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12
 13 **UNITED STATES DISTRICT COURT**
 14 **NORTHERN DISTRICT OF CALIFORNIA**
 15 **SAN JOSE DIVISION**

16 RAILWARE, INC.,

17 PLAINTIFF,

18 v.

19 PENINSULA CORRIDOR JOINT
 POWERS BOARD D/B/A CALTRAIN,

20 DEFENDANT.

Case No.

COMPLAINT

DEMAND FOR JURY TRIAL

21
 22 Plaintiff Railware, Inc. (“Railware” or “Plaintiff”) files this Complaint against Defendant
 23 Peninsula Corridor Joint Powers Board d/b/a Caltrain (“Caltrain” or “Defendant”) and alleges as
 24 follows:

25 **INTRODUCTION**

26 1. This lawsuit concerns Caltrain’s willful and deliberate infringement of Railware’s
 27 patents.

28 2. Railware produces one of the premier centralized train traffic control products in

the world, Dispatch X. Included in Railware’s Dispatch X is its patented safety technology, the Enhanced Employee Protection System (“EEPS”). Railware’s Dispatch X with EEPS functionality is designed to ensure the safety of track workers (also referred to as “railway field workers,” “roadway field workers,” or the like) that must enter onto tracks to perform maintenance and repairs, as well as to prevent damage to equipment and/or property. During track work, trains are typically blocked from traversing sections of tracks that have railway field workers on them. But like all human-controlled systems, these systems are subject to operator error, which can result in serious injury or death to railway workers, as well as damage to equipment and/or property. Railware’s patented safety technology places the power to remove a block on a specified segment(s) of track that prevent trains from being routed into the blocked area in the hands of the railway field worker on the tracks in the form of a code, thereby preventing the dispatcher/CTC system from prematurely, errantly or mistakenly lifting a block and ultimately saving lives and preventing injury of railway field workers, and preventing damage to equipment and/or property.

3. Railware holds, *inter alia*, a federally registered trademark in “EEPS,” as well as a common law trademark in the EEPS and/or “Enhanced Employee Protection System” marks/designations.¹ Railware’s first use of these marks in commerce was no later than November 2013.

4. Railware’s products, including Railware’s Dispatch X with EEPS functionality, are used on some of the busiest railroads in the country, including railroads of Metro-North Railroad and Long Island Rail Road. Millions of people rely on Railware’s products to transport them safely every day.

PATENTS-IN-SUIT

5. Railware’s owner, Ross Pirtle, spent considerable effort and investment developing the patented safety technology. As a result of this effort and investment, Mr. Pirtle was awarded

¹ Accordingly, any usage of the terms “enhanced employee protection system” or “EEPS” herein that is ascribed to any entity that is not Railware denotes that entity’s usage of the inventions described and claimed in the Asserted Patents. No other entity, beyond Railware, has exclusive rights, title and/or legal ownership in or of the EEPS and/or “Enhanced Employee Protection System” marks/designations or any goodwill associated therewith, as applied to computer software, recorded, for use in railway traffic control systems and apparatus for safety of railway workers and property.

two United States patents covering this safety technology: U.S. Pat. No. 9,517,782 (the “’782 patent”) (a copy of which is attached as **Exhibit A**) and 9,403,545 (the “’545 patent”). Mr. Pirtle assigned the ’782 and ’545 patents to Railware. The ’545 patent has since been reissued as two reissue patents: (1) U.S. Reissue Pat. No. RE47,835 (the “’835 patent”) (a copy of which is attached as **Exhibit B**); and (2) U.S. Reissue Pat. No. RE49,115 (the “’115 patent”) (a copy of which is attached as **Exhibit C**) (the ’782 patent, the ’835 patent, and the ’115 patent are collectively referred to herein as the “Asserted Patents”).

PARTIES

6. Railware is a corporation organized and existing under the laws of New York with its principal place of business located in Hauppauge, NY. Railware is the owner of all right, title, and interest in the Asserted Patents.

7. Railware produces one of the premier centralized train traffic control products in the world, Dispatch X. Included in Dispatch X is Railware’s EEPS functionality. Dispatch X with EEPS is used by some of the busiest railroads in the country, including railroads of Metro-North Railroad and Long Island Rail Road. Railware’s owner is also the creator of the EEPS functionality, which saves railway workers’ lives, prevents railway worker injury, and avoids the damage or destruction of costly railroad equipment, all by placing the power to lift a block on a section of track in the hands of the railway workers themselves that are on the track, thereby preventing the dispatcher/CTC system from prematurely, errantly or mistakenly lifting a block.

8. Peninsula Corridor Joint Powers Board d/b/a Caltrain is a Joint Powers Authority formed under California Government Code section 6500. At all times relevant to this Complaint, Peninsula Corridor Joint Powers Board has owned, operated, and done business under the name “Caltrain.”

9. Caltrain has a headquarters located at 1250 San Carlos Avenue, San Carlos, California 94070.

10. Caltrain operates a mass-transit system within California, including in this District.

11. Caltrain, as a joint powers authority, is controlled both by California statutory law, as well as the joint powers agreement entered into by the members comprising the joint powers

1 authority.²

2 12. Caltrain is “legally and financially independent from its three member agencies,
3 namely the San Mateo County Transit District (District), the Santa Clara Valley Transportation
4 Authority (VTA), and the City and County of San Francisco (CCSF), and is not a component unit
5 of any other organization.”³

6 13. Caltrain Board members are appointed by various elected officials from the
7 respective member agencies.⁴

8 14. Caltrain may, *inter alia*, enter into contracts and sue or be sued in its own name.⁵

9 15. Funding for the general operation of Caltrain is shared amongst the member
10 entities.⁶

11 16. The debts and obligations, including the defense of any legal claims, of Caltrain are
12 born by Caltrain.⁷

13 17. The State of California is not directly liable for the debts of liabilities of Caltrain.⁸

14 18. The majority of Caltrain’s operating budget is funded by fares, commercial
15 revenue, and private and public investment.⁹

16 JURISDICTION AND VENUE

17 19. **Jurisdiction.** This Court has subject matter jurisdiction of the action pursuant to
18 the patent laws of the United States, 35 U.S.C. § 1 *et seq.*, and pursuant to 28 U.S.C. § 1338
19 because Railware’s claims against Caltrain both arise out of the patent laws of the United States

20 _____
21 ² Cal. Gov’t Code § 6503.

22 ³ PENINSULA CORRIDOR JOINT POWERS BOARD, ANNUAL COMPREHENSIVE FINANCIAL REPORT (FISCAL YEARS
23 ENDED JUNE 30, 2023 AND 2022) at ii (available at <https://www.caltrain.com/media/32501>); Cal. Gov’t Code § 6507
24 (Caltrain is “a public entity separate from the parties to the agreement.”); Joint Powers Agreement Peninsula
Corridor Project § 4 (dated Oct. 3, 1996) (“JPA Agreement”) (“There is hereby created the JPB as a public entity
separate and apart from CCSF, SCVTA and SamTrans, or any current combination thereof. . . .”) (available at
<https://www.caltrain.com/media/2079/download?inline>).

⁴ JPA § 4.

⁵ Cal. Gov’t Code § 6508; JPA Agreement § 5.

⁶ JPA Agreement § 7.

⁷ JPA Agreement §§ 15, 16.

⁸ *Id.*

27 ⁹ Peninsula Corridor Joint Powers Board Statement Of Revenue And Expense Adopted Operating Budgets Fiscal
28 Years 2024 & 2025 (available at <https://www.caltrain.com/media/30699/>); PENINSULA CORRIDOR JOINT POWERS
BOARD, ANNUAL COMPREHENSIVE FINANCIAL REPORT (FISCAL YEARS ENDED JUNE 30, 2023 AND 2022) at 8-9
(available at <https://www.caltrain.com/media/32501>).

1 and raise a federal question.

2 20. This Court has personal jurisdiction over Caltrain at least because Caltrain owns
3 and/or operates trains and significant portions of track in this District, and the allegations of
4 infringement that give rise to this Complaint stem from Caltrain's activities in this District.

5 21. **Venue.** Venue is proper in this judicial district pursuant to 28 U.S.C. § 1400(b)
6 because, as alleged herein, Caltrain is a resident of this judicial district. Additionally, Caltrain has
7 committed acts of infringement in this District, and Caltrain maintains a regular and established
8 place of business in this District. Specifically, Caltrain maintains a regular and established place
9 of business at 585 Lenzen Avenue, San Jose, California 95126, via its operation of a control center
10 known as the Central Equipment & Maintenance Facility ("CEMOF").¹⁰

11 22. Caltrain has committed acts of infringement in this District. Caltrain's operation of
12 its dispatch system at, at least, its San Jose CEMOF control center, has infringed and continues to
13 infringe the Asserted Patents in this District as set forth herein. Specifically, Caltrain has operated
14 and/or continues to operate one or both of Westinghouse Air Brake Technologies Corporation's
15 ("Wabtec") RailwayNetSM and/or Advanced Information Management ("AIM") platforms
16 (formerly Collins Aerospace ARINC RailwayNetSM or AIM platform) with an EEPS and/or EEPS-
17 like functionality and/or another same or similar systems or methods. Operation of these systems
18 or methods, as implemented by Caltrain, including in this District, constitutes infringement of the
19 Asserted Patents as set forth herein.

20 23. **Divisional Assignment.** Assignment to the San Jose Division is proper pursuant to
21 Civil L.R. 3-2(c) and (e) because a substantial part of the events or omissions giving rise to the
22 claim occurred at the CEMOF dispatch center, which is located in Santa Clara county.

23 FACTUAL ALLEGATIONS

24 A. Railware and its Patented Technology

25 24. Railware provides one of the premier centralized train traffic control products in
26 the world, Dispatch X. Railware's products are used by some of the busiest railroads in the country,

27
28 ¹⁰ See *Central Equipment & Maintenance Facility (CEMOF)*, CALTRAIN, <https://www.caltrain.com/projects/central-equipment-maintenance-facility-cemof> (last visited July 7, 2025).

1 including to direct trains at Grand Central Station and New York Penn Station. Railware's products
2 are the industry standard for traffic control and operations management. Dispatch X provides
3 customers with high-definition graphics and point and click usability. It is scalable for everything
4 from a local control panel on a single interlocking to an entire railroad. Railware supports all
5 railroad protocols so customers can communicate with systems of any complexity in one high
6 resolution, graphic interface.

7 25. Included in Railware's Dispatch X is its patented EEPs functionality. Railware's
8 Dispatch X with EEPs was developed by Railware's owner and inventor on the Asserted Patents,
9 Ross Pirtle, to save railway field workers' lives and prevent injury of railway field workers, as
10 well as prevent damage to equipment and/or property.

11 26. Many modern railroads control the movement of trains through a railway network
12 using a centralized system known as centralized traffic control ("CTC"). CTC systems are used
13 for monitoring, tracking, and operating trains traversing tracks throughout a network. CTC systems
14 are controlled by train dispatchers. CTC systems typically include, among other front-end and
15 back-end components, one or more control consoles that display various pieces of information,
16 such as track conditions, train traffic, and scheduling. Through interactions with the control
17 console, the dispatcher can view and control the movement of trains throughout the railway
18 network. Movement of trains within a sector of track is typically governed by interlocking signals,
19 which are controlled by the dispatcher via interactions with a control console.

20 27. CTC systems are generally made up of a combination of both hardware components
21 and software components. The hardware components utilized can include items such as computers,
22 computer monitors, databases, servers, processors, keyboards, mobile devices, kiosks, and the like.
23 The software components include the software that is run on these various hardware components
24 to achieve the monitoring, tracking, and train operation functions critical to the aims of the CTC
25 system. An example of such a software is Railware's Dispatch X.

26 28. CTC systems also typically utilize a network, which can include, for example, data
27 networks, cellular networks, internet networks, radio networks, and the like, and any combination
28 thereof. This network is typically configured to facilitate exchanges between the various hardware

and/or software components of the CTC system, as well as to facilitate communications between the individuals working in the railway network, such as dispatchers, railway field workers, and the like.

