(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 821 312 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
07.01.2015 Bulletin 2015/02

(51) Int Cl.:
B61L 23/06 *(2006.01)* ***B61L 5/12*** *(2006.01)*

(21) Application number: **14175348.3**

(22) Date of filing: **02.07.2014**

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

(30) Priority: **02.07.2013 NL 1040280**

(71) Applicant: **Dual Inventive Holding B.V.**
5061 KG Oisterwijk (NL)

(72) Inventor: **Van der Poel, Lex Josephus Maria**
5061 PM Oisterwijk (NL)

(74) Representative: **Algemeen Octrooi- en Merkenbureau B.V.**
P.O. Box 645
5600 AP Eindhoven (NL)

(54) **Signaling system for signalling the decommisioning of a subsection of a railway track**

(57) The invention relates to a signalling system for signalling the decommissioning of a zone of a railway track. The signalling system comprises an decommissioning unit which is designed for decommissioning a zone of a railway, a plurality of warning units for providing light signals at a zone of a railway track decommissioned by the decommissioning unit, and a control unit designed for controlling the warning units. The signalling system is characterized in that the warning units are distributed over the length of the zone of the railway track for rendering the decommissioned zone of the railway track visible during operation.

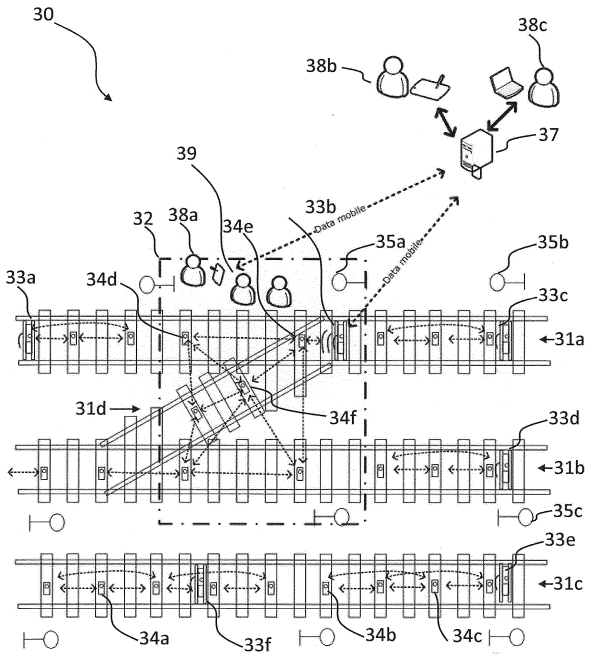

Fig. 3

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Description

[0001] The invention relates to a signalling system for signalling the decommissioning of a subsection of a railway track, comprising an decommissioning unit which is designed for being provided in a subsection of a railway track so as to decommission said subsection, and which decommissioning unit is furthermore designed for communicating with a plurality of warning units which are to give off light signals at a subsection of the railway track decommissioned by the decommissioning unit.

[0002] The invention also relates to an decommissioning unit and a warning unit for a signalling system as indicated above.

[0003] The Dutch rail network comprises many multiple-track railway sections, as do the rail networks in other countries. Railway sections are stretches of railway between two, usually major, railway stations. These railway sections may consist of one track, but they usually comprise a plurality of tracks. If there are more tracks, also denoted multiple track, trains in opposite directions will each have their own track, for example in the case of double track. This is in contrast to single track, where trains in the two directions have to use the same track. Decommissioning units can be used not only for railway sections, but also for signalling in and around railway station areas (rail yards). Wherever the present application mentions railway sections or tracks, therefore, this relates to the use in railway sections between stations as well as to railway station areas or rail yards.

[0004] In addition to single and double tracks there are railway sections in which three or even four tracks run parallel to one another, and at least in the Netherlands there are six-track railways in some locations.

[0005] Since the rail network is intensively used, it requires regular maintenance. Parts of a section may be taken out of service in order to carry out this maintenance safely. Train detection systems such as, for example, an electric current detection, in particular low-frequency electric current detection, may be used not only for detecting trains and signalling a zone as being occupied on the basis thereof by switching the signal to red, but also for simulating a train and thus signalling the zone as being occupied, so that maintenance can be carried out in the zone thus decommissioned.

[0006] As mentioned above, a railway section may comprise a plurality of tracks, each track being formed by two parallel rail bars. The sections are subdivided lengthwise into a number of zones. Each zone comprises one or several signals for providing information and granting clearance, as applicable, to a train driver. Said zones may be different in length and may be built up from several subsections. These subsections are mutually electrically separated. Each subsection comprises a power supply at one end by means of which a voltage can be applied across the rail bars. At the other end a relay is connected between the rail bars. This relay is energized by the power supply and held in this energized state as long as the circuit is not broken and the supply remains active. In this stable situation, the signal for the trains is green, indicating that a train is allowed to enter this zone.

