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(54) **Method for blocking a working area within a railway network and train control system**

(57) The invention concerns a method for blocking a working area (WA) within a railway network, the working area (WA) comprising one or more contiguous sections (S1, S2, S3) of a track (T) and the railway network comprising an interlocking (IL) and an axle counter with an axle counter evaluator (ACE), wherein the axle counter evaluator (ACE) outputs status information of the sections, and the interlocking (IL) outputs actual traffic information in due consideration of the status information, wherein: a maintainer sends a blocking request for blocking a requested working area (WA) to an operator or an operator terminal (OTT); a decision is made in dependence of the actual traffic situation whether to handover the blocking request to the axle counter evaluator (ACE) or not, in case of a handover a change of the status of all sections of the requested working area (WA) is carried out by setting the status information of said sections to "occupied". With the present invention the required level of safety can be ensured reliably without changing the interlocking logic.

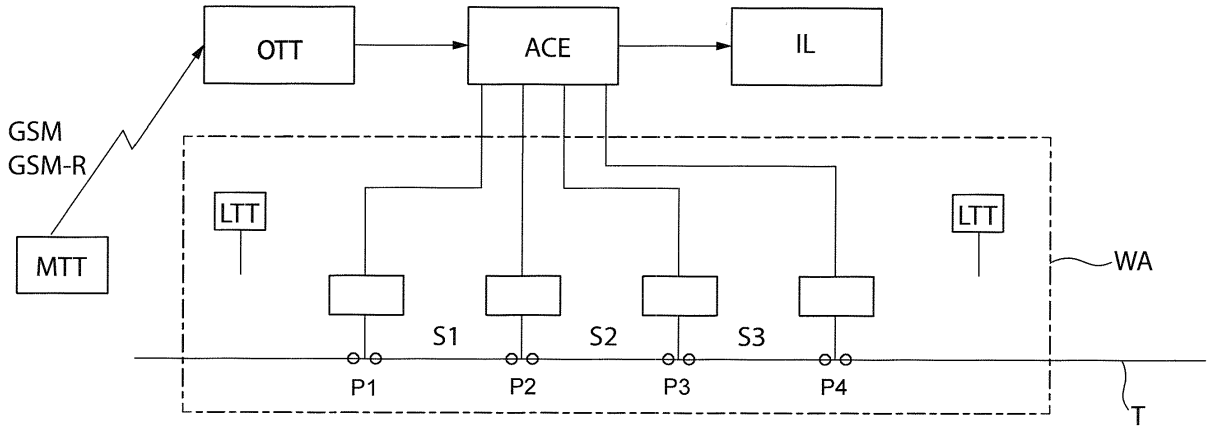

Fig. 1

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Description

Background of the invention

[0001] The invention concerns a method for blocking sections of a track within a railway network, the railway network comprising an interlocking and an axle counter with an axle counter evaluator, wherein the axle counter evaluator outputs status information of the sections, and the interlocking outputs actual traffic information in due consideration of the status information. The invention also concerns a train control system.

[0002] In case of maintenance work to be carried out at a track area the corresponding sections of the track have to be blocked in order to ensure safety of the maintenance staff.

[0003] It is known to generate a shortcut within the track circuit by attaching an electrical conducting wire between the two rails of a track. The track section is then deemed to be occupied. However this method is impractical and unreliable.

[0004] When axle counters are used the blocking of a section of a track is usually realized by contacting the traffic controller and asking him to block the corresponding sections. Yet, misunderstandings and with it the danger of injuries frequently occu r.

[0005] From Jernbaneverket (http://www.jernbaneverket.no; Norway railway) it is known to provide key cabinets at each section of the track, the key cabinets communicating directly with the interlocking and the traffic controller. A blocking request is sent from the key cabinet to the traffic controller. In case of an approval a key can be removed from the key cabinet and a signal is transmitted to the interlocking informing the interlocking about the section being blocked. Yet, this method requires complex adjustments of the interlocking logic and equipment for the key cabinets, such as cables, heating and light has to be provided.

Object of the invention

[0006] It is therefore an object of the invention to provide a method for blocking one or more sections of a track and a train control system wherein the required level of safety can be ensured reliably without complex adjustments of the interlocking logic or intervention of the operator.

Description of the invention

[0007] This object is solved by a method according to claim 1 and a train control system according to claim 10.

[0008] According to the invention working areas are defined, a working area comprising one or more contiguous sections of a track (parts of a track limited by counting points of the axle counter). Thus by blocking a working area several contiguous sections of the track can be blocked with one single request.

[0009] According to the invention a maintainer sends a blocking request for blocking a requested working area to an operator (e.g. a local traffic controller) or to an operator terminal (depending on the required safety level and the safety standard of the operator terminal). The operator terminal is preferably non-vital and displays the working areas in correspondence to the track layout. It acts as an interface between axle counter evaluator and maintainer. The operator terminal stores working area specific data and displays said data by issue (i.e. in case of a blocking request). Thereby it is ensured that the operator gets all relevant information concerning the requested working area.