29. When railway tracks require maintenance, railway field workers must physically enter the track area to perform the necessary maintenance. Entering an active track area poses grave risks to the railway field workers, who are defenseless against train traffic. Over time, various safety systems were developed, such as alarm systems that alerted railway workers to incoming train traffic, ideally allowing them time to vacate the track area before the train approached. These systems proved inadequate in protecting railway field workers.

30. As one example, using the CTC system, the dispatcher could remotely control the tracks used by trains.¹¹ This remote control enabled the remote dispatcher to “block” sections of track and to temporarily reroute trains away from blocked track sections that were being worked on by railway field workers.¹² But these systems suffered from certain drawbacks.¹³ Specifically, the blocking of track sections was controlled entirely by the remote dispatcher.¹⁴ Human error could and did lead to blocks being removed prematurely, errantly, or mistakenly by the dispatcher, such as either because the dispatcher falsely believed that the work was complete, or because the dispatcher intended to remove a different block and mistakenly removed a block on a track section where railway field workers were still working.¹⁵

31. Other examples of inadequate safety precautions include NORAC’s Operating Rules, including the “Form D” control system. NORAC’s Operating Rules have been adopted by numerous railroads and have existed since the mid-1980’s.¹⁶ “Form D” has been an integral part of NORAC’s Operating Rules since at least the early 1990’s. A “Form D” contains “written authorization(s), restriction(s), or instruction(s) issued by the Dispatcher to specified

¹¹ See ’782 patent at 1:48-62.

¹² *Id.* at 5:50-54.

¹³ *Id.* at 2:27-37.

¹⁴ *Id.* at 1:46-47.

¹⁵ See *id.* at 2:27-37.

¹⁶ See generally NORAC Operating Rules, 10th ed., (Nov. 6, 2011) (available at <https://www.hubdiv.org/docs/signaling/NORAC.pdf>).

1 individuals.”¹⁷ These instructions can include a “Form D Line 4,” which is used when “removing
 2 a track from service.”¹⁸ The Operating Rules require the dispatcher to determine that “controlled
 3 signals leading to the affected track are in Stop position” prior to issuing a “Form D Line 4.”¹⁹
 4 Similarly, prior to releasing a “Form D,” the dispatcher ostensibly must take certain actions,
 5 including “contact the addressee(s) and state his intent to cancel the Form D . . . , state the Form D
 6 number and, date, the cancellation time and date, and his initials, [and] ensure that all cancellation
 7 information is repeated [by the addressee] correctly.”²⁰

8 32. Despite these protections, human errors and accidents continued to occur, such as
 9 those recognized in the Federal Railroad Administration’s (FRA) Final Rule and in the Asserted
 10 Patents. Such errors included mistakes such as where “the train dispatchers did not maintain the
 11 required blocking devices.”²¹

12 33. Consistent with the infirmities of prior systems discussed above, unfortunately, a
 13 tragic event occurred that gave rise to the inventions described and claimed in the Asserted Patents.
 14 In 2013, a Metro-North Railroad passenger train struck and killed several railway field workers in
 15 West Haven, Connecticut. This happened because a remote dispatcher mistakenly removed the
 16 block protection on the wrong railroad track (that appeared in close proximity on the control
 17 console to the block protection that should have been removed).

18 34. Immediately after the accident occurred, Metro-North Railroad (Railware’s long-
 19 time customer) asked Railware’s President, Ross Pirtle (the inventor on the Asserted Patents), to
 20 determine and assess the cause of this tragic accident. Mr. Pirtle conducted an investigation, and
 21 determined that the accident was caused due to the dispatcher—believing the track to be clear—
 22 routing a train on the track where the workers were still working, which resulted in the train striking
 23 the railway field workers on the track and tragically killing them. Mr. Pirtle developed his
 24 inventions that are described and claimed in the Asserted Patents to prevent this from happening

25 _____
 26 ¹⁷ *Id.* at 7.

¹⁸ *Id.* at 52.

¹⁹ *Id.*

²⁰ *Id.* at 72.

²¹ Federal Railroad Administration, Railroad Workplace Safety; Roadway Worker Protection Miscellaneous
 28 Revisions (RRR), 81 Fed. Reg. 37840, 37859 (May 26, 2016) [hereinafter referred to as “RRR”].

again. Specifically, Mr. Pirtle invented an unconventional network architecture for generating, transmitting, receiving and using a code that is associated with a block placed on a track by a dispatcher and that is transmitted to the railway field worker(s) that is working on the track, but otherwise is not readily available to the dispatcher. In order to remove the block on a track, the code must be returned to the CTC system, such as by the dispatcher receiving the code from the railway field worker, for example, through a radio transmission. By putting the power to lift a block in the hands of the railway field worker(s) working under its protection, Mr. Pirtle's patented inventions prevent errant unblocking of track(s) within the railway network and ultimately save lives, prevent injury, and prevent damage to equipment and/or property. Mr. Pirtle's inventions are implemented at some of the busiest railroads in the U.S., as well as implemented in Railware's train control software (Dispatch X), which would ultimately become a commercial embodiment of the Asserted Patents called EEPS (Enhanced Employee Protection System).

35. Railware's patented technology has received praise in the industry. For example, the Federal Railroad Administration ("FRA") issued Safety Advisory 2014-02 "to reemphasize the importance of clear communication and compliance with applicable rules and procedures regarding roadway worker authority limits on controlled track."²² Therein, the FRA specifically stated "FRA recommends that railroads adopt one or more electronic technologies that may serve to fill the technology gap. Examples of such technology already in use include the following systems: Enhanced Employee Protection System [EEPS] . . .," referring to Railware's commercial embodiment of its patented technology.²³

36. As a result of Railware's and Mr. Pirtle's hard work and innovations, Railware's technology won the Federal Railroad Administration ("FRA") President's Award.

37. Ross Pirtle was awarded two U.S. patents for his inventions: the '782 patent and the '545 patent. The '545 patent has since been reissued as the '835 patent and the '115 patent. The '782 patent, the '835 patent, and the '115 each cover Railware's technology and products.

38. The '782 patent includes claims directed to methods and systems for railway

²² DOT Roadway Worker Authority Limits Rule, 79 Fed. Reg. 70268 (2014).

²³ *Id.* at 70269.

1 control. For example, in claim 5, the claimed method to enhance railway control to protect safety
2 of railway workers on or near railway tracks comprises (1) configuring a mobile user device of a
3 railway field worker to provide a device user interface to display information received via a
4 network from a railway control apparatus and to permit the railway field worker to respond to
5 prompts displayed thereon; (2) providing a terminal user interface on a terminal to permit a
6 terminal user to request the railway control apparatus to place a block on one or more specified
7 track sections to permit a railway field worker to enter the track sections while blocking railway
8 traffic to said track sections; (3) generating by the railway control apparatus a release code and
9 transmitting the release code to an electronic contact address accessible by the railway field worker
10 via operation of the user interface of the user terminal; and (4) permitting the block to said one or
11 more track sections to be removed by the railway control apparatus only upon receiving the release
12 code from the user terminal in return.

13 39. The '835 patent includes claims directed to methods and systems for centralized
14 railway control. For example, in claim 19, the claimed method for controlling railway access using
15 a railway traffic control apparatus of a centralized railway control system configured for
16 centralized control of traffic of a centrally controllable railway network including plural railways
17 and a plurality of railway traffic interlocks dispersed in said plural railways constituting said
18 railway network comprises (1) providing a user interface of the railway traffic control apparatus,
19 including a block placing part to place a block on one or more specified track sections in any of
20 said plural railways constituting said railway network that is managed by centralized control
21 operation from the railway traffic control apparatus, the railway traffic control apparatus
22 controlling, by said centralized control operation, one or more interlocks amongst the plurality of
23 railway traffic interlocks dispersed in said plural railways constituting said railway network, to
24 block railway traffic to the specified track sections and thereby to permit a railway field worker to
25 enter the track sections; (2) generating a removal code, determining an electronic contact address
26 of the railway field worker by accessing a rail personnel contact database registering, for each
27 railway personnel, electronic contact information of the railway personnel, and transmitting the
28 removal code to the electronic contact address of the railway field worker; and (3) permitting the

1 block to said one or more track sections to be removed only upon entry of the removal code by
2 said centralized control operation from the railway traffic control apparatus.

3 40. The '115 patent includes claims directed to methods and systems for centralized
4 railway control. For example, in claim 20, the claimed railway control apparatus for centralized
5 control of a centrally controllable railway network including plural railways and a plurality of
6 railway interlocks dispersed in said plural railways comprises (1) a processor for controlling a
7 plurality of track sections in the railway network, wherein each track section is associated with a
8 corresponding interlock and is disposed in any of said plural railways of said railway network that
9 is managed by centralized control operation from the railway control apparatus, the processor
10 controlling, by said centralized control operation, one or more interlocks amongst the plurality of
11 railway interlocks dispersed in said plural railways of said railway network, to block railway traffic
12 to one or more specified track sections; and (2) a memory device storing computer-executable
13 instructions, wherein execution of the computer-executable instructions by the processor causes
14 the railway control apparatus to: (a) receive a selection of at least one track section amongst the
15 plurality of track sections; (b) transmit a block signal to the corresponding interlock associated
16 with the at least one selected track section, to place a block on the selected track section by said
17 centralized control operation from the railway control apparatus; (c) generate a secret code
18 associated with the at least one selected track section; and (d) transmit the secret code to a remote
19 user terminal.

20 **B. Regulatory Requirements and Recommendations**

21 41. On or about December 16, 1996, the Federal Railroad Administration ("FRA")
22 promulgated 49 C.F.R. 214.319, which governs working limits on railroad tracks.

23 42. On or about November 25, 2014, the FRA issued Safety Advisory 2014-02 "to
24 reemphasize the importance of clear communication and compliance with applicable rules and
25 procedures regarding . . . [railway field worker] authority limits on controlled track."²⁴ In Safety
26 Advisory 2014-02, the FRA specifically stated "FRA recommends that railroads adopt one or more
27 electronic technologies that may serve to fill the technology gap. Examples of such technology

28 ²⁴ DOT Roadway Worker Authority Limits Rule, 79 Fed. Reg. 70268 (2014).

1 already in use include the following systems: Enhanced Employee Protection System
2 [EEPS]. . . .”²⁵

3 43. The FRA described one embodiment of Railware’s commercial implementation
4 (EEPS) of its patented technology as follows:

5 when an RWIC secures a track authority, he or she is provided a code via a beeper-like
6 device that is not provided to the dispatcher issuing the authority. The system is
7 designed so that the dispatcher cannot remove the blocking devices that are preventing
8 the clearing of the absolute signal until the RWIC provides him or her with the issued
9 code. Thus, the dispatcher cannot remove the associated on-track safety provided by
10 the authority without the knowledge and agreement of the RWIC.²⁶

11 44. On or about June 10, 2016, the FRA issued a Final Rule amending 49 C.F.R.
12 214.319. Specifically, 49 C.F.R. 214.319(b) provides:

13 (b) Each . . . railroad providing regularly scheduled intercity or commuter rail
14 passenger transportation that utilizes controlled track working limits as a form of
15 on-track safety (under §§ 214.321 through 214.323) in signalized territory shall:

16 (1) By July 1, 2017, evaluate its on-track safety program and identify an
17 appropriate method(s) of providing redundant signal protections
18 for . . . [railway] work groups who depend on a train dispatcher or control
19 operator to provide signal protection in establishing controlled track
20 working limits. For purposes of this section, redundant signal protections
21 means risk mitigation measures or safety redundancies adopted to ensure
22 the proper establishment and maintenance of signal protections for
23 controlled track working limits until such working limits are released by
24 the . . . [railway field] worker in charge. Appropriate redundant protections
25 could include the use of various risk mitigation measures (or a
26 combination of risk mitigation measures) such as technology, training,
27 supervision, or operating-based procedures; or could include use of
28 redundant signal protection, such as shunting, designed to prevent signal
system-related incursions into established controlled track working limits;
and

(2) By January 1, 2018, specifically identify, implement, and comply with
the method(s) of providing redundant protections in its on-track safety
program.