[0007] The moment a train enters the section, its axles and wheels will cause a short-circuit between the two rail bars. This short-circuit ensures that the relay is no longer energized and accordingly releases. This release of the relay causes the signal to switch to red and the relevant zone of the railway section will be signalled as being occupied. Other trains are not allowed to enter the zone as long as the signal of this zone is red and the zone is marked as occupied.

[0008] The moment maintenance work is to be carried out on a rail track, an existing detection system as described above is often employed for signalling a zone of the rail track as occupied and setting the signal to red. This is done according to the above example in that a train is simulated in the subsection of the rail track by providing a short-circuit bridge between the two rail bars. This has the result that the circuit is short-circuited in the same manner as by the presence of a train, so that the relay releases, the signal switches to red, and the zone is marked as occupied: this is called "decommissioning" or "taking out of service".

[0009] The simulation of a train by short-circuiting is achieved with a so-termed short-circuiting bridge. Such a short-circuiting bridge is known, for example, from NL 1033077 from the same applicant as the present application. The short-circuiting bridge disclosed therein consists of a plurality of arm parts in parallel that bring the two rail bars into electrical contact with one another. Said bridge is thus not dependent solely on the electrical resistance of one arm, but the bridge continues to short-circuit the rail bars also if the electrical contact of one of the arms should fail.

[0010] NL 1033581, also from the same applicant as the present application, discloses a short-circuiting bridge which is designed for being activated by remote control so that a zone can be signalled as occupied from a distance.

[0011] It is possible to switch such a short-circuiting bridge on and off by remote control. The short-circuiting bridge can accordingly remain present in the relevant subsection and an decommissioning can be effected by remote control whenever work is to be carried out. This has the advantage not only that a central control becomes possible thereby, but also that the time required for mounting the short-circuiting bridge and realizing the decommissioning in situ is no longer lost.

[0012] Such a short-circuiting bridge ensures that the zone of the rail track is taken out of service. It is thus safe for the railway workers to carry out work in this zone of the rail track as long as the short-circuiting bridge provides a short-circuit and thus creates a safe zone for the railway workers.

[0013] Since it is not immediately visible whether a remote controlled short-circuiting bridge is switched on or

not, such a bridge is usually provided with indicator means for displaying the status of the bridge. A known example is that of a lamp incorporated in the bridge.

[0014] The increasingly busy traffic over the rail network steadily increases the pressure as regards a shortening and more efficient performance of the maintenance work. A major portion of the trains is used for passenger transport, so the frequency of use of the rail network is higher during the day than at night. Many maintenance jobs are accordingly carried out during the night. Prior to the performance of these jobs, a plan is made as to which subsection's turn it will be for maintenance to be carried out. The zone comprising the relevant subsection or subsections is decommissioned before the work is started. When the maintenance workers arrive at the site, it is often difficult to determine exactly which portion of the railway section has been taken out of service, especially at night in the case of often badly lit portions of the rail track and in particular in or adjacent complicated portions of the railway system such as stations, shunting yards and other such places. Even if a short-circuiting bridge is provided with a light source, it will only be clear in the vicinity of the short-circuiting bridge that such a bridge was placed there. The exact contours of the safe zone, however, cannot be derived therefrom.

[0015] An object of the invention is to provide a solution to the problems outlined above and, according to a first aspect of the invention, provides a signalling system for signalling an decommissioning of a zone of a rail track. The signalling system comprises a plurality of warning units, each for providing a light signal at an decommissioned zone of a rail track, and a control unit which is designed for controlling the plurality of warning units. The signalling system is characterized in that the warning units are distributed over the length of the zone of the rail track during use so as to render visible the decommissioned zone of the rail track.

[0016] The signalling system is capable of rendering clearly visible which portions of the rail track belong to the safe decommissioning zone and which do not, thus ensuring the safety of the maintenance workers.

[0017] Prior art signalling systems are only capable of signalling the decommissioning itself, by an acoustic warning signal or by a visual warning signal, or a combination of the two. In situations where there are several tracks, however, such as in the frequently occurring multiple-track railways referred to above, it is often unclear which of the tracks has been decommissioned. This may yet be observed in the direct vicinity of a short-circuiting bridge, but farther away in the zone it is difficult to determine exactly which section was decommissioned. In the dark it becomes even more difficult than during the day to ascertain which section was decommissioned.

[0018] Given the present state of the art of signalling systems, moreover, it is not clear where exactly the zones begin and end. If one zone was decommissioned and a maintenance worker carries out maintenance work on the rail track at some distance to from the short-circuiting bridge, it is quite possible that he is present in an adjoining zone of that rail track, which zone is not out of service. It is practically impossible for the relevant maintenance worker to establish the end of a zone, especially in the dark.

[0019] The signalling system according to the present invention does not have this disadvantage because the system is provided with a plurality of warning units that give off light signals, which units are distributed with certain mutual intervals over the length of that zone of the rail track that was decommissioned. Since the control unit is designed for controlling the warning units, it is capable of controlling only those warning units that are located in the relevant zone of the rail track. A portion of the rail track is thus illuminated corresponding to the portion or zone that has been decommissioned. As long as they remain within the illuminated portions of the rail track, the railway workers can be sure that they are working in the safe zone and that their safety is accordingly guaranteed.