[0010] After receiving a blocking request the actual traffic situation is checked preferably by the operator in order to decide whether to handover the blocking request or not. In case of using safe components for sending and receiving the request or in case a lower safety level is sufficient an operator may be dispensable.

[0011] In case of a handover the axle counter evaluator is caused to set the status of the sections requested for blocking to "occupied". The axle counter evaluator transmits the status information of the sections to the interlocking, which controls switch points and signal lamps in dependence of the transmitted status information. Since the sections of the blocked working area are treated equal to occupied sections, they are not taken into account for composite routes generated by the interlocking. Thus a safe blocking of a working area can be realized without modifications of the interlocking logic, i.e. existing system components can be used.

[0012] In a preferred variant a translation table is used for identifying the assigned sections of the working area. Since the axle counter evaluator does not know any "working area" but only "sections", a translation table is defined to link the sections to specific working areas. In order to handover the blocking requests for each section of the concerned working area the section-information from the translation table is read out. To generate this table the axle counter evaluator comprises a modified version of a Data Management Tool (DMT).

[0013] Preferably the operator terminal comprises the translation table, wherein the software installed at the operator terminal reads the section-information from the translation table. In an alternative variant the axle counter evaluator comprises the translation table. The translation process is then part of the safe axle counter configuration.

[0014] The request is preferably sent via a wireless transmission, in particular via a mobile network, e.g. via GSM or

GSM-R.

[0015] In a highly preferred variant of the invention the request is sent by a handheld device (maintenance track-side terminal).

[0016] It is preferred that prior to sending the request an RFID-tag or a barcode of a local trackside terminal is scanned by means of the handheld device, wherein the RFID-tag/barcode identifies a specific working area. Each working area can be identified by a specific identifier (WA-ID) and can be represented by a specific graphic file (e.g. a GIF-file) showing the topological arrangement of the sections (working area within the wider range of the track layout.). The graphic files are preferably secured by a CRC code (WA-CRC) or similar and can be identified by a WA-Picture-ID (WA-PID). The local trackside terminal is preferably geographically located somewhere close to its corresponding working area and houses working areas specific information (WA-ID, WA-CRC). It comprises a facility to house a RFID-tag, in particular a passive type RFID tag (no battery) or a barcode. The RFID tag/barcode comprises an ID which identifies the corresponding working area.

[0017] Each local trackside terminal contains the data for one corresponding working area only. Multiple local trackside terminals can be assigned to one specific working area (e.g. at both ends of the working area).

[0018] After scanning the RFID-tag/barcode working area specific data (e.g. the number and location of the sections of the specific working area) are preferably displayed at the handheld.

[0019] In order to give the maintainer the opportunity to review the request, in particular concerning the working area to be blocked, it is highly preferred that prior to handover the request to the axle counter evaluator a request confirmation is sent to the maintainer.

[0020] In particular, the change of the status of the sections of the requested working area is carried out not until a verification of the maintainer has been received. For this purpose an invitation to verify the request is sent to the maintainer together with the request confirmation after checking the actual traffic information. This is done preferably by the operator or the operator terminal.

[0021] After the status of all sections of the requested working area have been set to "occupied" it is advantageous to send a blocking confirmation to the maintainer.

[0022] The invention also concerns a train control system comprising an interlocking and an axle counter with an axle counter evaluator, an operator terminal comprising a storage with working area specific data, the operator terminal being adapted to display working areas in correspondence to a track layout, a handheld device comprising an RFID-tag reader or a barcode reader, a display and a device for communication with the operator terminal; wherein the operator terminal being adapted to act as an interface between the axle counter evaluator and the handheld device, and a local trackside terminal which houses an RFID tag or a barcode.

[0023] For readout of the working area specific information from the local trackside terminal the handheld device comprises a display, a device for communication with the operator terminal, in particular a GSM and/or GSM-R modem, and an RFID-TAG reader or a barcode reader respectively. Optionally the handheld device can comprise a GPS receiver to verify the location of the maintainer.

[0024] In a preferred embodiment of the inventive train control system a translation table is stored in the storage of the operator terminal or the central axle counter evaluator, the translation table linking sections to specific work areas.

[0025] The inventive train control system is most advantageous if the interlocking is relay based, since a relay based interlocking is rugged and shows a long life time. No modifications of the complex interlocking logic have to be done.

[0026] In a preferred variant of the inventive train control system the working areas are stored in data models. All the information for a distinct identification of a working area (WA-ID, RDID-number, number and definition of the sections, graphic files with CRC codes etc.) are determined in a data model which is used by the operator terminal as well as by the handheld device.

