least part of the previously received selected data to each next guided vehicle it crosses.

[0021] For example, the selected data Ds collected/acquired by the ICM I_A are then transmitted by said ICM I_A to the RFID tag T_A in order to be stored in the RFID tag T_A and thus available for a reading by the RFID reader R_B. The RFID tag 13 according to the invention might be active or passive. It comprises in particular a memory for storing the selected data Ds and making them available for a reading by an RFID reader 12. The RFID tag 13 might be configured for automatically storing each selected data it receives, or optionally the ICM might be able to store the selected data in the memory of the RFID tag 13 and/or to read said memory. The ICM 11 and/or the RFID tag 13 are configured for managing the memory of the RFID tag 13, in particular for managing the selected data stored in the RFID tag memory. The RFID tag according to the invention might be a "read-only" RFID tag (wherein the RFID reader can only read the selected data stored in the RFID tag) or a "read/write" RFID tag (wherein the RFID reader can read the selected data stored in the RFID tag, and if necessary write some other data in the memory of the RFID tag, i.e. the so-called written data). Read-only and read/write RFID tags are well known by the skilled man and do not need further explanations.

[0022] Preferentially, each RFID system 1 according to the invention comprises at least two RFID tags 13 and two RFID readers 12, wherein at least one RFID tag 13 and one RFID reader 11 are configured for being installed/mounted on one side of the guided vehicle, for example on one side of the first car of the guided vehicle, and at least one other RFID tag 13 and one other RFID reader 12 are configured for being installed/mounted on another side of said guided vehicle, so that both sides (in principle lateral sides, i.e. each side of the guided vehicle that faces a side of another guided vehicle when the guided vehicles cross each other) of the guided vehicle are equipped with at least one RFID reader 12 and at least one RFID tag 13 as illustrated in Figure 1.

[0023] According to the present invention, the first guided vehicle A and the second guided vehicle B preferentially exchange their respective selected data Ds stored in the memory of their respective RFID tags of their respective RFID systems when they cross each other, i.e. when the RFID tag T_A and the RFID reader R_B face each other so that the RFID reader R_B might read the selected data Ds from, and/or write the so-called written data on, the memory of the RFID tag T_A. For this purpose, each RFID tag T_A, T_B installed on the first, respectively second, guided vehicle and each RFID reader R_B, R_A installed on the second, respectively first, guided vehicle are placed on the respective guided vehicles so that they may interact with each other when the first and second guided vehicles cross each other.

[0024] For example, when the first guided vehicle A and the second guided vehicle B cross each other, the RFID reader R_A equipping the first guided vehicle A may read and/or write the memory of the RFID tag T_B equipping the second guided vehicle B. The read data are the selected data Ds transmitted by the ICM I_B to the RFID tag R_B equipping the second guided vehicle B and that are then read by the RFID reader R_A of the first guided vehicle A and transmitted by said RFID reader R_A to the ICM I_A as additional data Da. The so-called written data are data written by the RFID reader R_A on the memory of the RFID tag T_B, and that can be then read by other RFID readers that communicate with the RFID tag T_B whose memory comprises said written data.

[0025] Each RFID reader 12 equipping an RFID system according to the invention installed on a first guided

vehicle A is configured for reading an RFID tag (i.e. for receiving radio signal from the RFID tag) equipping an RFID system installed on a second guided vehicle B when the first guided vehicle A crosses the second guided vehicle B. When reading the RFID tag, selected data and/or written data if any are collected by the RFID reader. The data collected by the RFID reader are transmitted by the latter to the ICM as additional data. Said additional data may trigger an action performed by the ICM. The latter is in particular able to analyze said additional data and to determine the actions to be performed. Examples of actions are sending an alert to the guided vehicle driver, sending data to an on-board device to which the ICM is connected, for example a control system or another ICM, displaying information in the cabin of the guided vehicle driver, etc. In particular, the additional data might automatically trigger said action.