[0020] The control unit forms part of the signalling system and may be constructed as a separate module that controls the warning units independently of the decommissioning unit. Said control unit, however, may alternatively be integrated into the decommissioning unit, or be included therein in such a manner that it can be taken out as an independent module.

[0021] In the various embodiments, a short-circuiting bridge is taken as an example of an decommissioning unit suitable for the invention with reference to which the invention can be readily elucidated. However, a short-circuiting bridge is merely a non-limitative example of an decommissioning unit suitable for use with an electric current system. Alternative decommissioning units operating by different principles, for example by means of a detection loop and the like, are equally well suitable. Those skilled in the art will understand from the present document which alternative decommissioning units are further known and suitable.

[0022] The signalling system according to the invention is accordingly designed such that the decommissioning signal may originate not only from an decommissioning unit (which may or may not form part of the signalling system), but also from some other source, for example from a process between a traffic control unit and a train control unit, where the train control unit passes on the message that a rail track or zone thereof is out of service. It is subsequently possible on the basis of this message to activate the signalling system, so that the warning units start giving light signals indicating that the relevant zone of the rail track (or the entire track) is out of service.

[0023] In a preferred embodiment, the signalling system according to the invention comprises at least one decommissioning unit for taking the zone of the rail track out of service, and the plurality of warning units are designed for giving off a light signal when the decommissioning unit takes the zone out of service.

[0024] In a further embodiment, the control unit is de-

signed for activating all warning units which are arranged in a zone of the rail track into giving the light signal when said zone is taken out of service.

[0025] Major portions of a railway track, if not the entire rail track, will be provided with warning units, and the control unit is capable of judging which of these warning units belong to the zone in which the decommissioning unit is present. When the decommissioning unit is triggered into inactivating the zone, the control unit will activate only those warning units that belong to this same zone so as to make the safely decommissioned zone visible.

[0026] In a specific embodiment, the control unit is integral with the decommissioning unit.

[0027] The decommissioning unit is equipped with the control unit in a practical embodiment. In a modular embodiment, however, the control unit may alternatively be constructed as a separate unit that controls the warning units independently of the decommissioning unit. With such a configuration, a user may use the control unit for activating all warning lights of a zone into emitting light when taking this zone of a rail track out of service. This may also take place automatically, for example in that the control unit is designed for detecting which zone is nearest by measuring the signal strength of one of the warning units, for example. The zone to which the warning unit having the greatest strength belongs may thus be automatically activated by the control unit in the case of an decommissioning of a zone. The control unit in a less autonomous version is designed for activating the warning units in response to a manual operation.

[0028] In an alternative embodiment, the control unit and the warning units are designed for communicating with one another in a wireless manner, in particular they are designed for an ad hoc network configuration.

[0029] Ad hoc networks are networks with a decentralized structure. This may be a wire-bound network, but in general it will more often be a wireless network. The decentralized structure makes the network adaptive, i.e. it can be active in various configurations. It is not a certainty that, for example, all nodes in such a network communicate with one another and with elements outside the network via one central node. All elements in a signalling system according to an embodiment of the invention can be regarded as nodes, i.e. not only the one or more control unit(s) or decommissioning unit(s), but also the various warning units.

[0030] The ad hoc configuration renders it possible for connections to be established not only between the warning units and the control unit or the decommissioning unit comprising the control unit, which acts as a so-called master node, but it is also possible for a connection to be established between warning units. Thus the power required for the wireless communication can be reduced. This is because it is not necessary for a warning unit at the end of a rail track zone to have a sufficient power for communicating with a control unit at the beginning of the respective zone. It suffices in such an ad hoc configuration to limit the transmission power to that which is necessary for communicating with an adjoining warning unit. The latter can subsequently communicate with its adjoining warning unit, and so on, until a connection with the control unit has been achieved.

[0031] The transmission power can be reduced in this manner to such an extent that a minimum supply suffices for long-term operation, especially in combination with energy efficient LED (Light Emitting Diode) lighting.

[0032] Another advantage of such a wireless ad hoc configuration is that adjoining zones can also be addressed since the warning units are not limited to communication with one master node control unit or one control unit comprising the decommissioning unit belonging to the relevant zone, but they can also communicate with adjoining control units or decommissioning units and with adjoining warning units and can accordingly be controlled thereby.

[0033] In a specific embodiment, the decommissioning unit and the warning unit are designed for Personal Area Network (PAN) communication, in particular wireless PAN communication.