[0027] Further advantages can be extracted from the description and the enclosed drawing. The features mentioned above and below can be used in accordance with the invention either individually or collectively in any combination. The embodiments mentioned are not to be understood as exhaustive enumeration but rather have exemplary character for the description of the invention.

Drawings

[0028] The invention is shown in the drawing.

FIG. 1 shows an inventive train control system and a working area to be blocked.

FIG. 2 shows a flow chart of the basic steps of the inventive method.

FIG. 3 shows a detailed flow chart of a preferred variant of the inventive meth-od, in which the steps are related to the compounds by means of which the steps are carried out.

[0029] In **Fig. 1** a working area **WA** is shown comprising three sections **S1, S2, S3** of a track **T,** each section S1, S2, S3 being limited by counting points **P1, P2, P3, P4** of an axle counter. At or near the working area WA at least one local track side terminal **LTT** of an inventive train control system is provided which is connected via a mobile network **GSM/GSM-R** to an operator terminal **OTT.** The operator terminal OTT is in connected to an axle counter evaluator ACE, the axle counter evaluator ACE determining the status of the sections S1, S2, S3 by means of detected signals of the counting points P1, P2, P3, P4. An interlocking IL is connected to the axle counter evaluator ACE, wherein the axle counter evaluator ACE provides the interlocking IL with status information of the sections S1, S2, S3.

[0030] **Fig. 2** shows the basic steps of the inventive method. A maintainer requests the working area WA to be blocked by sending a blocking request. On receiving the blocking request the actual traffic situation is checked. If the actual traffic situation allows the blocking request to be accepted the blocking request is handed over to the axle counter evaluator ACE, wherein information is sent to the axle counter evaluator ACE concerning sections S1, S2, S3 (corresponding to the working area WA) which shall be treated as "occupied". The axle counter evaluator ACE then sets the status of the corresponding sections S1, S2, S3 to "occupied", thereby ensuring that the sections S1, S2, S3 of the requested working area WA will not be taken into account for any further composite routes which are generated by the interlocking IL.

[0031] A preferred variant of the inventive method is shown in **Fig. 3** which can be carried out by the preferred embodiment of an inventive train control system shown in Fig. 1.

[0032] The local track side terminal LTT comprises a facility (e.g. a panel) to house an RFID-tag or a barcode and a picture representing the working area WA within the wider range of the track layout. By scanning the RFID-tag/barcode of the local trackside terminal LTT working area specific information can be obtained (e.g. an identifier **WA-ID** identifying the working area WA, a status **WA-S** of the working area WA, a graphic file (e.g. a **GIF**-file) of the picture of the working area WA, a secure code **WA-CRC** by which the graphic file is secured). Each local track side terminal LTT contains data for one specific working area WA only. Multiple local track side terminals LTT (here two) can be assigned to one specific working area WA (e.g. on both ends of the working area WA).

[0033] For identifying the working area WA to be blocked and for sending a blocking request a maintenance track-side terminal **MTT** is provided. The maintenance track-side terminal MTT is a handheld device and is supposed to be carried by the maintainer. The maintenance track-side terminal MTT comprises a display, a device (e.g. a GSM-R modem) for communication with the remote operator terminal **OTT,** and a reader for reading the RFID-tag/barcode to read the information from the local track side terminal LTT. In addition, a GPS-receiver to verify the location of the maintainer can be provided with the maintenance track-side terminal MTT.

[0034] The maintainer scans the RFID-tag or the barcode of the local track side terminal LTT by means of the maintenance track-side terminal MTT, thereby retrieving the working area specific information. The working area specific information is displayed on the maintenance track-side terminal MTT.

[0035] The working area WA is represented by one or more pictures describing the geographical location of the working area WA within a wider track layout area. The working area WA can have either the status WA-S "blocked" or "unblocked". Each status WA-S can be visualized by a specific background color of the picture. During the blocking or unblocking handshake process, additional background colors can be defined.

[0036] For the communication between the maintenance track-side terminal MTT and the operator terminal OTT both devices need to have the same information on previously defined working areas WA. Preferably the operator terminal OTT is the only source for the definition of working areas WA. The working areas WA on the maintenance track-side terminals MTT can be updated e.g. by using an USB interface of the maintenance track-side terminal MTT. By using a CRC code it can be ensured that both devices have the same definitions.

[0037] During the startup process of the maintenance track-side terminal MTT (initialization process) the maintenance track-side terminal MTT registers at the operator terminal OTT and verifies the validity of the working area definitions (WA-ID and associated CRC codes). This ensures that the registered maintenance track-side terminal MTT has actual working area definitions after registering and are eligible to communicate with the operator terminal OTT. This allows additionally assigning specific maintenance track-side terminals MTT to specific working areas WA the maintainer is allowed to operate with. If necessary a list of TAN's can be used to authorize a specific maintenance track-side terminal MTT to communicate with the operator terminal OTT.