45. Caltrain is a railroad subject to the provisions of 49 C.F.R. 214.319(b).

46. In the FRA’s Section-by-Section Analysis that accompanied the June 10, 2016 rule
change, the FRA specifically referred to Safety Advisory 2014-02 and its discussion of Railware’s
EEPS, concluding “FRA encourages railroads to use new technologies *such as EEPS* as they

²⁵ *Id.* at 70269.

²⁶ *Id.*

become available to provide redundant signal protections for . . . [railway] work groups and to comply with new paragraph (b).”²⁷

47. The “EEPS” technology referred to by the FRA is covered by the Asserted Patents.

48. Caltrain has followed and continues to follow the FRA’s recommendations and has implemented technology claimed in the Asserted Patents into at least its CTC systems. Caltrain deploys its infringing system(s), including the patented technology of the Asserted Patents, wherever it provides centralized train control systems, including in California.

C. Caltrain’s Notice of the Patents

49. Caltrain was made aware of its infringement of the Asserted Patents at least as of May 15, 2025.

50. More particularly, on May 15, 2025, a letter was sent to Caltrain stating that:

It appears that Caltrain has implemented and/or is in the process of implementing safety technology covered by . . . [the Asserted Patents] into at least its CTC system(s) provided by Westinghouse Air Brake Technologies Corporation (“Wabtec”) and/or other same or similar system or method. *See, e.g.*, Caltrain Railroad Company Train Collision with On-Track Equipment and Derailment and Fire, National Transportation Safety Board Track and Engineering Group Chairman Factual Report, RRD22MR007 at 58 (Sept. 9, 2022); Caltrain Passenger Train Collision with Hi-rail Construction Vehicles, National Transportation Safety Board, RIR-24-01 at 11 (Feb. 27, 2024).

51. Given this correspondence, Caltrain knew or should have known and received notice of the Asserted Patents at least as of May 15, 2025.

52. Further, assertion of infringement of only method claims of a patent does not implicate the Patent Act’s marking provision (35 U.S.C. § 287). However, to the extent the marking statute does apply, since at least October 21, 2020, Railware has included the patent numbers of the Asserted Patents (1) in the header bar of Railware’s Dispatch X system; and/or (2) on Railware’s freely and publicly available website.²⁸ Accordingly, Caltrain has had constructive notice and knowledge of the Asserted Patents since at least October 21, 2020.

53. Moreover, in a September 8, 2022 report, Caltrain indicated that “[m]eetings with [Southeastern Pennsylvania Transportation Authority (“SEPTA”)] and Wabtec (who recently

²⁷ DOT Roadway Worker Protection Final Rule, 81 Fed. Reg. 37839, 37861 (emphasis added).

²⁸ *EEPS with SURELOCK*, RAILWARE, <http://railware.net/eeeps.html> (last visited July 7, 2025).

1 purchased the Rockwell Collins dispatch system known as ARINC used at Caltrain) were held
 2 recently. The use of a single code for an RWIC to provide to the dispatcher is essentially
 3 ‘turnkey.’”²⁹ SEPTA utilizes Railware’s patented technology covered by the Asserted Patents in
 4 connection with its CTC systems. As Caltrain was holding meetings with SEPTA regarding its
 5 system, Caltrain knew or should have known of the systems used by SEPTA and their use of
 6 Railware’s patented technology covered by the Asserted Patents.

7 54. Caltrain knew or should have known and received notice of Railware’s patents that
 8 reissued from the ’545 patent (*i.e.*, the ’835 patent and the ’115 patent) on at least their respective
 9 dates of issuance: February 4, 2020 for the ’835 patent, and June 28, 2022 for the ’115 patent.
 10 Caltrain knew or should have known and received notice of the ’782 patent on at least its issue
 11 date: December 13, 2016.

12 55. Caltrain operates tracks alongside National Railroad Passenger Corporation d/b/a
 13 Amtrak (“Amtrak”), which also uses Railware’s patented technology covered by the Asserted
 14 Patents in connection with its CTC systems.³⁰ Caltrain knew or should have known of the systems
 15 used by Amtrak and their use of Railware’s patented technology covered by the Asserted Patents.

16 56. Railware filed suit against Amtrak for infringement of the Asserted Patents in
 17 relation to Amtrak’s implementation of Railware’s patented technology that Amtrak copied from
 18 New Jersey Transit and Metro-North and implemented in connection with its CTC systems.
 19 Accordingly, Caltrain also had actual or constructive knowledge and notice of the Asserted Patents
 20 at least as of June 15, 2022 (the filing date of the complaint against Amtrak). *See Railware Inc. v.*
 21 *National Railroad Passenger Corporation d/b/a Amtrak*, No. 1:22-cv-5013 (SDNY 2022).

22 57. Railware filed suit against Southeastern Pennsylvania Transportation Authority
 23 (“SEPTA”) for infringement of the Asserted Patents in relation to SEPTA’s implementation of
 24

25 ²⁹ *Caltrain Railroad Company Train Collision with On-Track Equipment and Derailment and Fire*, National
 26 Transportation Safety Board Track and Engineering Group Chairman Factual Report, RRD22MR007 at 58 (Sept. 9,
 2022).

27 ³⁰ CALTRAIN BUSINESS PLAN, FREQUENTLY ASKED QUESTIONS (FAQS) at 4 (Dec. 2019) (available at
 28 <https://www.caltrain.com/media/11259/download?inline>) (“Diridon Station: The existing San José Diridon Station is
 a major transit hub located within downtown San José. It is a historic station with transit service provided by
 Amtrak, Altamont Commuter Express, Caltrain, and VTA light rail and bus service.”).

Railware's patented technology in connection with its CTC systems. Caltrain has discussed Railware's patented technology covered by the Asserted Patents with SEPTA.³¹ Accordingly, Caltrain also had actual or constructive knowledge and notice of the Asserted Patents at least as of July 8, 2024 (the filing date of the complaint against SEPTA). *See Railware Inc. v. Southeastern Pennsylvania Transportation Authority*, No. 2:24-cv-02963 (EDPA 2024).

D. Caltrain's Infringement with the RailwayNetSM system/AIM system with EEPS and/or EEPS-like functionality and/or Any Same or Similar Systems or Methods

58. Caltrain and/or its agents own and/or operate one or more control centers, including at least at CEMOF, located in this District at 585 Lenzen Avenue, San Jose, California 95126.³² CEMOF "is the 'nerve center,' of the commuter railroad, where dispatchers direct and monitor train traffic between San Francisco and Gilroy."³³ This control center "controls all train movement on the corridor."³⁴ Caltrain "provides train service along a 77-mile route to 32 stations between San Francisco and Gilroy."³⁵

59. Caltrain has used and/or currently uses a CTC system that it refers to internally as the "Rail Operations Control System" or "ROCS."³⁶ ROCS is Caltrain's internal nomenclature for its implementation of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or other same or similar systems or methods,³⁷ that was formerly provided to it by Rockwell Collins, Inc. – a subsidiary of Raytheon

³¹ *Caltrain Railroad Company Train Collision with On-Track Equipment and Derailment and Fire*, National Transportation Safety Board Track and Engineering Group Chairman Factual Report, RRD22MR007 at 58 (Sept. 9, 2022).

³² *Central Equipment & Maintenance Facility (CEMOF)*, CALTRAIN, <https://www.caltrain.com/projects/central-equipment-maintenance-facility-cemof> (last visited July 7, 2025).

³³ *Id.*

³⁴ *Caltrain: Behind the Scenes of a Major Service Disruption*, CALTRAIN, <https://www.caltrain.com/rider-information/caltrain-behind-scenes-major-service-disruption> (last visited July 7, 2025).

³⁵ Caltrain Business Plan: Glossary of Key Terms at 1 (2018) (available at <https://caltrain.com/media/10973>).

³⁶ ARINC MAINTENANCE AND SUPPORT SERVICES, JPB BOARD OF DIRECTORS at 2 (Sept. 5, 2019) (available at <https://www.caltrain.com/media/2443/download>); MODERNIZATION PROGRAM PENINSULA CORRIDOR ELECTRIFICATION PROJECT (PCEP): JULY 2017 MONTHLY PROGRESS REPORT, CALTRAIN at 18-1 (July 31, 2017) (available at <https://www.caltrain.com/media/616/download?inline>); MODERNIZATION PROGRAM PENINSULA CORRIDOR ELECTRIFICATION PROJECT (PCEP): APRIL 2017 MONTHLY PROGRESS REPORT (April 30, 2017) at 17-1 (available at <https://caltrain.com/media/613/download?inline>).

³⁷ ARINC MAINTENANCE AND SUPPORT SERVICES, JPB BOARD OF DIRECTORS at 2 (Sept. 5, 2019) (available at <https://www.caltrain.com/media/2443/download>); MODERNIZATION PROGRAM PENINSULA CORRIDOR

Technology that did business as “Collins Aerospace” – that has since been acquired by Westinghouse Air Brake Technologies Corporation (“Wabtec”).³⁸

60. ARINC Incorporated (“ARINC”) was the original provider of what would become the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or same or similar systems used by Caltrain. In 2013, Rockwell Collins acquired ARINC. In 2018, United Technologies acquired Rockwell Collins. In 2020, Raytheon Technologies merged with United Technologies, and rebranded Rockwell Collins/ARINC as Collins Aerospace. In 2022, Collins Aerospace’s ARINC rail solutions business segment was acquired by Wabtec.³⁹ This acquisition included the RailwayNetSM system and/or the AIM system or same or similar systems used by Caltrain.⁴⁰

61. ARINC provided “fully integrated train control and Positive Train Control (PTC), control center integration and customer information systems, [] cybersecurity and life-cycle management” services to “regional, short line, inter-city, commuter, subway and light rail systems across the United States and Canada.”⁴¹

62. Likewise, Wabtec advertises that it provides, *inter alia*, “advanced train control

ELECTRIFICATION PROJECT (PCEP): JULY 2017 MONTHLY PROGRESS REPORT, CALTRAIN at 18-1 (July 31, 2017) (available at <https://www.caltrain.com/media/616/download?inline>); MODERNIZATION PROGRAM PENINSULA CORRIDOR ELECTRIFICATION PROJECT (PCEP): APRIL 2017 MONTHLY PROGRESS REPORT (April 30, 2017) at 17-1 (available at <https://caltrain.com/media/613/download?inline>); *Peninsula Corridor Electrification Project*, TYLIN, <https://www.tylin.com/work/projects/peninsula-corridor-electrification-project> (last visited July 7, 2025) (“We are also providing implementation management services to oversee the design, development, testing, and commissioning of the Office SCADA systems based on the Advanced Integration Management (AIM) system supplied by Wabtec (formerly ARINC), the system integrator.”).

³⁸ *Advanced Information Management (AIM) Rail Dispatch*, WABTEC, <https://www.wabteccorp.com/digital-intelligence/signaling-and-train-control/dispatch/advanced-information-management-aim-rail-dispatch> (last visited July 7, 2025) (describing AIM); *RailwayNet Positive Train Control Communication Solution*, WABTEC, <https://www.wabteccorp.com/digital-intelligence/signaling-and-train-control/communications/railwaynet-positive-train-control-communication-solution> (last visited July 7, 2025) (describing RailwayNetSM).

³⁹ *Wabtec Acquires Collins Aerospace’s ARINC Rail Solutions Business to Extend Rail Optimization Portfolio*, WABTEC (June 16, 2022), <https://www.wabteccorp.com/newsroom/press-releases/wabtec-acquires-collins-aerospace-s-arinc-rail-solutions-business-to-extend-rail-optimization-portfolio>.

⁴⁰ *Advanced Information Management (AIM) Rail Dispatch*, WABTEC, <https://www.wabteccorp.com/digital-intelligence/signaling-and-train-control/dispatch/advanced-information-management-aim-rail-dispatch> (last visited July 7, 2025) (describing AIM); *RailwayNet Positive Train Control Communication Solution*, WABTEC, <https://www.wabteccorp.com/digital-intelligence/signaling-and-train-control/communications/railwaynet-positive-train-control-communication-solution> (last visited July 7, 2025) (describing RailwayNetSM).