[0026] To summarize, the present invention proposes a simple system and method of communication between guided vehicle based on the exchange of data (selected data/written data) by means of RFID techniques, wherein the data are instantaneously transferred from one RFID system to another RFID system equipping different guided vehicles when said guided vehicles cross each other and are close enough for allowing the communication between an RFID tag and an RFID reader. The RFID systems according to the invention form a new kind of communication system for guided vehicles.

Claims

1. RFID system (1) configured for being installed onboard a first guided vehicle (A) in order to allow the latter to automatically exchange information with a second guided vehicle (B), the RFID system (1) according to the invention comprising:

   - an RFID reader (12) configured for being installed in a location on the first guided vehicle (A) that allows said RFID reader (12) to read an RFID tag (13) of an RFID system installed onboard the second guided vehicle when the first guided vehicle (A) and the second guided vehicle (B) cross each other;
   - an RFID tag (13) configured for being installed in a location on the first guided vehicle (A) that allows said RFID tag (13) to be read by an RFID reader (12) of the RFID system installed onboard the second guided vehicle (B) when the first guided vehicle (A) and the second guided vehicle (B) cross each other;
   - an Information Collector Module (11), hereafter called "ICM", wherein said ICM (11) is configured for being connected to an on-board device (2, 3) of the first guided vehicle (A) for acquiring/transmitting data from/to said on-board device (2, 3), said ICM (11) being connected to the RFID reader (12) for getting additional data (Da) wherein the additional data (Da) are data acquired by the RFID reader (12) when reading the RFID tag (13) of the RFID system equipping the second guided vehicle, said ICM (11) being furthermore connected to the RFID tag (13) for providing the latter with selected data (Ds) that are data selected from the data acquired from the on-board device (2,3) and designed for being read by the RFID reader (12) of the RFID system of the second guided vehicle (B), wherein the selected data (Ds) are configured for triggering a reconfiguration of the RFID tag (13) of the RFID system equipping the second vehicle by means of an ICM of the latter, so that its RFID tag (13) transmits at least part of the selected data to each next guided vehicle it crosses.

2. RFID system (1) according to claim 1, wherein the RFID tag (13) comprises a memory and the ICM (11) is capable to write the selected data (Ds) on said memory and/or read said memory.

3. RFID system (1) according to claim 1 or 2, wherein the ICM (11) comprises a memory and a processor.

4. RFID system (1) according to one of the claims 1-3, wherein the ICM (11) is configured for triggering an action when receiving the additional data Da.

5. RFID system (1) according to claim 4, wherein said action is one of the following actions: sending an alert to the guided vehicle driver; sending data to an on-board device (2, 3) to which the ICM (11) is connected; displaying information in a cabin of the first guided vehicle (A).

6. RFID system (1) according to one of the claims 1 to 5, wherein the RFID reader (12) is configured for writing data on a memory of the RFID tag (13) of the RFID system configured for equipping the second guided vehicle (B).

7. First guided vehicle (A) comprising the RFID system (1) according to one of the claims 1 to 6 for exchanging information with a second guided vehicle (B) when they cross each other.

8. Communication method for automatically exchanging information between a first guided vehicle (A) and a second guided vehicle (B), wherein each of said first guided vehicle (A) and second guided vehicle (B) comprises an RFID system including an RFID reader (12), an RFID tag (13), and an Information Collector Module (11), hereafter called "ICM", **characterized in that** an RFID technique is used for exchanging said information when the first guided vehicle (A) and the second guided vehicle (B) cross

each other, wherein transmitting information from the first guided vehicle (A) to the second guided vehicle (B) comprises:

- using the ICM (11) installed on-board the first guided vehicle (A) for acquiring data from an on-board device installed on-board said first guided vehicle (A);
- determining from the acquired data a set of data, hereafter called the "selected data", to be transmitted by means of the RFID tag (13) of the RFID system (1) equipping the first guided vehicle (A) to the RFID reader (12) of the RFID system of the second guided vehicle (B);
- using the RFID tag (13) of the RFID system (1) equipping the first guided vehicle (A) for transmitting the selected data to the RFID reader (12) of the RFID system equipping the second guided vehicle (B), the transmission of the selected data taking place when the first guided vehicle (A) and the second guided vehicle (B) cross each other, wherein the selected data (Ds) are configured for triggering a reconfiguration of the RFID tag (13) of the RFID system equipping the second vehicle by means of the ICM of the latter, so that its RFID tag (13) transmits at least part of the selected data to each next guided vehicle it crosses.