[0038] The graphical representation of the track layout is created by a standard DMT tool extended by additional functions to assign the sections S1, S2, S3 to the working area WA. This has the advantage that the data used for the configuration of the axle counter evaluator ACE, for the topological pictures and definition of working areas WA (assignment of sections S1, S2, S3 to working area WA) are consistent.

[0039] The maintainer has now the opportunity to check whether the right working area WA is displayed and can send a blocking request to the operator terminal OTT by transmitting a command ID, WA-ID and WA-CRC. The transmitted information is displayed at the operator terminal OTT. The operator terminal OTT can be a standard Windows-based PC system located in the operator's room and operated by the local traffic controller. This operator terminal OTT can be a non-vital PC

[0040] (SIL-0 level) and shows the working area WA in correspondence to the track layout. In case the operator terminal OTT is non-vital it does not show any real time information on the traffic situation. In particular in case of relays interlocking systems or a mechanical interlocking systems the safe display of the interlocking IL cannot display the geographical layout of the working areas WA. Therefore, the monitor of the operator terminal OTT displays a simplified track layout in the same topological arrangement as the safe display of the interlocking IL however including the arrangement of the working areas WA but without displaying any interlocking information. Since the displayed information is static (with the exception of the status of the working area WA) a limited number of GIF pictures can be used to avoid costly display software to display the track layout. These GIF pictures can be generated by a modified version of the DMT.

[0041] The main tasks of the operator terminal OTT are:

- to display the track layout including working areas WA,
- to communicate with the axle counter evaluator ACE, e.g. via Ethernet (for section blocking/unblocking),
- to communicate with the maintenance track-side terminal MTT, e.g. via GSM-R (handshake with the maintenance track-side terminal MTT),
- to act as a master for the working area definitions,
- to hold the translation table for the assignment between sections and working areas WA.

[0042] In case of relays interlocking systems or a mechanical interlocking systems the decision whether a working area WA can be blocked or unblocked is made by the operator by comparing the display of the operator terminal OTT showing the working areas WA with the traffic situation on the safe display of the interlocking IL. The track layout of both devices should be identical (or at least similar). I.e. the operator checks which section is occupied at the moment or will be occupied in the near future. Then the operator decides whether to confirm or to refuse the blocking request. In case of an electronic interlocking system with safe display the above described comparison is not necessary.

[0043] Depending on the actual traffic situation the operator sends a request confirmation (comprising command ID, WA-ID, WA-CRC) or a request refusal to the maintenance track-side terminal MTT. In case of a request confirmation the maintainer is asked to verify the requested working area WA. Verification is carried out again by transmitting command ID, WA-ID, WA-CRC to the operator terminal OTT. The operator terminal OTT determines automatically which sections S1, S2, S3 of the track T belong to the requested working area WA by means of a translation table. The operator terminal hands over the request to the axle counter evaluator ACE by transmitting information concerning the sections S1, S2, S3 which belong to the requested working area WA. Alternatively the operator terminal OTT hands over the request to the axle counter evaluator ACE by transmitting the information concerning the working area WA. In this case the axle counter evaluator ACE determines which sections S1, S2, S3 of the track T belong to the requested working area WA by means of a translation table.

[0044] The axle counter evaluator ACE sets the status of the corresponding sections to "occupied" and sends a section-blocking confirmation to the operator terminal OTT. A soon as all sections S1, S2, S3 of the requested working area WA are confirmed to be blocked the operator terminal OTT sends a WA-blocking confirmation to the maintenance track-side terminal MTT by transmitting WA-ID, WA-CRC and WA-S.

[0045] In the following a possible detailed functional description of the maintenance track-side terminal MTT is shown:

Maintainer	**Software Action**
Maintainer scans RFID-tag or barcode	Transmitted information: WA-ID, CRC code for the graphical file, representing the working area WA. Software scans all definitions for the working areas WA and compares whether the WA-ID corresponds to the stored WA-definitions in the maintenance track-side terminal MTT. If found, the maintenance track-side terminal MTT calculates the CRC code for the stored picture and compares the calculated value with the received CRC from the scanned RFID-tag/barcode. If matching, the picture for the working area WA is displayed on the monitor (in neutral color, e.g. grey). Together with the picture, a button is displayed with the command "Request OTT for blocking".