⁴¹ *Wabtec Acquires Collins Aerospace’s ARINC Rail Solutions Business to Extend Rail Optimization Portfolio*, WABTEC (June 16, 2022), <https://www.wabteccorp.com/newsroom/press-releases/wabtec-acquires-collins-aerospace-s-arinc-rail-solutions-business-to-extend-rail-optimization-portfolio>.

solutions that combine electronic train management, virtual block signaling, satellite communication, and precise positioning into a comprehensive train control solution” and “integrated services including construction, material, engineering, system integration, track services, and turnkey solutions for CTC, CBTC, and PTC systems.”⁴²

63. Wabtec offers a number of products and/or systems that provide, either alone or in combination with other products, infringing functionality, including, but not limited to the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or same or similar systems.

64. Caltrain’s implementation and use of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods in connection with its rail network(s) infringes the Asserted Patents.

65. For example, with respect to the ’782 patent, Caltrain’s software and/or hardware systems practice the claimed method for (1) configuring a mobile user device of a railway field worker to provide a device user interface to display information received via a network from a railway control apparatus and to permit the railway field worker to respond to prompts displayed thereon; (2) providing a terminal user interface on a terminal to permit a terminal user of the terminal to request the railway control apparatus to place a block on one or more specified track sections to permit a railway field worker to enter the track sections while blocking railway traffic to said track sections; (3) generating by the railway control apparatus a release code and transmitting the release code to an electronic contact address accessible by the railway field worker via operation of the user interface of the user terminal; and (4) permitting the block to said one or more track sections to be removed by the railway control apparatus only upon receiving the release code from the user terminal in return, such that they infringe one or more claims of the ’782 patent.

66. As a further example, with respect to the ’835 patent, Caltrain’s software and/or hardware systems practice the claimed method for controlling railway access using a railway

⁴² *Signaling and Train Control*, WABTEC, <https://www.wabteccorp.com/digital-intelligence/signaling-and-train-control> (last visited July 7, 2025).

1 traffic control apparatus of a centralized railway control system configured for centralized control
 2 of traffic of a centrally controllable railway network including plural railways and a plurality of
 3 railway traffic interlocks dispersed in said plural railways constituting said railway network
 4 centralized railway control system including (1) providing a user interface of the railway traffic
 5 control apparatus, including a block placing part to place a block on one or more specified track
 6 sections in any of said plural railways constituting said railway network that is managed by
 7 centralized control operation from the railway traffic control apparatus, the railway traffic control
 8 apparatus controlling, by said centralized control operation, one or more interlocks amongst the
 9 plurality of railway traffic interlocks dispersed in said plural railways constituting said railway
 10 network, to block railway traffic to the specified track sections and thereby to permit a railway
 11 field worker to enter the track; (2) generating a removal code, determining an electronic contact
 12 address of the railway field worker by accessing a rail personnel contact database registering, for
 13 each railway personnel, electronic contact information of the railway personnel, and transmitting
 14 the removal code to the electronic contact address of the railway field worker; and (3) permitting
 15 the block to said one or more track sections to be removed only upon entry of the removal code by
 16 said centralized control operation from the railway traffic control apparatus, such that they infringe
 17 one or more claims of the '835 patent.

18 67. As a further example, with respect to the '115 patent, Caltrain's software and/or
 19 hardware systems practice the claimed railway control apparatus for centralized control of a
 20 centrally controllable railway network including plural railways and a plurality of railway
 21 interlocks dispersed in said plural railways comprises (1) a processor for controlling a plurality of
 22 track sections in the railway network, wherein each track section is associated with a corresponding
 23 interlock and is disposed in any of said plural railways of said railway network that is managed by
 24 centralized control operation from the railway control apparatus, the processor controlling, by said
 25 centralized control operation, one or more interlocks amongst the plurality of railway interlocks
 26 dispersed in said plural railways of said railway network, to block railway traffic to one or more
 27 specified track sections; and (2) a memory device storing computer-executable instructions,
 28 wherein execution of the computer-executable instructions by the processor causes the railway

control apparatus to: (a) receive a selection of at least one track section amongst the plurality of track sections; (b) transmit a block signal to the corresponding interlock associated with the at least one selected track section, to place a block on the selected track section by said centralized control operation from the railway control apparatus; (c) generate a secret code associated with the at least one selected track section; and (d) transmit the secret code to a remote user terminal, such that they infringe one or more claims of the '115 patent.

68. Caltrain's implementation and use of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality and/or other same or similar system or methods includes enhanced employee protection functionality, which Caltrain refers to internally as an "Enhanced Employee Protection System[]." ⁴³

Roadway Worker Protection

- March 10, 2022 Incident – NTSB Investigation
- Changes to Roadway Worker in Charge Training, Processes and Scheduling
- Bus Bridges, Safety Briefings, Planning
- Enhanced Employee Protection Systems



⁴³ CALTRAIN SAFETY BRIEFING (April 19, 2023) at 18 (available at <https://www.caltrain.com/media/30177/download>); PENINSULA CORRIDOR JOINT POWERS BOARD, ANNUAL COMPREHENSIVE FINANCIAL REPORT (FISCAL YEARS ENDED JUNE 30, 2023 AND 2022) at ix (available at <https://www.caltrain.com/media/32501>); PENINSULA CORRIDOR JOINT POWERS BOARD, ANNUAL COMPREHENSIVE FINANCIAL REPORT (FISCAL YEARS ENDED JUNE 30, 2024 AND 2023) at xiii (available at <https://www.caltrain.com/media/34732>); Project Monitoring Report (PMR) November 2024: Peninsula Corridor Electrification Project (PCEP) San Francisco to San Jose, CA at A-1 (2024) (available at <https://www.caltrain.com/media/35145>).

FIRST CLAIM FOR RELIEF
(Infringement of the '782 Patent)

69. Railware repeats and incorporates by reference all prior allegations of this Complaint as if fully set forth herein.

70. Railware is the owner by assignment of all right, title, and interest in and to the '782 patent.

71. The '782 patent is valid and enforceable.

72. Claim 5 of the '782 patent recites:

A method to enhance railway control, to protect safety of railway workers on or near railway tracks, said method comprising:

configuring a mobile user device of a railway field worker to provide a device user interface to display information received via a network from a railway control apparatus and to permit the railway field worker to respond to prompts displayed thereon;

providing a terminal user interface on a terminal to permit a terminal user of the terminal request the railway control apparatus to place a block on one or more specified track sections to permit a railway field worker to enter the track sections while blocking railway traffic to said track sections;

generating by the railway control apparatus a release code and transmitting the release code to an electronic contact address accessible by the railway field worker via operation of the user interface of the user terminal; and

permitting the block to said one or more track sections to be removed by the railway control apparatus only upon receiving the release code from the user terminal in return.

73. In violation of 35 U.S.C. § 271(a), Caltrain has infringed and continues to infringe one or more claims of the '782 patent by making, using, offering for sale, selling, and/or importing in or into the United States a system or method covered by the '782 patent, including, but not limited to, at least Caltrain's implementation and use of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods.⁴⁴

74. Caltrain, through its implementation and use of the the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like

⁴⁴ Further investigation may reveal that others of Caltrain's products and systems also directly or indirectly infringe at least claim 5 and/or other claims of the '782 patent.

1 functionality or any same or similar systems or methods, infringes at least claim 5 of the '782
2 patent.

3 75. Caltrain's implementation and use of the the RailwayNetSM system with EEPS
4 and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality
5 or any same or similar systems or methods practices a "method to enhance railway control, to
6 protect safety of railway workers on or near railway tracks."

7 76. Caltrain's implementation and use of the RailwayNetSM system with EEPS and/or
8 EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any
9 same or similar systems or methods includes an enhanced employee protection system, which
10 protects the safety of railway workers on or near railway tracks.⁴⁵

11 Roadway Worker Protection (RWP) has also been a focus in the aftermath of a train collision incident in March
12 2022. Gaps were discovered in RWP programs that contributed to the San Bruno incident, and Caltrain has closed
13 those gaps through revised RWP training; changed to a safer fouling distance – 10 feet from the rail and 10 feet from
the overhead wires; improved processes for issuing track and time protection; and investment in a software based
enhanced employee protection system that adds yet another layer of RWP.

14 77. Caltrain owns and/or operates one or more control centers, including the CEMOF
15 located at 585 Lenzen Avenue, San Jose, California 95126.⁴⁶ Control centers are centralized
16 railway control systems for controlling trains on certain sections of track.⁴⁷ Caltrain implements
17 and uses the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM
18 system with EEPS and/or EEPS-like functionality or any same or similar systems or methods as a
19 SaaS and/or IaaS—a software/infrastructure as a service—product that provides “full-featured
20 network management and infrastructure, hardware, network, operating systems, and applications
21
22
23

24 ⁴⁵ PENINSULA CORRIDOR JOINT POWERS BOARD, ANNUAL COMPREHENSIVE FINANCIAL REPORT (FISCAL YEARS
25 ENDED JUNE 30, 2023 AND 2022) at ix (available at <https://www.caltrain.com/media/32501>); PENINSULA
CORRIDOR JOINT POWERS BOARD, ANNUAL COMPREHENSIVE FINANCIAL REPORT (FISCAL
YEARS ENDED JUNE 30, 2024 AND 2023) at xiii (available at <https://www.caltrain.com/media/34732>).

26 ⁴⁶ See *Central Equipment & Maintenance Facility (CEMOF)*, CALTRAIN, <https://www.caltrain.com/projects/central-equipment-maintenance-facility-cemof> (last visited July 7, 2025).

27 ⁴⁷ See *Central Equipment & Maintenance Facility (CEMOF)*, CALTRAIN, <https://www.caltrain.com/projects/central-equipment-maintenance-facility-cemof> (last visited July 7, 2025); *Caltrain: Behind the Scenes of a Major Service Disruption*, CALTRAIN, <https://www.caltrain.com/rider-information/caltrain-behind-scenes-major-service-disruption>
28 (last visited July 7, 2025).

1 for fault, performance, security and configuration management.”⁴⁸

2 78. The RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the
3 AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods
4 is advertised to help facilitate the increases in safety and reliability that train control systems
5 provide.⁴⁹

6 79. The RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the
7 AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods,
8 which Caltrain uses, improves rail safety.⁵⁰

9 80. More particularly, “[t]his system refers to communication-based/processor-based
10 train control technology designed to address a number of rail safety issues, including train-to-train
11 collisions, over-speed derailments, incursions into established work-zone limits, and train
12 movement through a main-line switch that is in an improper position.”⁵¹

21 ⁴⁸ ROCKWELL COLLINS INC., ARINC RAILWAYNET WHITE PAPER 6 (2016) (available at
22 https://www.rockwellcollins.com/-/media/Files/Unsecure/Services-And-Support/Information-Management/ARINC-Rail/RailwayNet/ARINC-Rail_RailwayNet_white-paper.ashx) [hereinafter referred to as “White Paper”].

23 ⁴⁹ *Amtrak signs nationwide contract for Rockwell Collins’ ARINC RailwayNetSM Positive Train Control service*,
24 COLLINS AEROSPACE (Sep. 6, 2017) (available at https://rockwellcollins.com/-/media/Files/Unsecure/Services-And-Support/Information-Management/ARINC-Rail/RC_Amtrak-Press-Release_09-06-17.ashx); *RailwayNet Positive Train Control Communication Solution*, WABTEC, <https://www.wabteccorp.com/digital-intelligence/signaling-and-train-control/communications/railwaynet-positive-train-control-communication-solution> (last visited July 7, 2025).

25 ⁵⁰ PENINSULA CORRIDOR JOINT POWERS BOARD, ANNUAL COMPREHENSIVE FINANCIAL REPORT (FISCAL YEARS
26 ENDED JUNE 30, 2023 AND 2022) at ix (available at <https://www.caltrain.com/media/32501>); *Caltrain Railroad Company Train Collision with On-Track Equipment and Derailment and Fire, National Transportation Safety Board Track and Engineering Group Chairman Factual Report*, RRD22MR007 at 58 (Sept. 9, 2022); *Caltrain Passenger Train Collision with Hi-rail Construction Vehicles, National Transportation Safety Board*, RIR-24-01
27 at 11 (Feb. 27, 2024).