9. Communication method according to claim 8, wherein the first guided vehicle (A) acquires information from the second guided vehicle (B) according to the following steps:

- using the RFID reader (12) installed on-board the first guided vehicle (A) for automatically reading and acquiring additional data (Da) by reading the RFID tag (13) of the RFID system equipping the second guided vehicle (B);
- transmitting the additional data (Da) to the ICM (11) of the RFID system equipping the first guided vehicle (A) ;
- triggering an action in function of the additional data (Da) by means of the ICM (11).

10. Communication method according to claim 9, wherein triggering an action comprising one of the followings actions: sending an alert to the guided vehicle driver; sending data to an on-board device (2, 3) to which the ICM (11) is connected; displaying information in a cabin of the first guided vehicle (A).

11. Communication method according to claim 9 or 10 wherein the additional data (Da) are data selected by the ICM (11) equipping the RFID system installed on-board the second guided vehicle (B) and transmitted by means of the RFID tag (13) installed on the second guided vehicle (B) to the RFID reader (12) installed on the first guided vehicle (A) when the first guided vehicle (A) and the second guided vehicle (B) cross each other.

12. Communication method according to one of the claims 9 to 11 wherein the ICM (11) triggers said action after analysis of the additional data (Da).

13. Communication method according to one of the claims 9-10 comprising using the RFID reader (12) of the RFID system installed on-board the first guided vehicle (A) for writing data, hereafter called "written data", on a memory of the RFID tag (13) of the RFID system installed on-board the second guided vehicle (B).

14. Communication method according to claim 13 wherein the written data are data specific to the track on which the first guided vehicle (A) is running.

Patentansprüche

1. RFID-System (1), das für die Installation an Bord eines ersten spurgebundenen Fahrzeugs (A) konfiguriert ist, damit letzteres automatisch mit einem zweiten spurgebundenen Fahrzeug (B) Informationen austauschen kann, wobei das erfindungsgemäße RFID-System (1) Folgendes umfasst:

- ein RFID-Lesegerät (12), das für die Installation an einer Stelle an dem ersten spurgebundenen Fahrzeug (A) konfiguriert ist, die es dem RFID-Lesegerät (12) ermöglicht, ein RFID-Tag (13) eines an Bord des zweiten spurgebundenen Fahrzeugs installierten RFID-Systems auszulesen, wenn das erste spurgebundene Fahrzeug (A) und das zweite spurgebundene Fahrzeug (B) aneinander vorbeifahren,
- ein RFID-Tag (13), das für die Installation an einer Stelle an dem ersten spurgebundenen Fahrzeug (A) konfiguriert ist, die es möglich macht, dass das RFID-Tag (13) von einem RFID-Lesegerät (12) des an Bord des zweiten spurgebundenen Fahrzeugs (B) installierten RFID-Systems ausgelesen wird, wenn das erste spurgebundene Fahrzeug (A) und das zweite spurgebundene Fahrzeug (B) aneinander vorbeifahren,
- ein Informationssammelmodul (11), das nachfolgend als "ISM" bezeichnet wird, wobei das ISM (11) für das Verbinden mit einer Bordvorrichtung (2, 3) des ersten spurgebundenen Fahrzeugs (A) zum Erfassen/Übermitteln von Daten aus/zu der Bordvorrichtung (2, 3) konfiguriert ist, wobei das ISM (11) für das Abrufen zusätzlicher Daten (Da) mit dem RFID-Lesegerät (12) verbunden ist, wobei es sich bei den