[0034] A personal area network is a computer network that is used for short range communication between devices such as computers, telephones and other mobile communication equipment. The communication often takes place in accordance with the Institute of Electrical and Electronics Engineers, IEEE, standard 802.15. The wireless communication may be effected by means of Bluetooth or, for example, infrared. Examples of such wireless PAN systems are Z-wave, 6loWPAN and Zigbee, but the signalling system is not designed for operating only in accordance with these systems; those skilled in the art will understand which other PAN systems are also suitable.

[0035] In a next embodiment, the control unit is further designed for communicating with a central processing unit so as to enable the central processing unit to inactivate the zone by remote control.

[0036] As was noted above, the communication between the control unit or the decommissioning unit comprising the control unit and the warning units as well as that among the warning units can take place in a wireless manner via a wireless area network or personal area network. The control unit is the master node herein and the warning units are the slave nodes of the network. Usually, however, communication does not take place directly with the master node but via a central processing unit or server. This server enables (authorized) users via an internet link to address the control unit and thus take a zone of a rail track out of service by remote control. The communication between the central processing unit and the control unit usually takes place via a mobile data network. Examples of such networks are 2G GSM networks, 2,5G GRPS or EDGE networks, but also 3G UMTS, HSDPA, or LTE networks. The system, however, is not limited to the above networks and those skilled in the art will realize that the system is also suitable for future networks

such as 4G LTE Advanced networks and the like.

[0037] The central processing unit and the control unit are located at some distance to one another in the above example. In particular, the control unit is present in the decommissioning unit in the railway whereas the central processing unit is in a data centre located at a distance thereto. In an alternative embodiment, however, the central processing unit may be present close to the decommissioning unit. If there are, for example, further communication or control systems present adjacent the subsection, for example control means for the European Train Control System, ETCS, the central processing unit may be accommodated in the housing thereof or may even be integrated therewith. Communication between the control unit and the central processing unit in that case takes place over a short range and may be realized by means of a wireless area network or personal area network, whereas communication from that point onwards is realized by a mobile network.

[0038] In yet another embodiment, at least one of the warning units is incorporated in the decommissioning unit.

[0039] At least one of the warning units is incorporated in the decommissioning unit in an integral system, the control unit being integral with this decommissioning unit. In a fully integrated system, rail tracks are provided with at least one decommissioning unit for each zone, accommodated in or on one of the crossbars between the two rail bars, and at least a plurality of warning units are included for each zone, either integrated into the crossbars or fixed to a rail bar. In an optimum configuration there are at least so many warning units included per zone that always at least a number of warning units of that zone are visible. This means in a practical embodiment that there is present one warning unit at approximately every third crossbar. In another embodiment, the decommissioning unit may be arranged in the vicinity of the rail track, for example immediately next to the rail track or in a housing that is present already adjacent the rail track, such as a control box.

[0040] In a further embodiment, the warning units each comprise at least one light emitting diode element, and in another embodiment said light emitting diode is designed for emitting light with an on/off switching frequency lying in a range of 0.5 to 5 Hz, in particular 1 to 3 Hz, and more in particular 2 Hz.

[0041] LED elements have the favourable property that they emit much light while being nevertheless very energy efficient. This renders them eminently suitable for devices that are not connected to a mains supply, such as the warning units of a signalling system according to an embodiment of the invention.

[0042] The flickering effect of the LED elements enhances their visibility, since flickering light strikes the eye more strongly than continuous light. The light may be green in an embodiment, indicating a safe zone, but alternatively also red, which is more usual for alarm signalling, while other variations such as blue, yellow, etc. are also possible.

[0043] In a next embodiment, each warning unit comprises a unique code, and the control unit controls the warning units on the basis of their respective unique codes.

[0044] In an ad hoc configuration, the control unit may be designed for issuing a broadcast message which includes a command to activate the warning units. If all warning units have their respective unique codes, however, the message may be coded such that those unique codes are incorporated therein that are to be activated, i.e. of those warning units that belong to the same zone as the decommissioning unit. The control unit is thus capable of sending a broadcast activation message, and the warning units can pass on this message via the ad hoc configuration among themselves, each warning unit being capable of determining whether it is to be activated or not by matching the coded message against its own unique code.

[0045] In a second embodiment, a decommissioning unit is provided designed for use in a signalling system according to one of the above descriptions.

[0046] In a third embodiment, a warning unit is provided designed for use in a signalling system according to one of the above descriptions.

[0047] In a fourth embodiment, a control unit is provided designed for use in a signalling system according to one of the above descriptions.

[0048] The invention will be explained in more detail below with reference to the figures, in which:

Figures 1a and 1b are situation sketches of a subsection of a railway track protected by a railway safety system;

Figure 2 shows a decommissioning unit for use in an embodiment of a signalling system according to the invention; and

Figure 3 diagrammatically shows a signalling unit according to an embodiment of the invention.

[0049] Corresponding components have been given the same reference numerals in the ensuing description of the figures for a better understanding of the invention.