(continued)

Maintainer	Software Action
Maintainer compares the displayed working area WA with the picture displayed on the local track side terminal LTT and checks whether this is the working area WA he wants to block. If confirmed, the maintainer activates the button "Request OTT for blocking"	The software establishes a link to the operator terminal OTT via GSM-R (or similar) and sends the following information to the operator terminal OTT: Command-ID (Request Blocking), WA-ID, WA-CRC
	After confirmation by the operator terminal OTT, the maintenance track-side terminal MTT receives the command "Confirm Blocking" with the following information: Command-ID (Confirm Blocking), WA-ID, WA-S, WA-CRC. The following integrity check is executed: 1) Compare the received WA-ID with the WA-ID sent for the blocking request 2) Calculate CRC for the GIF defined for the specific WA-ID and WA-S 3) Compare whether all information are matching After checking the integrity the maintenance track-side terminal MTT displays the picture for the specific working area WA according to the status (WA-S), e.g. with yellow background to signal the Maintainer: "Request accepted, please confirm blocking this WA" Together with the picture, a button is displayed with the command "Confirm blocking WA-nn" (nn corresponds to the WA-number)
Maintainer compares the displayed working area WA with the picture displayed on the local track side terminal LTT and re-confirms that this is the WA he wants to block. The maintainer activates the button "Confirm blocking WA-nn"	The maintenance track-side terminal MTT sends the following information to the OTT: Command-ID (Blocking Confirmed), WA-ID, WA-CRC
	Now the operator terminal OTT can initiate blocking of the sections S1, S2, S3 belonging to the working area WA. After completing of the blocking, the operator terminal OTT sends a telegram to the maintenance track-side terminal MTT to confirm the blocking with the following information: Command-ID (WA Blocked), WA-ID, WA-S, WA-CRC. The maintenance track-side terminal MTT executes the described integrity check and displays the corresponding picture (e.g. with red background) on the monitor to signal the Maintainer: "Blocking successful". The software disconnects the link to the operator terminal OTT either after completing the sequence or after a defined timeout (e.g. 5 min). In latter case, the working area WA will then be displayed with status "WA-S undefined".

[0046] For unblocking the working area WA, a corresponding sequence can be applied.

[0047] In the following a possible detailed functional description of the axle counter evaluator communication is shown:

Trigger	Software action
Blocking Request from MTT Communication Module (Information: WA-ID)	The software of the operator terminal OTT reads the section-information from the WA- translation table and sends a blocking request for each section S1, S2, S3 to the axle counter evaluator ACE. Each blocking request will be answered by a "blocking confirmed" telegram from the axle counter evaluator ACE. If all sections S1, S2, S3 are successful blocked and confirmed by the axle counter evaluator ACE, a command "blocking WA confirmed" is sent to the maintenance track-side terminal MTT. In case a section blocking request is not confirmed by the axle counter evaluator ACE, the whole working area WA cannot get blocked and the request needs to be rejected. This means a "Section unblocking" command needs to unblock all already blocked sections and a command "blocking WA not confirmed" is sent to the maintenance track-side terminal communication module.
Unblocking Request from maintenance track-side terminal communication Module (Information: WA-ID)	Similar, however a two-stage procedure shall be implemented in the communication with the axle counter evaluator ACE to avoid that an unblocking command is issued by coincidence.

[0048] In the following a possible detailed functional description of the communication of the maintenance track-side terminal MTT with the operator terminal OTT is shown:

Trigger	Software action
Incoming Request for Blocking	The operator terminal OTT receives the identification for the blocking request (comprising WA-ID and CRC for the WA-ID GIF). Based on the WA-ID it calculates the CRC code and compares it with the received one (validation of request). The requested working area WA is displayed at the display of the operator terminal OTT (maybe with an alarm to wake up the operator) and a window with the request (MTT-ID, caller etc. is displayed) The operator verifies the request by comparing the requested working area WA with the traffic conditions on the safe display of the IL. If all conditions are met, the operator sends a telegram to the maintenance track-side terminal MTT, asking to verify the request. Transmitted information is WA-ID, WA-S, CRC for the GIF. (WA-S and CRC corresponds to the GIF picture (e.g. WA with yellow background)
Incoming Confirmation for Blocking	Status: Blocking request is confirmed by the maintenance track-side terminal MTT (maintainer), which means that the blocking can be executed. The request will be handed over to - and processed by the axle counter evaluator communication module. The request status will be marked as "under process" and the GSM-R communication with the maintenance track-side terminal MTT is kept until the final "WA Blocking confirmed" is successfully transmitted to the MTT. The working area WA on the operator terminal OTT will be marked as "Request confirmed (e.g. yellow background color) which means that the blocking request is under process.
Confirmation "WA is blocked" received from ACE communication module	The requested working area WA will be displayed at the operator terminal OTT monitor as blocked (e.g. with red background color) and a telegram to the MTT is send with WA-ID, WA-S, CRC for the GIF picture "blocked" (e.g. in red color). The GSM-R link to the MTT will be disconnected after successful transmission.

[0049] According to the present invention the status of sections S1, S2, S3 belonging to a requested working area WA is set to "occupied" by the axle counter evaluator ACE. Therefore for the interlocking blocked sections appear to be occupied, i.e. the interlocking IL does not see any difference between an occupied section (section within which a train stays or is expected to be) or a blocked section. Therefore the present invention allows safe and convenient blocking and unblocking of working areas without modifications of the interlocking logic.