zusätzlichen Daten (Da) um Daten handelt, die von dem RFID-Lesegerät (12) erfasst werden, wenn es das RFID-Tag (13) des RFID-Systems ausliest, mit dem das zweite spurgebundene Fahrzeug ausgestattet ist, wobei das ISM (11) ferner für das Versorgen des RFID-Tags (13) mit ausgewählten Daten (Ds), bei denen es sich um Daten handelt, die unter den aus der Bordvorrichtung (2, 3) erfassten und für das Lesen durch das RFID-Lesegerät (12) des RFID-Systems des zweiten spurgebundenen Fahrzeugs (B) ausgelegten Daten ausgewählt sind, mit dem RFID-Tag (13) verbunden ist, wobei die ausgewählten Daten (Ds) für das Auslösen einer Neukonfiguration des RFID-Tags (13) des RFID-Systems, mit dem das zweite Fahrzeug ausgestattet ist, mithilfe eines ISM des letzteren konfiguriert sind, so dass sein RFID-Tag (13) zumindest einen Teil der ausgewählten Daten zu jedem nächsten spurgebundenen Fahrzeug überträgt, an dem es vorbeifährt.

2. RFID-System (1) nach Anspruch 1, wobei das RFID-Tag (13) einen Speicher umfasst und das ISM (11) in der Lage ist, die ausgewählten Daten (Ds) in den Speicher zu schreiben und/oder den Speicher auszulesen.

3. RFID-System (1) nach Anspruch 1 oder 2, wobei das ISM (11) einen Speicher und einen Prozessor umfasst.

4. RFID-System (1) nach einem der Ansprüche 1 bis 3, wobei das ISM (11) so konfiguriert ist, dass es einen Vorgang auslöst, wenn es die zusätzlichen Daten (Da) empfängt.

5. RFID-System (1) nach Anspruch 4, wobei es sich bei dem Vorgang um einen der folgenden Vorgänge handelt: Senden einer Warnmeldung zum Fahrer des spurgebundenen Fahrzeugs, Senden von Daten zu einer Bordvorrichtung (2, 3), mit der das ISM (11) verbunden ist, Anzeigen von Informationen in einer Kabine des ersten spurgebundenen Fahrzeugs (A).

6. RFID-System (1) nach einem der Ansprüche 1 bis 5, wobei das RFID-Lesegerät (12) zum Schreiben von Daten in einen Speicher des RFID-Tags (13) des für das Ausstatten des zweiten spurgebundenen Fahrzeugs (B) konfigurierten RFID-Systems konfiguriert ist.

7. Erstes spurgebundenes Fahrzeug (A), das das RFID-System (1) nach einem der Ansprüche 1 bis 6 für den Austausch von Informationen mit einem zweiten spurgebundenen Fahrzeug (B) beim Aneinandervorbeifahren umfasst.

8. Kommunikationsverfahren für den automatischen Austausch von Informationen zwischen einem ersten spurgebundenen Fahrzeug (A) und einem zweiten spurgebundenen Fahrzeug (B), wobei sowohl das erste spurgebundene Fahrzeug (A) als auch das zweite spurgebundene Fahrzeug (B) ein RFID-System mit einem RFID-Lesegerät (12), einem RFID-Tag (13) und einem nachfolgend als "ISM" bezeichneten Informationssammelmodul (11) umfasst, **dadurch gekennzeichnet, dass** für den Austausch der Informationen eine RFID-Technik verwendet wird, wenn das erste spurgebundene Fahrzeug (A) und das zweite spurgebundene Fahrzeug (B) aneinander vorbeifahren, wobei das Übertragen von Informationen von dem ersten spurgebundenen Fahrzeug (A) zu dem zweiten spurgebundenen Fahrzeug (B) Folgendes umfasst:

- Benutzen des an Bord des ersten spurgebundenen Fahrzeugs (A) installierten ISM (11) zum Erfassen von Daten aus einer Bordvorrichtung, die an Bord des ersten spurgebundenen Fahrzeugs (A) installiert ist,
- Bestimmen eines Datensatzes aus den erfassten Daten, der nachfolgend als "ausgewählte Daten" bezeichnet wird, für die Übertragung mithilfe des RFID-Tags (13) des RFID-Systems (1), mit dem das erste spurgebundene Fahrzeug (A) ausgestattet ist, zu dem RFID-Lesegerät (12) des RFID-Systems des zweiten spurgebundenen Fahrzeugs (B),
- Benutzen des RFID-Tags (13) des RFID-Systems (1), mit dem das erste spurgebundene Fahrzeug (A) ausgestattet ist, für das Übertragen der ausgewählten Daten zum RFID-Lesegerät (12) des RFID-Systems, mit dem das zweite spurgebundene Fahrzeug (B) ausgestattet ist, wobei die Übertragung der ausgewählten Daten erfolgt, wenn das erste spurgebundene Fahrzeug (A) und das zweite spurgebundene Fahrzeug (B) aneinander vorbeifahren, wobei die ausgewählten Daten (Ds) für das Auslösen einer Neukonfiguration des RFID-Tags (13) des RFID-Systems, mit dem das zweite Fahrzeug ausgestattet ist, mithilfe des ISM des letzteren konfiguriert sind, so dass sein RFID-Tag (13) zumindest einen Teil der ausgewählten Daten zu jedem nächsten spurgebundenen Fahrzeug überträgt, an dem es vorbeifährt.

9. Kommunikationsverfahren nach Anspruch 8, wobei das erste spurgebundene Fahrzeug (A) gemäß den folgenden Schritten Informationen aus dem zweiten spurgebundenen Fahrzeug (B) erfasst:

- Benutzen des an Bord des ersten spurgebundenen Fahrzeugs (A) installierten RFID-Lesegeräts (12) für das automatische Auslesen und

Erfassen zusätzlicher Daten (Da) durch Auslesen des RFID-Tags (13) des RFID-Systems, mit dem das zweite spurgebundene Fahrzeug (B) ausgestattet ist,
- Übertragen der zusätzlichen Daten (Da) zum ISM (11) des RFID-Systems, mit dem das erste spurgebundene Fahrzeug (A) ausgestattet ist,
- Auslösen eines Vorgangs in Abhängigkeit von den zusätzlichen Daten (Da) mithilfe des ISM (11).

10. Kommunikationsverfahren nach Anspruch 9, wobei das Auslösen eines Vorgangs einen der folgenden Vorgänge umfasst: Senden einer Meldung zum Fahrer des spurgebundenen Fahrzeugs, Senden von Daten zu einer Bordvorrichtung (2, 3), mit der das ISM (11) verbunden ist, Anzeigen von Informationen in einer Kabine des ersten spurgebundenen Fahrzeugs (A).

11. Kommunikationsverfahren nach Anspruch 9 oder 10, wobei es sich bei den zusätzlichen Daten (Da) um Daten handelt, die von dem ISM (11) ausgewählt werden, mit dem das an Bord des zweiten spurgebundenen Fahrzeugs (B) installierte RFID-System ausgestattet ist, und mithilfe des an dem zweiten spurgebundenen Fahrzeug (B) installierten RFID-Tags (13) zu dem am ersten spurgebundenen Fahrzeug (A) installierten RFID-Lesegerät (12) übertragen werden, wenn das erste spurgebundene Fahrzeug (A) und das zweite spurgebundene Fahrzeug (B) aneinander vorbeifahren.

12. Kommunikationsverfahren nach einem der Ansprüche 9 bis 11, wobei das ISM (11) den Vorgang nach Analyse der zusätzlichen Daten (Da) auslöst.