[0050] Figure 1a shows a railway track built up from consecutive rail track subsections 1_{-1}, 1, 1_{+1}, etc. Each zone of a railway may comprise one, or usually several rail track subsections 1_{-1}, 1, 1_{+1}, etc. The railway track composed of the individual subsections is constructed from rail bars 2a-2b placed on crossbars 3. The consecutive rail track subsections are separated from one another by insulating coupling bridges 4 provided in one rail bar or, as shown in the figure, in both rail bars 2a-2b.

[0051] Each rail bar subsection 1_{-1}, 1, 1_{+1}, etc. is provided with an electric current loop by means of which it can be ascertained whether a train is present in the relevant subsection. To achieve this, the electric current loop of each rail track subsection comprises a power source 5 which is connected to the rail bars 2a and 2b

by connections 5a and 5b, respectively. At the opposite side of the rail track subsection there is a railway or release relay 6 which is also electrically connected to the two rail bars 2a and 2b of the relevant subsection via connections 6a and 6b, respectively.

[0052] In the situation shown in figure 1a, there is no train in the subsection 10, which means that the voltage applied (by the voltage source 5) across the two rail bars 2a-2b ensures that the (magnetic) relay 6 is energized. This situation has the effect that the railway signals belonging to the relevant zone comprising this rail track subsection are green and the railway protection system allows trains to enter this zone with the rail track subsection 10.

[0053] Figure 1b shows the situation where a train 7 moving from left to right enters the rail track subsection 10. The axles 7a of the train short-circuit the two rail bars 2a-2b, so that a current will flow from the voltage source 5 through the connection 5a, the rail bar 2a, the axles 7a, the other rail bar 2b and the connection 5b back into the voltage source 5. The result is that there is less, or substantially no current flowing through the relay 6 anymore, so that the latter releases. This situation is shown in figure 1 b.

[0054] The release of the relay 6 owing to the short-circuit created between the two rail bars 2a-2b causes the railway signals of the zone comprising the relevant rail track subsection 10 to switch to red. Switching to red of the railway signals signifies that the relevant zone is partitioned off and signalled as being occupied, i.e. it is not accessible to further rail traffic for the time being.

[0055] Such a short-circuiting of the rail track subsection 10 by a passing train 7 can be simulated by means of a "simulation train" in the form of an decommissioning unit or short-circuiting bridge in the event of maintenance work in the relevant rail track subsection.

[0056] Short-circuiting bridges are available in various embodiments. Thus a short-circuiting circuit according to the present state of the art is known which is mechanically mounted between the rail bars and causes a short-circuit when mounted. This bridge may or may not be fitted with a safety system which measures the resistance across the short-circuiting bridge so as to ensure the short-circuit between the two rail bars.

[0057] Figure 2 shows an electrical short-circuiting circuit according to the state of the art which is provided with means 24 for switching it on and off by remote control. The short-circuiting bridge 20 consists of two arm parts 21 a and 21 b which are interconnected by a hinge 22. The bridge can be placed between two rail bars 2a-2b by means of this hinge, for example in that some pressure is exerted thereon from above with a foot. The bridge will then be secured between the rail bars in a stable manner.

[0058] The bridge 20 in the embodiment shown comprises two contact portions 23a-23b by means of which the bridge is brought into electrical contact with the respective rail bars 2a-2b. The two arms of the bridge, however, are not in continuous electrical contact with one another, but they can be switched on and off either through an operation on the bridge itself or by a communication module via remote control.

[0059] When the short-circuiting circuit 20 is switched on, it will bring the first rail bar 2a into electrical contact with the second rail bar 2b. The relevant zone of the rail track will be taken out of service thereby in that it is signalled as occupied, and the signal is switched to red. In a specific embodiment the bridge further comprises a test module 25 for monitoring the short-circuit resistance between the two rail bars.

[0060] The short-circuiting bridge shown in figure 2 is constructed as a portable short-circuiting bridge. This means that it can be removed and used again elsewhere for inactivating a zone of a rail track. In an alternative embodiment it may be integrated in a crossbar of the rail track and thus be permanently included in the subsection. In yet another embodiment it may be accommodated adjacent to the rail track, for example in a control box already present next to the track.

[0061] The short-circuiting bridge 20 is capable of communicating with a central processing unit by means of a communication module 24 for passing on, for example, the short-circuit status which is to be communicated to a control room. The communication module can also receive a command via the central processing unit for switching the short-circuiting bridge on and off by remote control.

[0062] Figure 3 shows an example of a signalling system 30 according to an embodiment of the invention. Three rail tracks are shown therein by way of example: tracks 31a, 31b and 31c. An additional track 31 d is present between the tracks 31 a and 31 b to enable trains to change track.

[0063] A short-circuiting bridge is shown by way of an example of a decommissioning unit for a better understanding of the invention. The invention, however, is also applicable to alternative decommissioning units capable of signalling a zone of a rail track as occupied so that this zone must not be entered by trains anymore. The following embodiments, furthermore, relate to a short-circuiting bridge comprising a control unit designed for controlling the warning units. In an alternative embodiment, the short-circuiting bridge or other decommissioning unit and the control unit may be operational in different housings independently of one another.