28 ⁵¹ White Paper at 3.



81. Because Caltrain's implementation and use of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods increases rail safety through a "communication-based/processor-based train control technology," Caltrain practices a "method to enhance railway control, to protect safety of railway workers on or near railway tracks."

82. Caltrain's implementation and use of RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods further "configure[es] a mobile user device of a railway field worker to provide a device user interface to display information received via a network from a railway control apparatus and to permit the railway field worker to respond to prompts displayed thereon."

83. Caltrain's implementation and use of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods includes the utilization of mobile devices for railway field workers such that calls may be conducted between the railway field worker and the dispatcher to

“to release Track and Time Authority.”⁵²

84. Furthermore, Caltrain’s implementation and use of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods includes the use of “release codes” “for a [Roadway Worker In Charge]” which the railway field worker must “provide to the dispatcher” in order for a block to be released.⁵³

c. Release “Codes”

- i. Meetings with SEPTA and Wabtec (Who recently purchased the Rockwell Collins dispatch system known as ARINC used at Caltrain) were held recently. The use of a single code for an RWIC to provide to the dispatcher is essentially “turnkey.”]

Caltrain Passenger Train Collision with Hi-rail Construction Vehicles
RIR-24-01

1.7.3 Redundant Safety Protections

Caltrain instituted a redundant safety process for dispatchers requiring them to click a checkbox verifying the release of track and time authority before its release. They also acquired software that will only allow the dispatcher to release track and time authority after both the RWIC and one other authorized person in the work group has entered a special pin code into the system.

Caltrain now requires that a RWIC be physically within the limits of track and time authority when requesting and releasing authority. They also modified On Track Safety Rule 6.3.1 to require the track and time authority form to be initialed by at least one other roadway worker/contractor in the work group confirming that they are clear of the track.

⁵² Caltrain Passenger Train Collision with Hi-rail Construction Vehicles, National Transportation Safety Board, RIR-24-01 at 11 (Feb. 27, 2024).

⁵³ Caltrain Railroad Company Train Collision with On-Track Equipment and Derailment and Fire, National Transportation Safety Board Track and Engineering Group Chairman Factual Report, RRD22MR007 at 58 (Sept. 9, 2022); Caltrain Passenger Train Collision with Hi-rail Construction Vehicles, National Transportation Safety Board, RIR-24-01 at 11 (Feb. 27, 2024); QUARTERLY PROGRESS REVIEW MEETING NO. 22: DECEMBER 5, 2022, PENINSULA CORRIDOR JOINT POWERS BOARD (JPB)/CALTRAIN at 4 (Dec. 19, 2022).

- The safety task force formed after the March 10, 2022 incident continues to meet.
 - A new protocol has been developed that requires both the Roadway Worker in Charge (RWIC) and the contractor's foreman to sign off before track and time protection can be released.
 - A new electronic process has just been implemented that requires a specific electronic code to be transmitted to the dispatcher. Before protection can be released.

85. Caltrain's RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods has implemented and used and continues to use a system whereby its CTC system permits users to respond to prompts over a network.

86. Caltrain's RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods displays information received via a network from a railway control apparatus. For example, the railway control apparatus provides a release code to the railway field worker's (e.g., the "RWIC") mobile device.

87. Caltrain's RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods also specifies providing back-office infrastructure and messaging, including "[s]torage and delivery of crew and consist information, train IDs and clearances."⁵⁴

88. Caltrain's implementation and use of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods provides information (e.g., a release code) to the railway worker's mobile device.⁵⁵ Such communication happens over a network. Further, the railway field worker is able to respond to prompts displayed on the mobile device in order to provide the CTC train dispatcher with the release code.

89. As noted above, Caltrain's implementation and use of the RailwayNetSM system

⁵⁴ White Paper at 7.

⁵⁵ See, e.g., *Caltrain Railroad Company Train Collision with On-Track Equipment and Derailment and Fire*, National Transportation Safety Board Track and Engineering Group Chairman Factual Report, RRD22MR007 at 58 (Sept. 9, 2022); *Caltrain Passenger Train Collision with Hi-rail Construction Vehicles*, National Transportation Safety Board, RIR-24-01 at 11 (Feb. 27, 2024).

with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods includes the use of “release codes” or a “pin code” which the railway field worker must “provide to the dispatcher” in order for a block to be released.⁵⁶

c. Release “Codes”

- i. Meetings with SEPTA and Wabtec (Who recently purchased the Rockwell Collins dispatch system known as ARINC used at Caltrain) were held recently. The use of a single code for an RWIC to provide to the dispatcher is essentially “turnkey.”]

Caltrain Passenger Train Collision with Hi-rail Construction Vehicles
RIR-24-01

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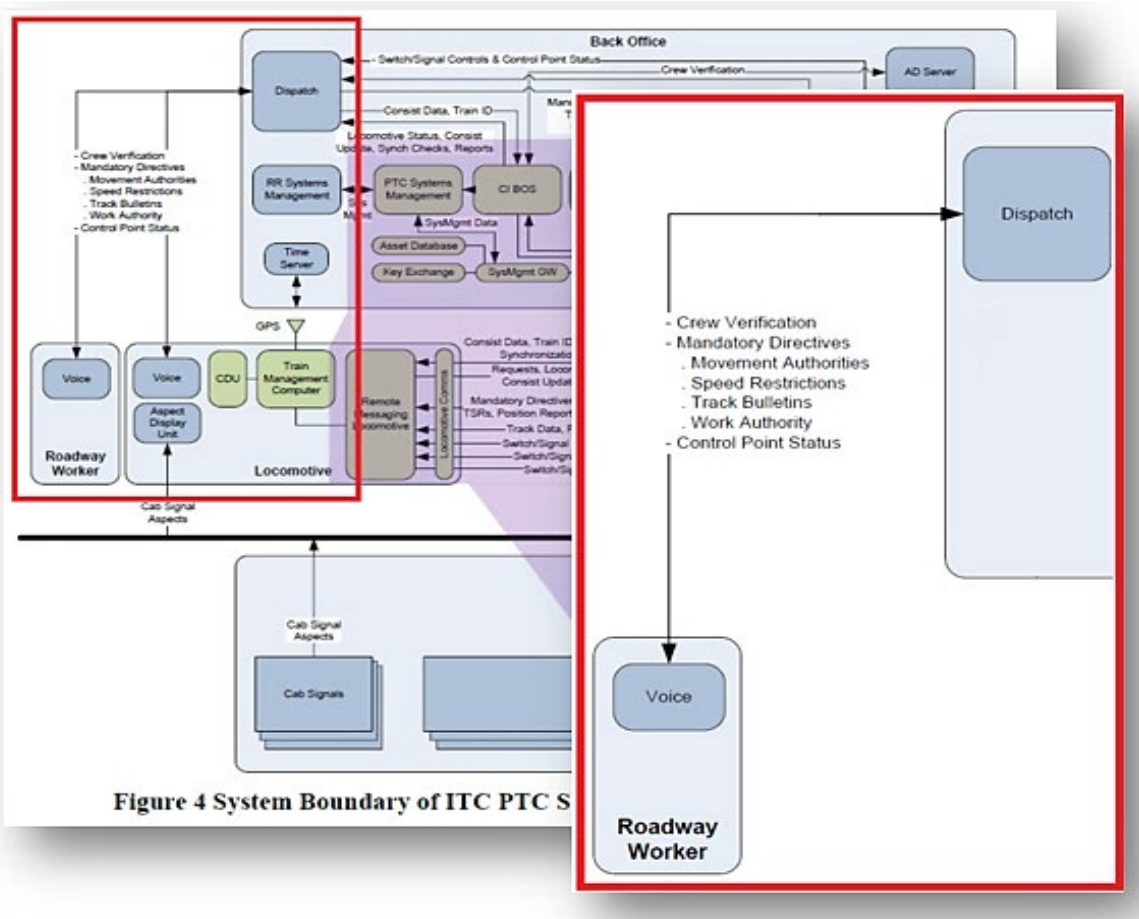
- The safety task force formed after the March 10, 2022 incident continues to meet.
 - A new protocol has been developed that requires both the Roadway Worker in Charge (RWIC) and the contractor’s foreman to sign off before track and time protection can be released.
 - A new electronic process has just been implemented that requires a specific electronic code to be transmitted to the dispatcher. Before protection can be released.

90. Caltrain also provides its railway field workers with company issued mobile

⁵⁶ See, e.g., *Caltrain Railroad Company Train Collision with On-Track Equipment and Derailment and Fire*, National Transportation Safety Board Track and Engineering Group Chairman Factual Report, RRD22MR007 at 58 (Sept. 9, 2022); *Caltrain Passenger Train Collision with Hi-rail Construction Vehicles*, National Transportation Safety Board, RIR-24-01 at 11 (Feb. 27, 2024); QUARTERLY PROGRESS REVIEW MEETING NO. 22: DECEMBER 5, 2022, PENINSULA CORRIDOR JOINT POWERS BOARD (JPB)/CALTRAIN at 4 (Dec. 19, 2022).

devices.⁵⁷

91. Furthermore, the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods supports I-ETMS message flows, including communications with railway workers to communicate crew verification and mandatory directives.⁵⁸



92. Likewise, Wabtec acknowledges that it offers I-ETMS supported packages.⁵⁹

⁵⁷ See, e.g., Roadway Worker Protection (RWP) Caltrain Training - Study Guide, Caltrain at 5 (available at <https://www.caltrain.com/media/2098#:~:text=Fouling%20a%20track%2D%20is%20the%20placement%20of,field%20side%20of%20the%20nearest%20running%20rail.&text=safety%20at%20least%2015%20seconds%20prior%20to%20the%20train%20passing%20by%20the%20work%20zone>); *Caltrain Passenger Train Collision with Hi-rail Construction Vehicles*, National Transportation Safety Board, RIR-24-01 at 5 (Feb. 27, 2024) (“About 9:58 a.m., the RWIC contacted the dispatcher by phone and released Track and Time Authority . . .”).

⁵⁸ *Positive Train Control Interoperability and Networking Research: Final Report*, Fed. Railroad Admin. (Dec. 2015) at 14 [hereinafter referred to as “Final Report”].

⁵⁹ *I-ETMS Positive Train Control (PTC) Communications Package*, WABTEC, <https://www.wabteccorp.com/digital-intelligence/signaling-and-train-control/communications/i-etms-positive-train-control-ptc-communications-package> (last visited July 7, 2025).

1 Wabtec also advertises that RailwayNetSM “offers reliable, tailored, and scalable PTC messaging.
 2 Utilizing VHF, cellular, Wi-Fi and MPLS, RailwayNetSM PTC delivers initialization messages . .
 3 . .”⁶⁰

4 93. Accordingly, Caltrain’s implementation and use of RailwayNetSM system with
 5 EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like
 6 functionality or any same or similar systems or methods, by providing a technology infrastructure
 7 to send and receive messages (including “release codes” and/or “unique PINs”) via a network and
 8 by providing mobile devices to rail workers, practices a method that “configure[es] a mobile user
 9 device of a railway field worker to provide a device user interface to display information received
 10 via a network from a railway control apparatus and to permit the railway field worker to respond
 11 to prompts displayed thereon.”

12 94. Caltrain’s implementation and use of RailwayNetSM system with EEPS and/or
 13 EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any
 14 same or similar systems or methods further provides “a terminal user interface on a terminal to
 15 permit a terminal user of the terminal request the railway control apparatus to place a block on one
 16 or more specified track sections to permit a railway field worker to enter the track sections while
 17 blocking railway traffic to said track sections.”