Claims

1. Method for blocking a working area (WA) within a railway network,
the working area (WA) comprising one or more contiguous sections (S1, S2, S3) of a track (T) and the railway network comprising an interlocking (IL) and an axle counter with an axle counter evaluator (ACE), wherein the axle counter evaluator (ACE) outputs status information of the sections, and the interlocking (IL) outputs actual traffic information in due consideration of the status information, wherein:

    • a maintainer sends a blocking request for blocking a requested working area (WA) to an operator or an operator terminal (OTT);
    • a decision is made in dependence of the actual traffic situation whether to handover the blocking request to the axle counter evaluator (ACE) or not,
    • in case of a handover a change of the status of all sections of the requested working area (WA) is carried out by setting the status information of said sections to "occupied".

2. Method according to claim 1, **characterized in that** a translation table is used for identifying the assigned sections of the working area (WA).

3. Method according to claim 2, **characterized in that** the operator terminal (OTT) comprises the translation table.

4. Method according to any one of the preceding claims, **characterized in that** the request is sent via a wireless transmission method, in particular via a mobile network (GSM, GSM-R).

5. Method according to any one of the preceding claims, **characterized in that** the request is sent by a handheld device (MTT).

6. Method according to claim 4, **characterized in that** prior to sending the request an RFID-tag or a barcode of a local trackside terminal (LTT) is scanned by means of the handheld device (MTT), wherein the RFID-tag or the barcode respectively identifies a specific working area (WA).

7. Method according to claim 5, **characterized in that** after scanning the RFID signal or the barcode working area specific data (WA-ID, WA-CRC) are displayed at the handheld (MTT).

8. Method according to any one of the preceding claims, **characterized in that** prior to handover the request to the axle counter evaluator (ACE), a request confirmation is sent to the maintainer.

9. Method according to claim 7, **characterized in that** the change of the status of the sections of the requested working area (WA) is carried out not until a verification of the maintainer has been received.

10. Method according to any one of the preceding claims, **characterized in that** after the status of all sections (S1, S2, S3) of the requested working area (WA) have been set to "occupied" a blocking confirmation is sent to the maintainer.

11. Train control system comprising
an interlocking (IL) and an axle counter with an axle counter evaluator (ACE),
an operator terminal (OTT) comprising storage with working area specific data (WA-ID, WA-CRC), the operator terminal (OTT) being adapted to display working areas (WA) in correspondence to a track layout,
a handheld device (MTT) comprising an RFID-tag reader or a barcode reader, a display and a device for communication with the operator terminal;
wherein the operator terminal (OTT) being adapted to act as an interface between the axle counter evaluator (ACE) and the handheld device (MTT), and
a local trackside terminal (LTT) which houses an RFID tag or a barcode.

12. System according to claim 11, **characterized in that** a translation table is stored in the storage of the operator terminal (OTT), the translation table linking sections to specific work areas (WA).

13. System according to any one of the claims 11 through 12, **characterized in that** the interlocking (IL) is relay based.

14. System according to any one of the claims 11 through 13, **characterized in that** the working areas (WA) are stored

in data models.