13. Kommunikationsverfahren nach einem der Ansprüche 9 bis 10, das das Benutzen des RFID-Lesegeräts (12) des an Bord des ersten spurgebundenen Fahrzeugs (A) installierten RFID-Systems zum Schreiben von Daten, die nachfolgend als "geschriebene Daten" bezeichnet werden, in einen Speicher des RFID-Tags (13) des an Bord des zweiten spurgebundenen Fahrzeugs (B) installierten RFID-Systems umfasst.

14. Kommunikationsverfahren nach Anspruch 13, wobei es sich bei den geschriebenen Daten um spezifische Daten zu dem Gleis handelt, auf dem das erste spurgebundene Fahrzeug (A) fährt.

Revendications

1. Système RFID (1) conçu pour être installé à bord d'un premier véhicule guidé (A) afin de permettre à ce dernier d'échanger automatiquement des informations avec un second véhicule guidé (B), le système RFID (1) selon l'invention comprenant :

- un lecteur RFID (12) conçu pour être installé dans un emplacement sur le premier véhicule guidé (A) qui permet audit lecteur RFID (12) de lire une étiquette RFID (13) d'un système RFID installé à bord du second véhicule guidé lorsque le premier véhicule guidé (A) et le second véhicule guidé (B) se croisent ;
- une étiquette RFID (13) conçue pour être installée dans un emplacement sur le premier véhicule guidé (A) qui permet à ladite étiquette RFID (13) d'être lue par un lecteur RFID (12) du système RFID installé à bord du second véhicule guidé (B) lorsque le premier véhicule guidé (A) et le second véhicule guidé (B) se croisent ;
- un module collecteur d'informations (11), ci-après nommé « ICM », dans lequel ledit ICM (11) est conçu pour être connecté à un dispositif embarqué (2, 3) du premier véhicule guidé (A) pour acquérir/transmettre des données provenant/audit dispositif embarqué (2, 3), ledit ICM (11) étant connecté au lecteur RFID (12) pour obtenir des données supplémentaires (Da), les données supplémentaires (Da) étant des données acquises par le lecteur RFID (12) lors de la lecture de l'étiquette RFID (13) du système RFID équipant le second véhicule guidé, ledit ICM (11) étant connecté en outre à l'étiquette RFID (13) pour fournir à cette dernière des données sélectionnées (Ds) qui sont des données sélectionnées à partir des données acquises du dispositif embarqué (2, 3) et désignées pour être lues par le lecteur RFID (12) du système RFID du second véhicule guidé (B), les données sélectionnées (Ds) étant conçues pour déclencher une reconfiguration de l'étiquette RFID (13) du système RFID équipant le second véhicule au moyen d'un ICM de ce dernier, de sorte que son étiquette RFID (13) transmet au moins une partie des données sélectionnées à chaque prochain véhicule guidé qu'il croise.

2. Système RFID (1) selon la revendication 1, dans lequel l'étiquette RFID (13) comprend une mémoire et l'ICM (11) est capable d'écrire les données sélectionnées (Ds) sur ladite mémoire et/ou de lire ladite mémoire.

3. Système RFID (1) selon la revendication 1 ou 2, dans lequel l'ICM (11) comprend une mémoire et un processeur.

4. Système RFID (1) selon l'une des revendications 1 à 3, dans lequel l'ICM (11) est conçu pour déclencher une action lors de la réception des données supplémentaires Da.

5. Système RFID (1) selon la revendication 4, dans lequel ladite action est l'une des actions suivantes : envoyer une alerte au conducteur du véhicule guidé ; envoyer des données à un dispositif embarqué (2, 3) auquel l'ICM (11) est connecté ; afficher des informations dans une cabine du premier véhicule guidé (A).

6. Système RFID (1) selon l'une des revendications 1 à 5, dans lequel le lecteur RFID (12) est conçu pour écrire des données sur une mémoire de l'étiquette RFID (13) du système RFID conçu pour équiper le second véhicule guidé (B).

7. Premier véhicule guidé (A) comprenant le système RFID (1) selon l'une des revendications 1 à 6 permettant d'échanger des informations avec un second véhicule guidé (B) lorsqu'ils se croisent.