18 95. Caltrain operates one or more control centers that are “the ‘nerve center,’ of the
 19 commuter railroad, where dispatchers direct and monitor train traffic between San Francisco and
 20 Gilroy”⁶¹ and which “control[] all train movement on the corridor.”⁶²

21 96. Caltrain’s control centers, examples of which are shown below, include a number
 22 of terminals through which train dispatchers control the movement of trains, including by placing
 23 blocks on specified track sections:

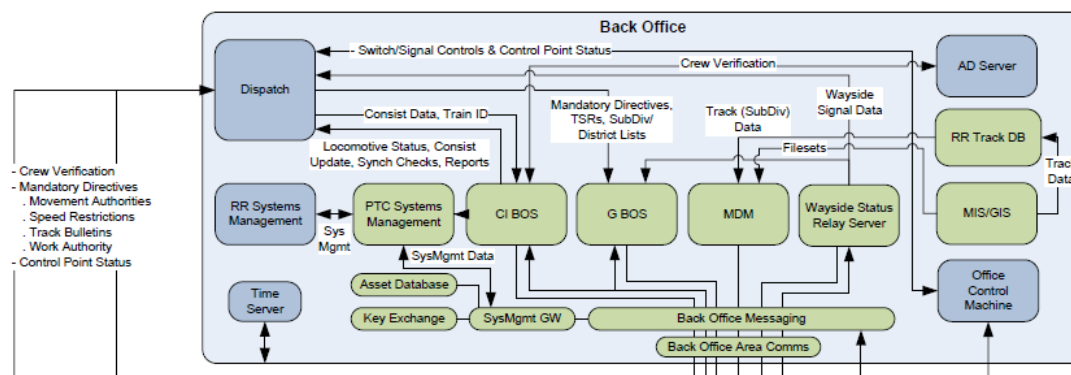
24
 25 ⁶⁰ *RailwayNet Positive Train Control Communication Solution*, WABTEC, <https://www.wabteccorp.com/digital-intelligence/signaling-and-train-control/communications/railwaynet-positive-train-control-communication-solution>
 26 (last visited July 7, 2025).

27 ⁶¹ *Central Equipment & Maintenance Facility (CEMOF)*, CALTRAIN, <https://www.caltrain.com/projects/central-equipment-maintenance-facility-cemof> (last visited July 7, 2025).

28 ⁶² *Caltrain: Behind the Scenes of a Major Service Disruption*, CALTRAIN, <https://www.caltrain.com/rider-information/caltrain-behind-scenes-major-service-disruption> (last visited July 7, 2025).

CEMOF⁶³

97. The RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods includes an “integration server and software” that “provides connectivity between the railroad IT systems and the hosted back-office components.”⁶⁴ The integration server provides a terminal user interface on a terminal for use by the system dispatcher.



⁶³ Peninsula Corridor Electrification Project, TYLIN, <https://www.tylin.com/work/projects/peninsula-corridor-electrification-project> (last visited July 7, 2025).

⁶⁴ See White Paper at 8 (illustrating “AIM[®] integration server”); see also *RailwayNet Positive Train Control Communication Solution*, WABTEC, <https://www.wabteccorp.com/digital-intelligence/signaling-and-train-control/communications/railwaynet-positive-train-control-communication-solution> (last visited July 7, 2025).

AIM® integration server

The ARINC RailwayNet integrations server and software provides connectivity between the railroad IT systems and the hosted back-office components. The functions of this application include:

- › Interface with customer's IT gateway
- › Interface with back office
- › Manage crew authentication through the customer's IT gateway
- › Functions to assign train ID to trains based on the clearance number
- › Functions to manage train consist through the customer's IT gateway
- › Functions to track, display, and store events and alarms

Centralized Traffic Control and SCADA

Collins designs and integrates state-of-the-art rail control solutions using our ARINC Advanced Information Management (AIM®) platform. AIM serves as an end-to-end solution for all rail control requirements, including SCADA, Centralized Traffic Control, Positive Train Control (PTC) and control center integration. Highly flexible and feature-rich, AIM enables railroads to maximize operational efficiency, cost-effectiveness and safety, all while providing an environment protected by the latest tools and techniques in cybersecurity.

KEY AREAS OF EXPERTISE

- | | |
|---|--|
| • Train monitoring and control | • Bulletins, authorities and restrictions management |
| • Automatic train tracking | • Employee in Charge (EIC) terminals |
| • Automatic route setting/automatic routing | • Emergency Operating Procedures (EOP) |
| • Automatic traffic regulation and schedule deviation | • Power planning |
| • Schedule management | • Playback and simulation |
| • Integrated yard management | • Data acquisition |
| | • Interface integration |

98. The RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods, as implemented and used and continues to be used by Caltrain, provides the network connections and office applications required to exchange critical information among railroads. It is available on a subscription basis as hosted SaaS (software as a service) and IaaS (infrastructure as a service) solutions and messaging from the back office to the locomotive through VHF, cellular, and Wi-Fi is also available.⁶⁵

99. The RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods provides “train monitoring and control,” “automatic route setting/automatic routing,” “automatic traffic regulation,” and “bulletins, authorities, and restrictions management,” as shown, for

⁶⁵ New from Rockwell Collins: *Shared-network PTC platform*, RAILWAY AGE 14 (July 2016), https://issuu.com/railwayage/docs/july_2016_railway_age; *RailwayNet Positive Train Control Communication Solution*, WABTEC, <https://www.wabteccorp.com/digital-intelligence/signaling-and-train-control/communications/railwaynet-positive-train-control-communication-solution> (last visited July 7, 2025).

example, in the image below.⁶⁶ One or more of these functionalities encompasses the claimed limitation “permit a terminal user of the terminal request the railway control apparatus to place a block on one or more specified track sections to permit a railway field worker to enter the track sections while blocking railway traffic to said track sections.”

Centralized Traffic Control and SCADA

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KEY AREAS OF EXPERTISE

- | | |
|---|--|
| • Train monitoring and control | • Bulletins, authorities and restrictions management |
| • Automatic train tracking | • Employee in Charge (EIC) terminals |
| • Automatic route setting/automatic routing | • Emergency Operating Procedures (EOP) |
| • Automatic traffic regulation and schedule deviation | • Power planning |
| • Schedule management | • Playback and simulation |
| • Integrated yard management | • Data acquisition |
| | • Interface integration |

100. The RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods, as implemented and used and continues to be used by Caltrain, uses “track and time” in which “[b]efore granting track and time authority, the dispatcher must apply a ‘block’ through the dispatching system to prevent train movement into the limits.”⁶⁷

101. The RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the

⁶⁶ *Intelligence-Based Rail Solutions*, COLLINS AEROSPACE, [\[https://web.archive.org/web/20211122013021/https://www.collinsaerospace.com/-/media/project/collinsaerospace/collinsaerospace-website/product-assets/marketing/r/rail/arinc-rail-solutions-for-passengers.pdf?rev=e7e5ddbff2de4154ba265f03e27f14d3\]](https://web.archive.org/web/20211122013021/https://www.collinsaerospace.com/-/media/project/collinsaerospace/collinsaerospace-website/product-assets/marketing/r/rail/arinc-rail-solutions-for-passengers.pdf?rev=e7e5ddbff2de4154ba265f03e27f14d3) (last visited July 7, 2025); see also *Advanced Information Management (AIM) Rail Dispatch*, WABTEC, <https://www.wabteccorp.com/digital-intelligence/signaling-and-train-control/dispatch/advanced-information-management-aim-rail-dispatch> (last visited July 7, 2025).

⁶⁷ Caltrain Passenger Train Collision with Hi-rail Construction Vehicles, National Transportation Safety Board, RIR-24-01 at 11 (Feb. 27, 2024).

1 AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods,
2 as implemented and used and continues to be used by Caltrain, that places track sections in “foul
3 time” necessarily “permit a terminal user of the terminal request the railway control apparatus to
4 place a block on one or more specified track sections to permit a railway field worker to enter the
5 track sections while blocking railway traffic to said track sections.”

6 102. Specifically, FRA regulations 49 C.F.R. § 214.323 defines “foul time” as “a method
7 of establishing working limits on controlled track in which a . . . [railway field worker] is notified
8 by the train dispatcher or control operator that *no trains will operate within a specific segment of*
9 *controlled track until the . . . [railway field worker] reports clear of the track.*” (emphasis added).

10 103. Caltrain’s implementation and use of the RailwayNetSM system with EEPS and/or
11 EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any
12 same or similar systems or methods has the ability to take tracks out of service and/or place tracks
13 in foul time.⁶⁸

14 104. Because Caltrain, through its implementation and use of the RailwayNetSM system
15 with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like
16 functionality or any same or similar systems or methods, has the ability to take tracks out of service
17 and/or place tracks in foul time, it practices the claimed method “to place a block on one or more
18 specified track sections to permit a railway field worker to enter the track sections while blocking
19 railway traffic to said track sections.”

20 105. In order to comply with and implement FRA’s recommendations in its regulations
21 (communication-based/processor-based train control technology designed to address a number of
22 railway safety issues including train-to-train collisions, over-speed derailments, incursions into
23

24 ⁶⁸ See, e.g., *Caltrain Railroad Company Train Collision with On-Track Equipment and Derailment and Fire,*
25 *National Transportation Safety Board Track and Engineering Group Chairman Factual Report*, RRD22MR007 at
26 15 (Sept. 9, 2022) (“The RWIC was asked if he were aware about whether the men or equipment fouled main track
27 one. . . .”); Roadway Worker Protection (RWP) Caltrain Training - Study Guide, Caltrain at 10 (“Form C -Track Out
28 Of Service . . . The track is taken out of service and not available for trains to use unless the RWIC provides
permission. . . .) (available at
<https://www.caltrain.com/media/2098#:~:text=Fouling%20a%20track%2D%20is%20the%20placement%20of,field%20side%20of%20the%20nearest%20running%20rail.&text=safety%20at%20least%2015%20seconds%20prior%20to%20the%20train%20passing%20by%20the%20work%20zone.>).

1 established work-zone limits, and train movement through a main-line switch that is in an improper
 2 position), the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM
 3 system with EEPS and/or EEPS-like functionality or any same or similar systems or methods must
 4 be configured and used to place a block on one or more sections of railway track to prevent trains
 5 from traversing the one or more sections of railway track.⁶⁹

6 106. Accordingly, by permitting the train dispatcher to take a track out of service and/or
 7 place a track under foul time, the RailwayNetSM system with EEPS and/or EEPS-like functionality
 8 and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems
 9 or methods, as implemented and used and continues to be used by Caltrain, “permit[s] a terminal
 10 user of the terminal request the railway control apparatus to place a block on one or more specified
 11 track sections to permit a railway field worker to enter the track sections while blocking railway
 12 traffic to said track sections.”

13 107. Caltrain’s implementation and use of the RailwayNetSM system with EEPS and/or
 14 EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any
 15 same or similar systems or methods further generates “by the railway control apparatus a release
 16 code and transmit[s] the release code to an electronic contact address accessible by the railway
 17 field worker via operation of the user interface of the user terminal.”

18 108. In a report submitted to the U.S. Department of Transportation regarding the
 19 RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with
 20 EEPS and/or EEPS-like functionality or any same or similar systems or methods, communications
 21 to the railway field worker are generated in the “back office.”⁷⁰ This “back office” fulfills the claim
 22 element requirement for a railway control apparatus.⁷¹

23
 24
 25 ⁶⁹ See Final Report at 14; *see also* NEC One-Year Plan 2019 at 233.

26 ⁷⁰ Final Report at 11.

27 ⁷¹ See ARINC MAINTENANCE AND SUPPORT SERVICES, JPB BOARD OF DIRECTORS at 2 (Sept. 5, 2019) (available at
 28 <https://www.caltrain.com/media/2443/download>); MODERNIZATION PROGRAM PENINSULA CORRIDOR
 ELECTRIFICATION PROJECT (PCEP): JULY 2017 MONTHLY PROGRESS REPORT, CALTRAIN at 18-1 (July 31, 2017)
 (available at <https://www.caltrain.com/media/616/download?inline>); MODERNIZATION PROGRAM PENINSULA
 CORRIDOR ELECTRIFICATION PROJECT (PCEP): APRIL 2017 MONTHLY PROGRESS REPORT (April 30, 2017) at 17-1
 (available at <https://caltrain.com/media/613/download?inline>).