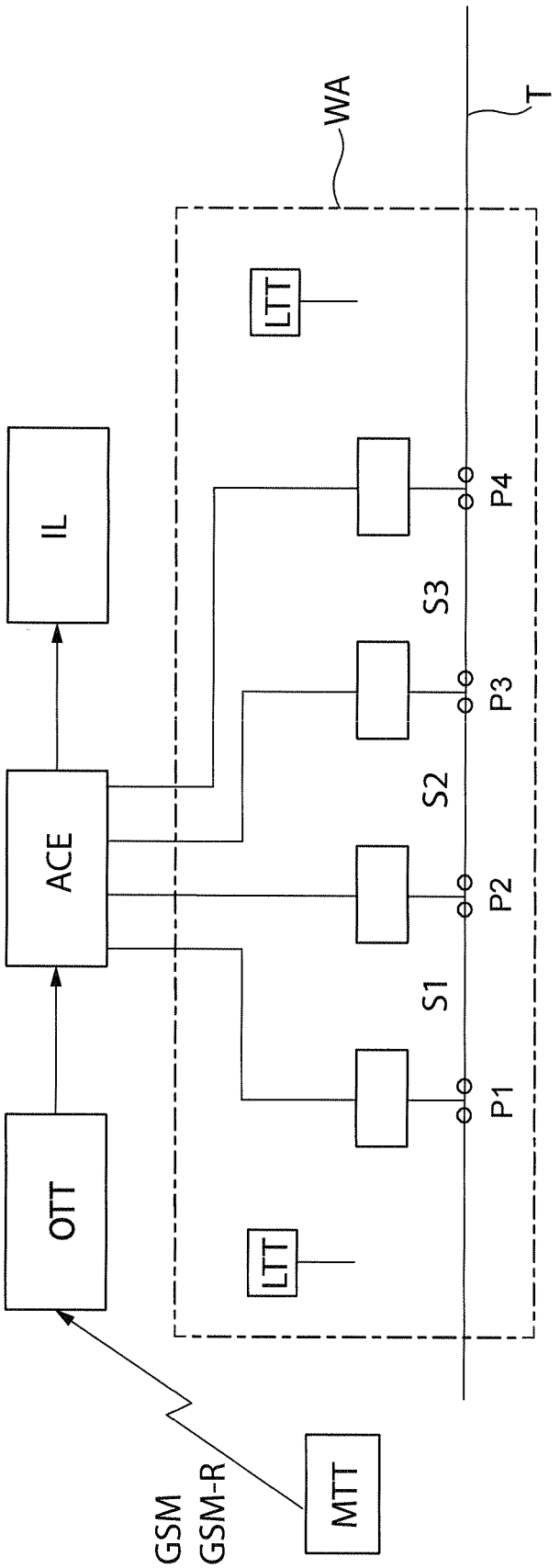

Fig. 1

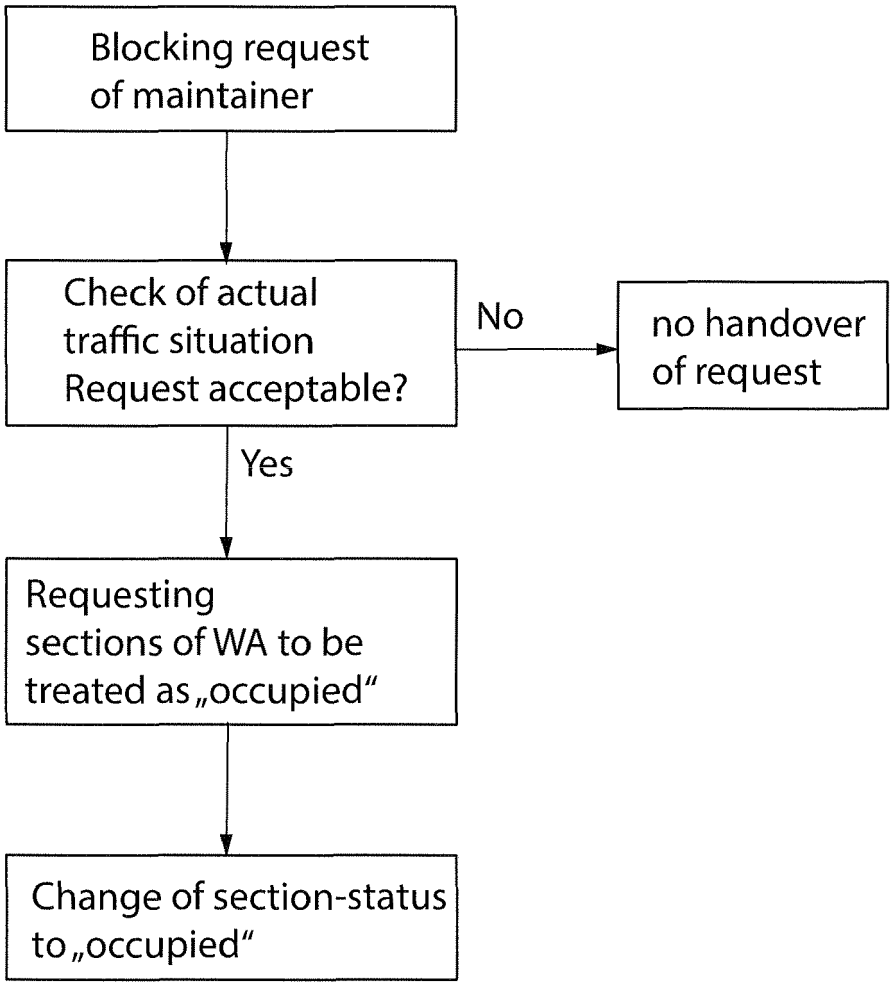
Blocking request of maintainer
Check of actual traffic situation Request acceptable?
No
no handover of request
Yes
Requesting sections of WA to be treated as „occupied"
Change of section-status to „occupied"