[0064] Each rail track 31a-31d comprises a plurality of rail track subsections 1_{-1}, 1, 1_{+1}, etc. corresponding to the subsections 1_{-1}, 1, 1_{+1}, etc. shown in figure 1. Each zone comprises one or more subsections and has at least one signal 35a, 35b, etc. which is red in the case of a blocked zone, i.e. a zone that is not accessible because a train is present therein or where maintenance work is being carried out for which the zone has been taken out of service. The signal may also be green, which indicates that the zone is free and a train may enter the zone.

[0065] A dash-dot line in figure 3 indicates a zone 32

which in this example comprises a number of subsections. Figure 3 further shows a number of short-circuiting bridges 33a, 33b, 33c, etc. Each zone, such as the zone 32, has at least one short-circuiting bridge for decommissioning a subsection of this zone and thus the zone itself. Figure 3 further shows various warning units, here represented as lamp units 34a, 34b, 34c, etc. These lamp units are also present in the various subsections of a zone. Each zone thus has at least one short-circuiting bridge and a plurality of lamp units.

[0066] Since the short-circuiting bridge is capable of communicating with the various lamp units, it can switch them on in the case of decommissioning. The lamp units will accordingly emit light and the decommissioning is made visible.

[0067] In the example shown, the short-circuiting bridge is capable only of activating those lamps that belong to the same zone, i.e. that are physically present in the same geographical area of the zone of the rail track as the activated short-circuiting bridge, for example the zone 32 bounded by the dash-dot line in figure 3. As a result, only the lamps of the lamp units belonging to this same zone will light up. This renders visible the contours of the subsection 32 and maintenance workers 39 present in situ can clearly discern which zone 32 is safe and where the safe zone ends, i.e. up to where they can carry out work.

[0068] The arrows between the various lamp units indicate the communication channel. This implies that in this embodiment there is no conventional star network configuration in which one central node of the network maintains communication with all individual nodes. This embodiment comprises an ad hoc network in which the nodes can also communicate with one another and thus pass on control and data messages to neighbouring nodes. This has the advantage that the transmission power of the nodes can be considerably reduced and that communication can take place, for example, in accordance with IEEE 802.15 instead of the more usual IEEE 802.11 standard. The lamp units require batteries of smaller capacity as a result of this and their operational life is considerably longer.

[0069] The short-circuiting bridges are further provided with a communication module for communication via a mobile data network, which renders possible communication with a server 37 in a different location. An example of such a server is an MTinfo 3000 system which is available from the present applicant. The server will often be located in a data centre and enables managers 38a, planners and work safety officers 38b, but also workers in situ 38a to switch the short-circuiting bridges on and off by remote control via the server 37 and a web interface or alternative portal.

[0070] In the embodiment shown in figure 3, the various lamp units are provided with LED modules for emitting green, red, blue or other light. This may be a continuous radiation, but in a practical embodiment the light flickers with a frequency of approximately twice per second so as to provide a clear distinction between the safe and the unsafe zone.

Claims

1. A signalling system for signalling a decommissioning of a subsection of a railway track, comprising
a plurality of warning units for providing a light signal at a decommissioned zone of a rail track, and
a control unit arranged for controlling the plurality of warning units, **characterized in that** the warning units are distributed during use over the length of the zone of the rail track so as to render visible the decommissioned zone of the rail track.

2. A signalling system according to claim 1, further comprising:

   an decommissioning unit designed for decommissioning a zone of a rail track, wherein the plurality of warning units give off a light signal when the decommissioning unit decommissioned the zone.

3. A signalling system according to claim 2, wherein the control unit is designed for activating all warning units which are arranged in a zone of the rail track into giving the light signal when said zone is decommissioned.

4. A signalling system according to claim 3, wherein the decommissioning unit comprises the control unit.

5. A signalling system according to any one of the preceding claims, wherein the control unit and the warning units are designed for communicating with one another in a wireless manner, in particular wherein the control unit and the warning units are designed for an ad hoc network configuration, and more in particular wherein they are designed for personal area network communication or wireless personal area network communication.

6. A signalling system according to any one of the preceding claims, wherein the decommissioning unit is further designed for communicating with a central processing unit so as to enable the central processing unit to decommission the zone by remote control.

7. A signalling system according to claim 6, wherein the central processing unit is designed to be incorporated in at least on of close to or remote from the decommissioning unit.

8. A signalling system according to any one of the preceding claims, wherein at least one of the warning units is incorporated in the decommissioning unit.

9. A signalling system according to any one of the preceding claims, wherein the warning units and the decommissioning unit are accommodated in separate housings.

10. A signalling system according to any one of the preceding claims, wherein one of the warning units or the decommissioning unit can be fixedly fastened to a rail bar of the rail track or to a crossbar between two rail bars.