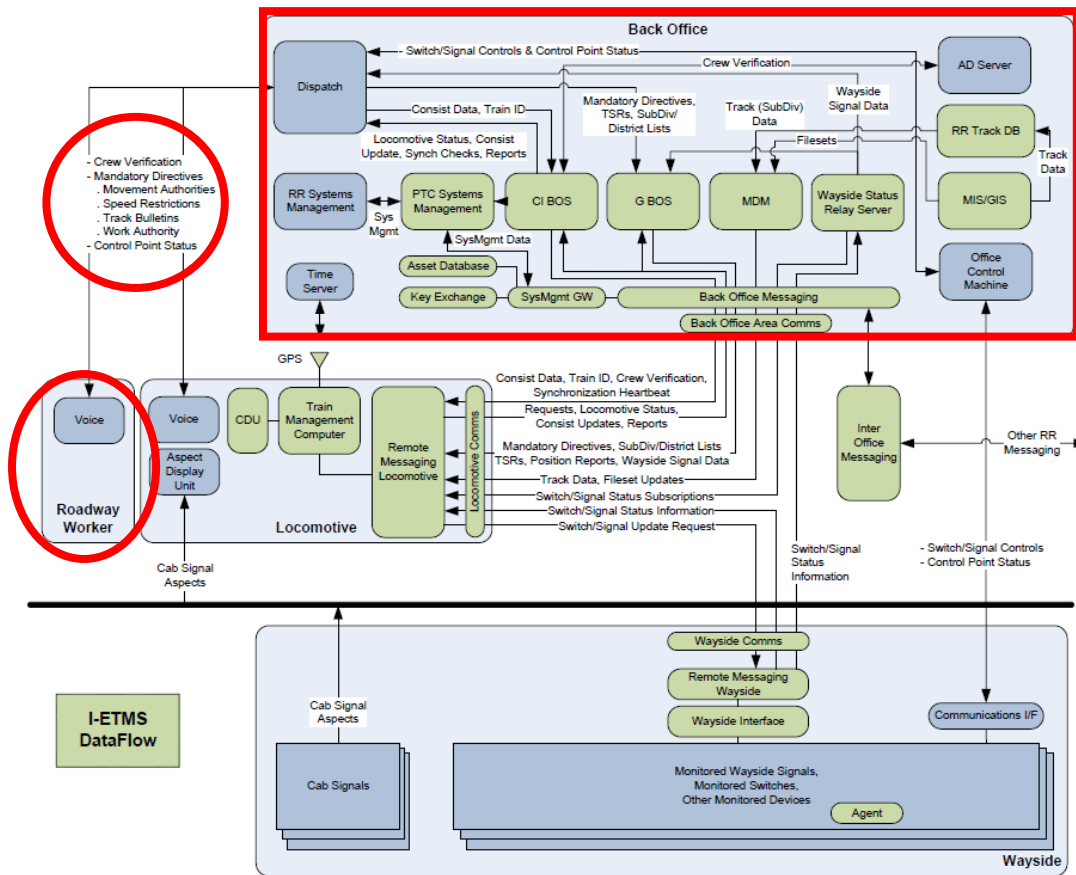


Figure 2 I-ETMS PTC Message Flows

109. The “back office” of Caltrain’s implementation and use of the RailwayNetSM system with EEPs and/or EEPs-like functionality and/or the AIM system with EEPs and/or EEPs-like functionality or any same or similar systems or methods generates a release code which is transmitted to the railway field worker.⁷²

⁷² See, e.g., *Caltrain Railroad Company Train Collision with On-Track Equipment and Derailment and Fire*, National Transportation Safety Board Track and Engineering Group Chairman Factual Report, RRD22MR007 at 58 (Sept. 9, 2022); *Caltrain Passenger Train Collision with Hi-rail Construction Vehicles*, National Transportation Safety Board, RIR-24-01 at 11 (Feb. 27, 2024); QUARTERLY PROGRESS REVIEW MEETING NO. 22: DECEMBER 5, 2022, PENINSULA CORRIDOR JOINT POWERS BOARD (JPB)/CALTRAIN at 4 (Dec. 19, 2022).

c. Release "Codes"

- i. Meetings with SEPTA and Wabtec (Who recently purchased the Rockwell Collins dispatch system known as ARINC used at Caltrain) were held recently. The use of a single code for an RWIC to provide to the dispatcher is essentially "turnkey."

Caltrain Passenger Train Collision with Hi-rail Construction Vehicles
RIR-24-01

1.7.3 Redundant Safety Protections

Caltrain instituted a redundant safety process for dispatchers requiring them to click a checkbox verifying the release of track and time authority before its release. They also acquired software that will only allow the dispatcher to release track and time authority after both the RWIC and one other authorized person in the work group has entered a special pin code into the system.

Caltrain now requires that a RWIC be physically within the limits of track and time authority when requesting and releasing authority. They also modified On Track Safety Rule 6.3.1 to require the track and time authority form to be initialed by at least one other roadway worker/contractor in the work group confirming that they are clear of the track.

- The safety task force formed after the March 10, 2022 incident continues to meet.
 - A new protocol has been developed that requires both the Roadway Worker in Charge (RWIC) and the contractor's foreman to sign off before track and time protection can be released.
 - A new electronic process has just been implemented that requires a specific electronic code to be transmitted to the dispatcher. Before protection can be released.

110. In order for the code to be transmitted to the railway field worker, the "back office" of Caltrain's implementation and use of the RailwayNetSM system with EEPs and/or EEPs-like functionality and/or the AIM system with EEPs and/or EEPs-like functionality or any same or similar systems or methods must retrieve the phone number of the railway field worker (*i.e.*, an "electronic contact address") and then transmit the release code to an electronic contact address accessible by the railway field worker.

111. The release code corresponds to the blocking protection applied in the CTC

system.⁷³

Caltrain Passenger Train Collision with Hi-rail Construction Vehicles
RIR-24-01

1.7.3 Redundant Safety Protections

Caltrain instituted a redundant safety process for dispatchers requiring them to click a checkbox verifying the release of track and time authority before its release. They also acquired software that will only allow the dispatcher to release track and time authority after both the RWIC and one other authorized person in the work group has entered a special pin code into the system.

Caltrain now requires that a RWIC be physically within the limits of track and time authority when requesting and releasing authority. They also modified On Track Safety Rule 6.3.1 to require the track and time authority form to be initialed by at least one other roadway worker/contractor in the work group confirming that they are clear of the track.

- The safety task force formed after the March 10, 2022 incident continues to meet.
 - A new protocol has been developed that requires both the Roadway Worker in Charge (RWIC) and the contractor's foreman to sign off before track and time protection can be released.
 - A new electronic process has just been implemented that requires a specific electronic code to be transmitted to the dispatcher. Before protection can be released.

112. The RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods, as implemented and used and continues to be used by Caltrain, specifies providing back office infrastructure and messaging, including “[s]torage and delivery of crew and consist information, train IDs and clearances.”⁷⁴ It further specifies enabling compliance with I-ETMS systems.⁷⁵ Because I-ETMS systems require communication of crew verification and employee authentication, Caltrain maintains electronic contact addresses of the railway field workers from a

⁷³ See, e.g., *Caltrain Railroad Company Train Collision with On-Track Equipment and Derailment and Fire*, National Transportation Safety Board Track and Engineering Group Chairman Factual Report, RRD22MR007 at 58 (Sept. 9, 2022); *Caltrain Passenger Train Collision with Hi-rail Construction Vehicles*, National Transportation Safety Board, RIR-24-01 at 11 (Feb. 27, 2024); QUARTERLY PROGRESS REVIEW MEETING NO. 22: DECEMBER 5, 2022, PENINSULA CORRIDOR JOINT POWERS BOARD (JPB)/CALTRAIN at 4 (Dec. 19, 2022).

⁷⁴ See White Paper at 7; see also *Advanced Information Management (AIM) Rail Dispatch*, WABTEC, <https://www.wabteccorp.com/digital-intelligence/signaling-and-train-control/dispatch/advanced-information-management-aim-rail-dispatch> (last visited July 7, 2025) (similar advertisements from Wabtec).

⁷⁵ See Final Report at 43.

1 rail personnel contact database. The RailwayNetSM system with EEPS and/or EEPS-like
 2 functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or
 3 similar systems or methods messaging functions also include “[k]ey exchange server,” described
 4 as “[s]ecurity keys with data store.”⁷⁶

5 A summary of the ARINC RailwayNet PTC hosting service functionality is shown below.

Messaging functions	Description	Included
Back-office messaging	Message transmission for the railroad back office	•*
Inter-office messaging	Message transmission between assets and railroad back offices in support of train initialization	•*
Systems management gateway	Messaging systems management	•
Systems management	Remote asset monitoring and control	Optional
Back-office area communications	Communications infrastructure at the Annapolis facility in support of railroad remote asset connectivity via cellular and internet connections	•
Key exchange server	Security keys with data store	•

15 113. Accordingly, since Caltrain’s implementation and use of the RailwayNetSM system
 16 with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like
 17 functionality or any same or similar systems or methods provides railway field workers with a
 18 release code that corresponds to the blocking protection applied in the control system, Caltrain
 19 practices the step of “generating by the railway control apparatus a release code and transmitting
 20 the release code to an electronic contact address accessible by the railway field worker via
 21 operation of the user interface of the user terminal.”

22 114. Caltrain’s implementation and use of the RailwayNetSM system with EEPS and/or
 23 EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any
 24 same or similar systems or methods permits “the block to said one or more track sections to be
 25 removed by the railway control apparatus only upon receiving the release code from the user
 26 terminal in return.”

27
 28 ⁷⁶ White Paper at 7.

115. Caltrain's implementation and use of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods includes an enhanced employee protection system, which requires the dispatcher to enter a "release code" or a "pin code" in order to remove the protection (e.g., the foul time) from the track.⁷⁷

c. Release "Codes"

- i. Meetings with SEPTA and Wabtec (Who recently purchased the Rockwell Collins dispatch system known as ARINC used at Caltrain) were held recently. The use of a single code for an RWIC to provide to the dispatcher is essentially "turnkey."

Caltrain Passenger Train Collision with Hi-rail Construction Vehicles
RIR-24-01

1.7.3 Redundant Safety Protections

Caltrain instituted a redundant safety process for dispatchers requiring them to click a checkbox verifying the release of track and time authority before its release. They also acquired software that will only allow the dispatcher to release track and time authority after both the RWIC and one other authorized person in the work group has entered a special pin code into the system.

Caltrain now requires that a RWIC be physically within the limits of track and time authority when requesting and releasing authority. They also modified On Track Safety Rule 6.3.1 to require the track and time authority form to be initialed by at least one other roadway worker/contractor in the work group confirming that they are clear of the track.

- The safety task force formed after the March 10, 2022 incident continues to meet.
 - A new protocol has been developed that requires both the Roadway Worker in Charge (RWIC) and the contractor's foreman to sign off before track and time protection can be released.
 - A new electronic process has just been implemented that requires a specific electronic code to be transmitted to the dispatcher. Before protection can be released.

116. Moreover, the FRA has recognized that systems such as the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like

⁷⁷ See, e.g., *Caltrain Railroad Company Train Collision with On-Track Equipment and Derailment and Fire*, National Transportation Safety Board Track and Engineering Group Chairman Factual Report, RRD22MR007 at 58 (Sept. 9, 2022); *Caltrain Passenger Train Collision with Hi-rail Construction Vehicles*, National Transportation Safety Board, RIR-24-01 at 11 (Feb. 27, 2024); QUARTERLY PROGRESS REVIEW MEETING NO. 22: DECEMBER 5, 2022, PENINSULA CORRIDOR JOINT POWERS BOARD (JPB)/CALTRAIN at 4 (Dec. 19, 2022).