8. Procédé de communication permettant d'échanger automatiquement des informations entre un premier véhicule guidé (A) et un second véhicule guidé (B), chacun desdits premier véhicule guidé (A) et second véhicule guidé (B) comprend un système RFID comprenant un lecteur RFID (12), une étiquette RFID (13) et un module collecteur d'informations (11), ci-après nommé « ICM », **caractérisé en ce qu'**une technique RFID est utilisée pour échanger lesdites informations lorsque le premier véhicule guidé (A) et le second véhicule guidé (B) se croisent, la transmission des informations du premier véhicule guidé (A) au second véhicule guidé (B) comprend :

- l'utilisation de l'ICM (11) installé à bord du premier véhicule guidé (A) pour l'acquisition de données d'un dispositif embarqué installé à bord dudit premier véhicule guidé (A) ;
- la détermination à partir des données acquises d'un ensemble de données, ci-après nommé les « données sélectionnées », devant être transmises au moyen de l'étiquette RFID (13) du système RFID (1) équipant le premier véhicule guidé (A) au lecteur RFID (12) du système RFID du second véhicule guidé (B) ;
- l'utilisation de l'étiquette RFID (13) du système RFID (1) équipant le premier véhicule guidé (A) pour transmettre les données sélectionnées au lecteur RFID (12) du système RFID équipant le second véhicule guidé (B), la transmission des données sélectionnées se déroulant lorsque le premier véhicule guidé (A) et le second véhicule guidé (B) se croisent, les données sélectionnées (Ds) étant conçues pour déclencher une reconfiguration de l'étiquette RFID (13) du système RFID équipant le second véhicule au moyen de l'ICM de ce dernier, de sorte que son étiquette RFID (13) transmet au moins une partie des données sélectionnées à chaque prochain véhicule guidé qu'il croise.

9. Procédé de communication selon la revendication 8, dans lequel le premier véhicule guidé (A) acquiert des informations à partir du second véhicule guidé (B) en fonction des étapes suivantes :

- l'utilisation du lecteur RFID (12) installé à bord du premier véhicule guidé (A) pour lire automatiquement et acquérir des données supplémentaires (Da) en lisant l'étiquette RFID (13) du système RFID équipant le second véhicule guidé (B) ;
- la transmission des données supplémentaires (Da) à l'ICM (11) du système RFID équipant le premier véhicule guidé (A) ;
- le déclenchement d'une action en fonction des données supplémentaires (Da) au moyen de l'ICM (11).

10. Procédé de communication selon la revendication 9, dans lequel le déclenchement d'une action comprend l'une des actions suivantes : l'envoi d'une alerte au conducteur du véhicule guidé ; l'envoi de données à un dispositif embarqué (2, 3) auquel l'ICM (11) est connecté ; l'affichage d'informations dans une cabine du premier véhicule guidé (A).

11. Procédé de communication selon la revendication 9 ou 10, dans lequel les données supplémentaires (Da) sont des données sélectionnées par l'ICM (11) équipant le système RFID installé à bord du second véhicule guidé (B) et transmis au moyen de l'étiquette RFID (13) installée sur le second véhicule guidé (B) au lecteur RFID (12) installé sur le premier véhicule guidé (A) lorsque le premier véhicule guidé (A) et le second véhicule guidé (B) se croisent.

12. Procédé de communication selon l'une des revendications 9 à 11, dans lequel l'ICM (11) déclenche ladite action après l'analyse des données supplémentaires (Da).

13. Procédé de communication selon l'une des revendications 9 à 10 comprenant l'utilisation du lecteur RFID (12) du système RFID installé à bord du premier véhicule guidé (A) pour écrire des données, ci-après nommées « données écrites », sur une mémoire de l'étiquette RFID (13) du système RFID installé à bord du second véhicule guidé (B).

14. Procédé de communication selon la revendication 13, dans lequel les données écrites sont des données spécifiques à la voie sur laquelle circule le premier véhicule guidé (A).