11. A signalling system according to any one of the preceding claims, wherein the warning units each comprise at least one light emitting diode element, which light emitting diode element is designed in particular for emitting light with an on/off switching frequency lying in a range of 0.5 to 5 Hz, in particular 1 to 3 Hz, and more in particular 2 Hz.

12. A signalling system according to any one of the preceding claims, wherein each warning unit comprises a unique code, and the control unit controls the warning units on the basis of their respective unique codes.

13. An decommissioning unit designed for use in a signalling system according to any one of the preceding claims.

14. A warning unit designed for use in a signalling system according to any one of the preceding claims 1 to 12.

15. A control unit designed for use in a signalling system according to any one of the preceding claims 1 to 12.

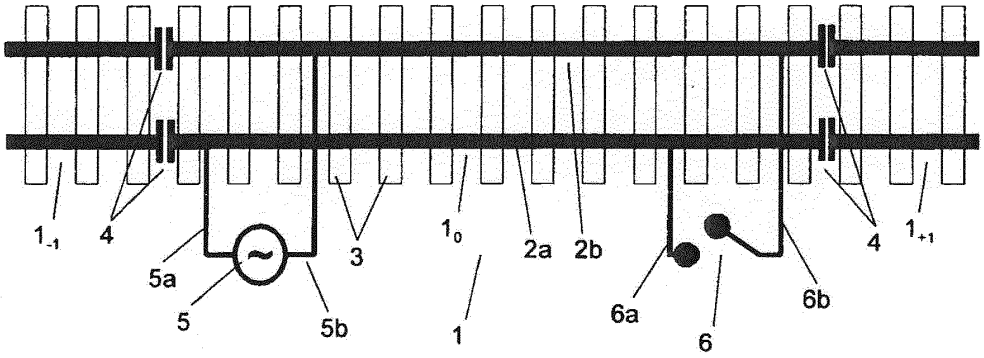
1-1
4
5a
5
5b
3
10
1
2a
2b
6a
6
6b
4
1+1

Fig. 1a

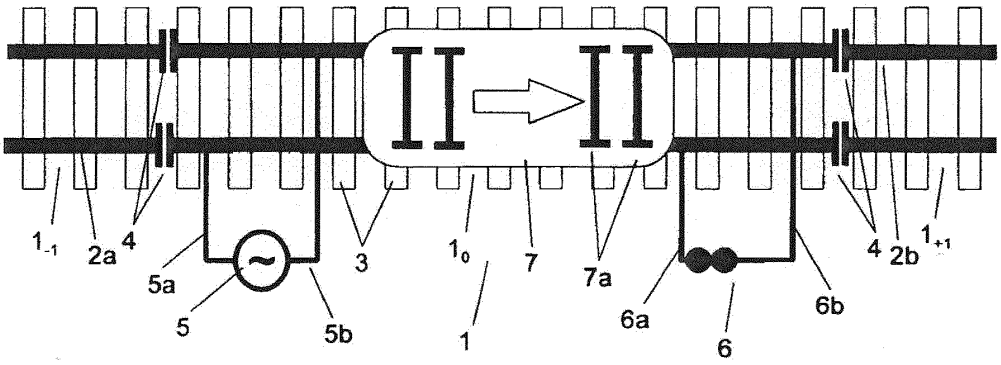
1-1
2a
4
5a
5
5b
3
10
1
7
7a
6a
6
6b
4
2b
1+1