Fig. 2

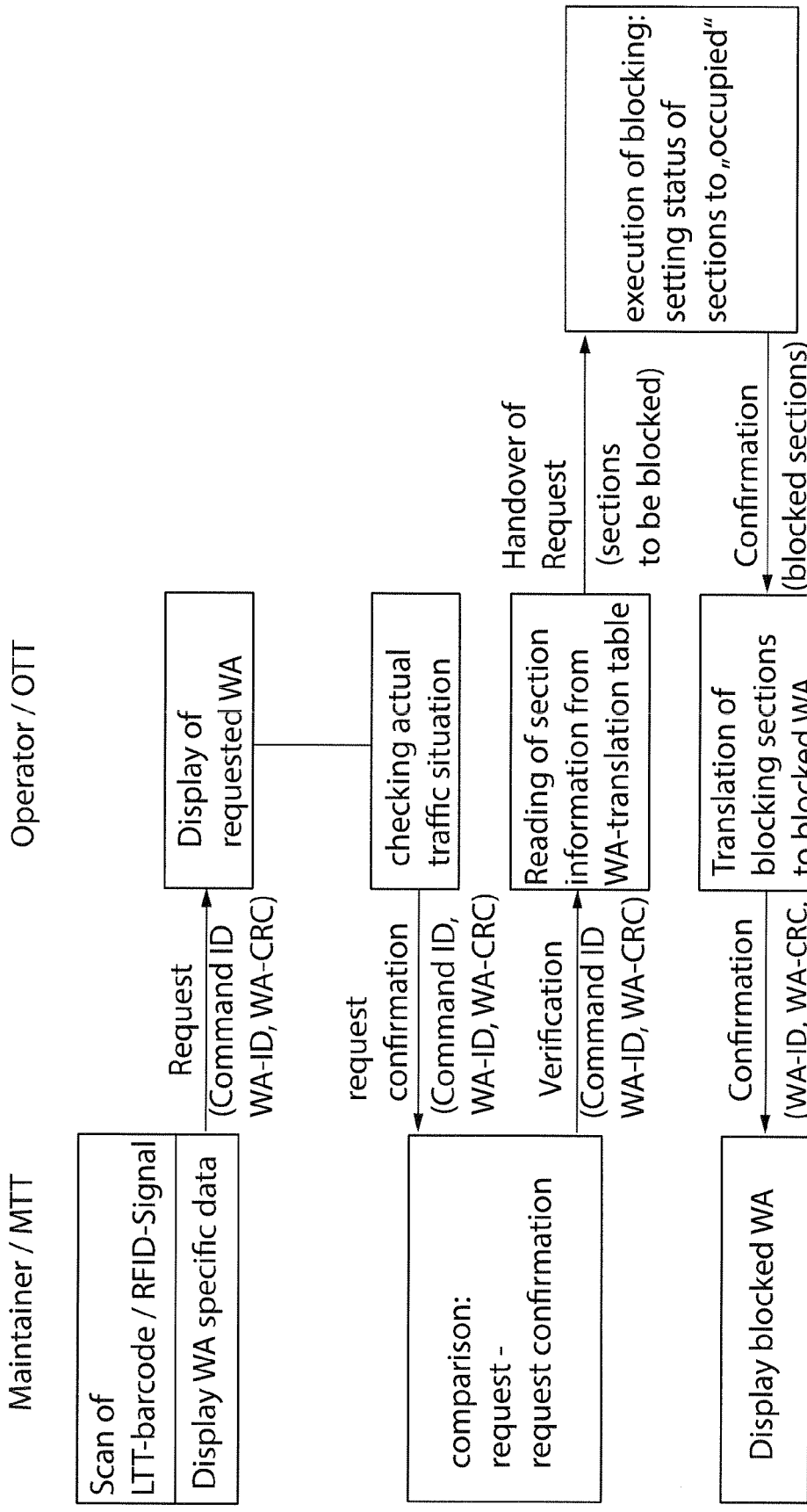
Maintainer / MTT
Operator / OTT
Scan of LTT-barcode / RFID-Signal
Display WA specific data
Request (Command ID WA-ID, WA-CRC)
Display of requested WA
request confirmation (Command ID, WA-ID, WA-CRC)
checking actual traffic situation
comparison: request - request confirmation
Verification (Command ID WA-ID, WA-CRC)
Reading of section information from WA-translation table
Handover of Request (sections to be blocked)
execution of blocking: setting status of sections to „occupied"
Confirmation (blocked sections)
Translation of blocking sections to blocked WA
Confirmation (WA-ID, WA-CRC, WA-S)
Display blocked WA

Fig. 3

Europäisches Patentamt
European Patent Office
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EUROPEAN SEARCH REPORT

Application Number
EP 14 18 8344

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 1 308 366 A1 (CIT ALCATEL [FR] ALCATEL LUCENT [FR]) 7 May 2003 (2003-05-07) * paragraph [0009] - paragraph [0016] * * paragraph [0022] * * paragraph [0027] * * paragraph [0032] - paragraph [0034] * -----	1-14	INV. B61L23/28 B61L1/16 ADD. B61L23/06
A	DIETMAR LITTERSCHEID UND STEFAN WILHELMI: "Lösungen für den technisch unterstützten Zugleitungsbetrieb bei der WEG", 20130401, vol. 105, no. 4, 1 April 2013 (2013-04-01), pages 28-31, XP001580320, * Chapter 4.1-4.2; page 29 - page 31 * -----	1-14	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
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CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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L : document cited for other reasons

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