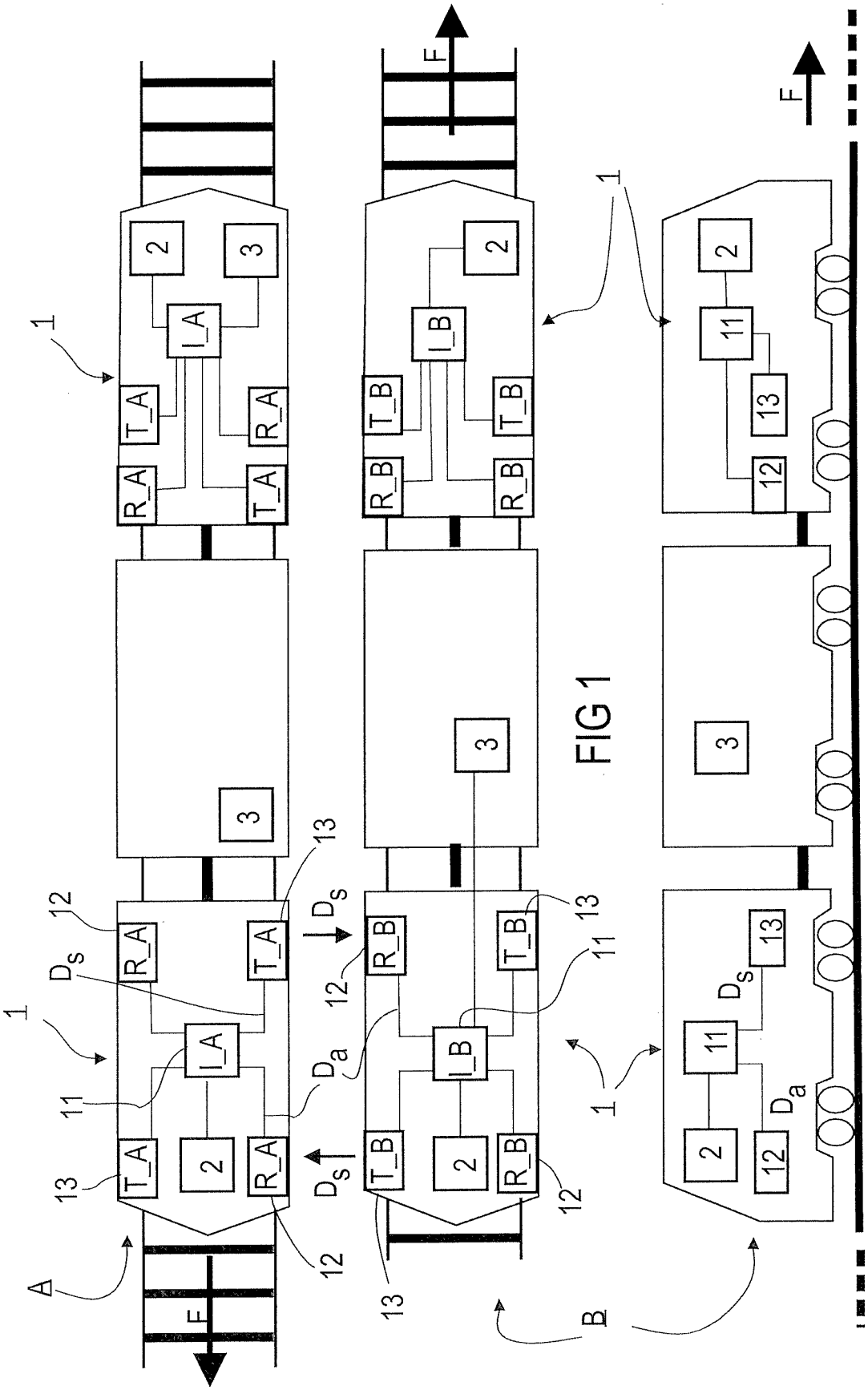

FIG 1

FIG 2

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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