Fig. 1b

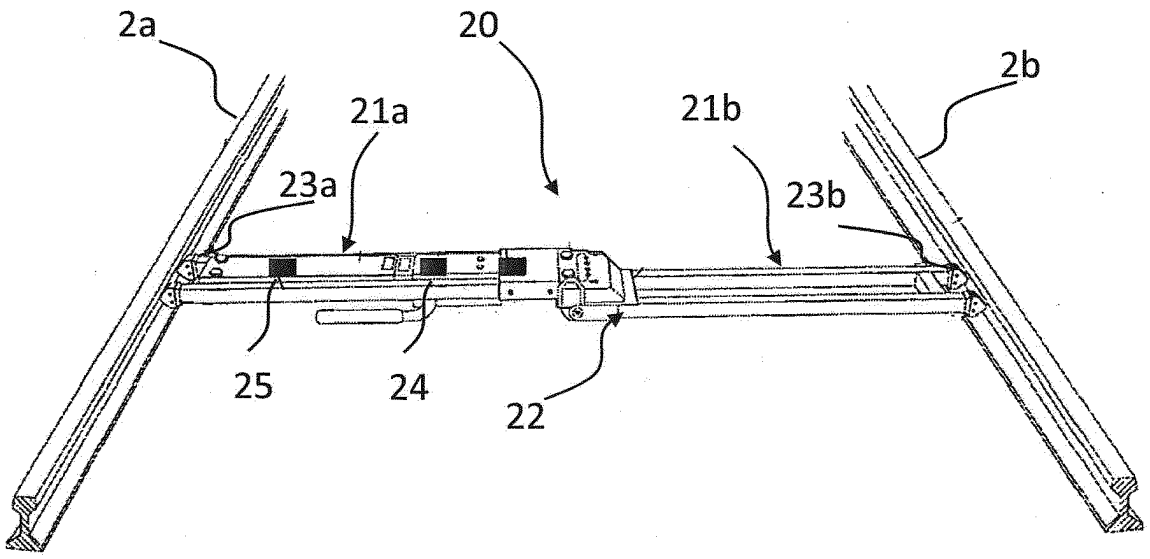

Fig. 2

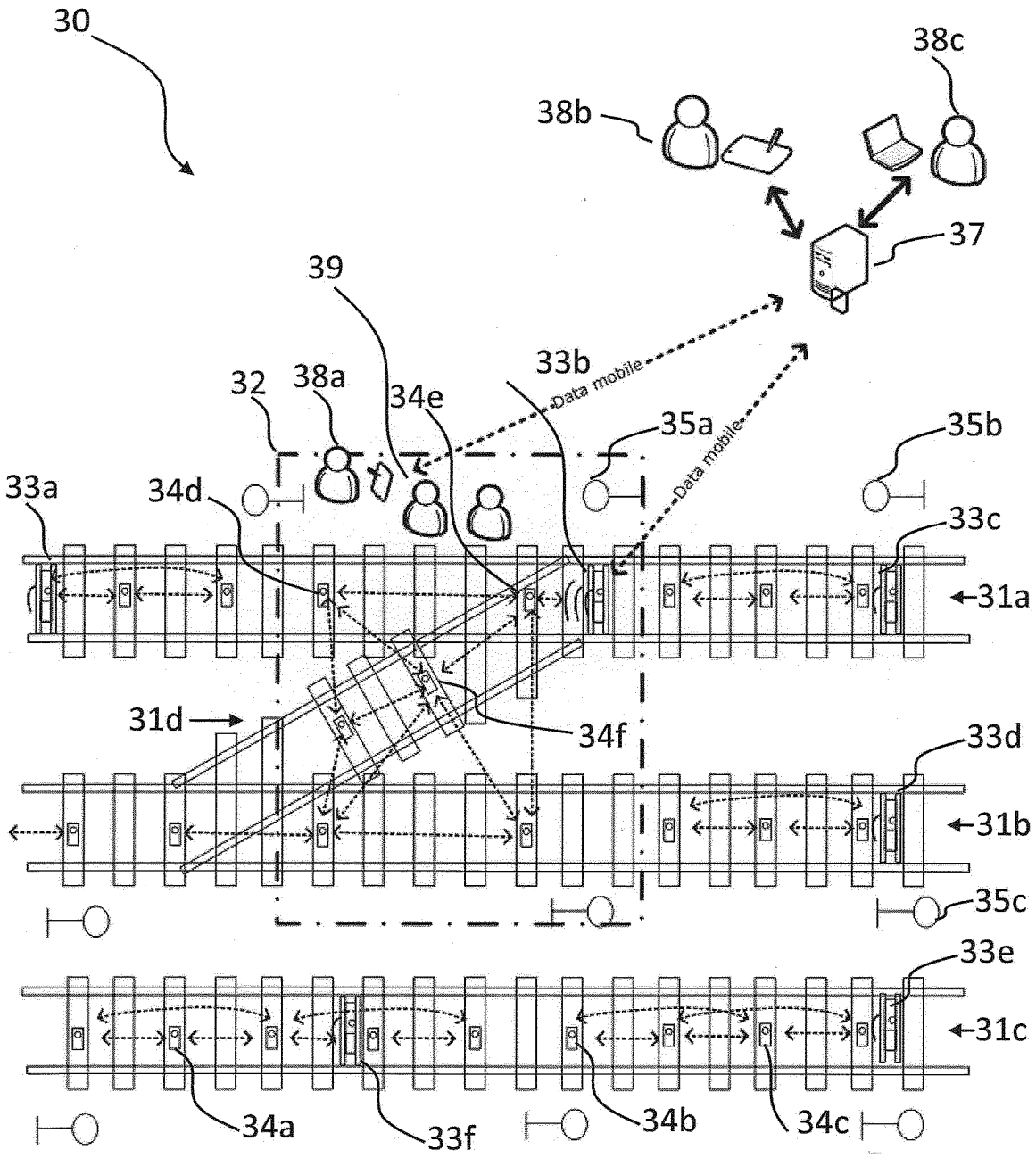
30
38c
38b
37
39
33b
Data mobile
32
38a
34e
35a
Data mobile
35b
33a
34d
33c
31a
31d
34f
33d
31b
35c
33e
31c
34a
33f
34b
34c

Fig. 3

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EUROPEAN SEARCH REPORT

Application Number
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Place of search	Date of completion of the search	Examiner
Munich	30 October 2014	Massalski, Matthias

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EUROPEAN SEARCH REPORT

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Place of search	Date of completion of the search	Examiner
Munich	30 October 2014	Massalski, Matthias

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