1 functionality or any same or similar systems or methods implemented and used and continues to
 2 be used by Caltrain complies with applicable recommended regulations (communication-
 3 based/processor-based train control technology designed to address a number of rail safety issues
 4 including train-to-train collisions, over-speed derailments, incursions into established work-zone
 5 limits, and train movement through a main-line switch that is in an improper position) by providing
 6 that the “dispatching system will not allow a dispatcher to release controlled track working limits
 7 until the RWIC affirmatively indicates via an electronic prompt that he or she is releasing working
 8 limits authority.”⁷⁸

9 117. Accordingly, Caltrain’s implementation and use of the RailwayNetSM system with
 10 EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like
 11 functionality or any same or similar systems or methods thus permits “the block to said one or
 12 more track sections to be removed by the railway control apparatus only upon receiving the release
 13 code from the user terminal in return.”

14 118. Therefore, Caltrain, through its implementation and use of the RailwayNetSM
 15 system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-
 16 like functionality or any same or similar systems or methods has infringed and continues to infringe
 17 at least claim 5 of the ’782 patent.

18 119. As direct and proximate result of Caltrain’s infringement of the ’782 patent,
 19 Railware has been irreparably injured and has been caused significant harm and financial damages.

20 120. Caltrain has also induced and continues to induce infringement of at least claim 5
 21 of the ’782 patent in violation of 35 U.S.C. § 271(b).

22 121. Caltrain induces its users, and/or developers of its systems or methods to infringe
 23 at least claim 5 of the ’782 patent, and does so with the specific intent, by providing instructions,
 24 directions, information, and/or knowledge on how to use its systems and/or incorporate its systems
 25 or methods into other products (including the RailwayNetSM system with EEPS and/or EEPS-like
 26 functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or
 27

28 ⁷⁸ RRR, 81 Fed. Reg. at 37860.

1 similar systems or methods). For example, Caltrain instructs its own dispatchers on how to use the
2 system to infringe.

3 122. Caltrain had notice of and was aware or should have been aware of its infringement
4 of the '782 patent on at least December 13, 2016, or at the latest by May 15, 2025.

5 123. Caltrain knew or should have known and received notice of the '782 patent on at
6 least its issue date: December 13, 2016.

7 124. Further, to the extent the marking requirements of 35 U.S.C. § 287 apply, Caltrain
8 had constructive knowledge of the '782 patent at least since October 21, 2020.

9 125. Further, Caltrain knew or should have known and received notice of the '782 patent
10 on at least June 15, 2022, which is the date Railware filed suit against Amtrak for infringement of
11 the '782 patent, or earlier considering the business relationship between Caltrain and Amtrak, and
12 again on at least July 8, 2024, which is the date Railware filed suit against SEPTA for infringement
13 of the '782 patent, and again on the dates of any subsequent litigations filed by Railware regarding
14 the Asserted Patents.

15 126. Further, Caltrain knew or should have known and received notice of the '782 patent
16 on at least September 8, 2022, which is the date Caltrain issued a report indicating that it had met
17 with SEPTA regarding its CTC system, and discussed the “use of a single code for an RWIC to
18 provide to the dispatcher.”

19 127. Further, Caltrain knew or should have known and received notice of the '782 patent
20 as of May 15, 2025, when Caltrain was sent a letter informing it of its infringement of the '782
21 patent.

22 128. Caltrain's continued infringement on or after any of these dates is in spite of the
23 objectively high likelihood that its activities constitute infringement of a valid patent, and this risk
24 was either known or so obvious that it should have been known to Caltrain. Thus, Caltrain's
25 continued infringement at least as of December 13, 2016, or at the latest May 15, 2025, is willful
26 and deliberate.

27 129. Railware has suffered and continues to suffer damages and irreparable harm as a
28 result of Caltrain's past and ongoing infringement. Unless and until Caltrain's infringement is

enjoined, Railware will continue to be damaged and irreparably harmed.

130. Railware is entitled to all remedies at law and equity including, but not limited to, an injunction against Caltrain's infringement of the '782 patent pursuant to 35 U.S.C. § 283.

131. Railware is entitled to damages for Caltrain's infringement of the '782 patent including, but not limited to, damages pursuant to 35 U.S.C. §§ 284 and 285.

**SECOND CLAIM FOR RELIEF
(Infringement of the '835 patent)**

132. Railware repeats and incorporates by reference all prior allegations of this Complaint as if fully set forth herein.

133. Railware is the owner by assignment of all right, title, and interest in and to the '835 patent.

134. The '835 patent is valid and enforceable.

135. Claim 19 of the '835 patent recites:

A method for controlling railway access using a railway traffic control apparatus of a centralized railway control system configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, the method comprising:

providing a user interface of the railway traffic control apparatus, including a block placing part to place a block on one or more specified track sections in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to block railway traffic to the specified track sections and thereby to permit a railway field worker to enter the track sections;

generating a removal code, determining an electronic contact address of the railway field worker by accessing a rail personnel contact database registering, for each railway personnel, electronic contact information of the railway personnel, and transmitting the removal code to the electronic contact address of the railway field worker; and

permitting the block to said one or more track sections to be removed only upon entry of the removal by said centralized control operation from the railway traffic control apparatus.

136. In violation of 35 U.S.C. § 271(a), Caltrain has infringed and continues to infringe one or more claims of the '835 patent by making, using, offering for sale, selling, and/or importing

in or into the United States a system or method covered by the '835 patent, including, but not limited to, at least Caltrain's implementation and/or use of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods.⁷⁹

137. Caltrain's implementation and use of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods includes an enhanced employee protection functionality, which protects the safety of railway workers on or near railway tracks.⁸⁰

Roadway Worker Protection (RWP) has also been a focus in the aftermath of a train collision incident in March 2022. Gaps were discovered in RWP programs that contributed to the San Bruno incident, and Caltrain has closed those gaps through revised RWP training; changed to a safer fouling distance – 10 feet from the rail and 10 feet from the overhead wires; improved processes for issuing track and time protection; and investment in a software based enhanced employee protection system that adds yet another layer of RWP.

138. Caltrain, through its implementation and/or use of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods, infringes at least claim 19 of the '835 patent.

139. Caltrain's implementation and use of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods practices a "method for controlling railway access using a railway traffic control apparatus of a centralized railway control system configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network."

140. Caltrain owns and/or operates one or more control centers, including the CEMOF located at 585 Lenzen Avenue, San Jose, California 95126.⁸¹ Control centers are centralized

⁷⁹ Further investigation may reveal that others of Caltrain's products and systems also directly or indirectly infringe at least claim 19 or other claims of the '835 patent.

⁸⁰ PENINSULA CORRIDOR JOINT POWERS BOARD, ANNUAL COMPREHENSIVE FINANCIAL REPORT (FISCAL YEARS ENDED JUNE 30, 2023 AND 2022) at ix (available at <https://www.caltrain.com/media/32501>).

⁸¹ See *Central Equipment & Maintenance Facility (CEMOF)*, CALTRAIN, <https://www.caltrain.com/projects/central-equipment-maintenance-facility-cemof> (last visited July 7, 2025).

1 railway control systems using methods to control access to railway tracks configured for
 2 centralized control of traffic of a centrally controllable railway network including plural railways
 3 and a plurality of railway traffic interlocks dispersed in said plural railways constituting said
 4 railway network.

5 141. Caltrain's control centers, examples of which are shown below, include a number
 6 of terminals through which train dispatchers control the movement of trains, including by placing
 7 blocks on specified track sections. The below images illustrate.

8 CEMOF⁸²



21 142. Caltrain's control centers are "the 'nerve center,' of the commuter railroad, where
 22 dispatchers direct and monitor train traffic between San Francisco and Gilroy"⁸³ and "control[] all
 23 train movement on the corridor."⁸⁴

24 143. The RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the

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26 ⁸² *Peninsula Corridor Electrification Project*, TYLIN, <https://www.tylin.com/work/projects/peninsula-corridor-electrification-project> (last visited July 7, 2025).

27 ⁸³ *Central Equipment & Maintenance Facility (CEMOF)*, CALTRAIN, <https://www.caltrain.com/projects/central-equipment-maintenance-facility-cemof> (last visited July 7, 2025).

28 ⁸⁴ *Caltrain: Behind the Scenes of a Major Service Disruption*, CALTRAIN, <https://www.caltrain.com/rider-information/caltrain-behind-scenes-major-service-disruption> (last visited July 7, 2025).

1 AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods
 2 provides “centralized traffic control,” “train monitoring and control,” “automatic route
 3 setting/automatic routing,” “automatic traffic regulation,” and “bulletins, authorities,” and
 4 “restrictions management.”⁸⁵

5 Centralized Traffic Control 6 and SCADA

7 Collins designs and integrates state-of-the-art rail control
 8 solutions using our ARINC Advanced Information Management
 9 (AIM®) platform. AIM serves as an end-to-end solution for
 10 all rail control requirements, including SCADA. Centralized
 11 Traffic Control, Positive Train Control (PTC) and control center
 12 integration. Highly flexible and feature-rich, AIM enables
 13 railroads to maximize operational efficiency, cost-effectiveness
 14 and safety, all while providing an environment protected by
 15 the latest tools and techniques in cybersecurity.

16 KEY AREAS OF EXPERTISE

- | | |
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| • Train monitoring and control | • Bulletins, authorities and restrictions management |
| • Automatic train tracking | • Employee in Charge (EIC) terminals |
| • Automatic route setting/automatic routing | • Emergency Operating Procedures (EOP) |
| • Automatic traffic regulation and schedule deviation | • Power planning |
| • Schedule management | • Playback and simulation |
| • Integrated yard management | • Data acquisition |
| | • Interface integration |

19 144. Caltrain has implemented and used and continues to use the RailwayNetSM system
 20 with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like
 21 functionality or any same or similar systems or methods.⁸⁶

22
 23 ⁸⁵ *Intelligence-Based Rail Solutions*, COLLINS AEROSPACE,
 24 [<https://web.archive.org/web/20211122013021/https://www.collinsaerospace.com/-/media/project/collinsaerospace/collinsaerospace-website/product-assets/marketing/r/rail/arinc-rail-solutions-for-passengers.pdf?rev=e7e5ddbff2de4154ba265f03e27f14d31>] (last visited July 7, 2025); *see also* *Advanced Information Management (AIM) Rail Dispatch*, WABTEC, <https://www.wabteccorp.com/digital-intelligence/signaling-and-train-control/dispatch/advanced-information-management-aim-rail-dispatch> (last visited July 7, 2025).

26 ⁸⁶ ARINC MAINTENANCE AND SUPPORT SERVICES, JPB BOARD OF DIRECTORS at 2 (Sept. 5, 2019) (available at <https://www.caltrain.com/media/2443/download>); MODERNIZATION PROGRAM PENINSULA CORRIDOR
 27 ELECTRIFICATION PROJECT (PCEP): JULY 2017 MONTHLY PROGRESS REPORT, CALTRAIN at 18-1 (July 31, 2017)
 28 (available at <https://www.caltrain.com/media/616/download?inline>); MODERNIZATION PROGRAM PENINSULA

145. Caltrain implemented and used and continues to use the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods as a SaaS and/or IaaS—a software/infrastructure as a service—product that provides “full-featured network management and infrastructure, hardware, network, operating systems, and applications for fault, performance, security and configuration management.”⁸⁷

146. The RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods is advertised to help facilitate the increases in safety and reliability in train control systems.⁸⁸

147. The RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods, which Caltrain implemented and uses, improves rail safety. More particularly, “[t]his system refers to communication-based/processor-based train control technology designed to address a number of rail safety issues, including train-to-train collisions, over-speed derailments, incursions into

CORRIDOR ELECTRIFICATION PROJECT (PCEP): APRIL 2017 MONTHLY PROGRESS REPORT (April 30, 2017) at 17-1 (available at <https://caltrain.com/media/613/download?inline>); *Peninsula Corridor Electrification Project*, TYLIN, <https://www.tylin.com/work/projects/peninsula-corridor-electrification-project> (last visited July 7, 2025) (“We are also providing implementation management services to oversee the design, development, testing, and commissioning of the Office SCADA systems based on the Advanced Integration Management (AIM) system supplied by Wabtec (formerly ARINC), the system integrator.”); *Caltrain Railroad Company Train Collision with On-Track Equipment and Derailment and Fire, National Transportation Safety Board Track and Engineering Group Chairman Factual Report*, RRD22MR007 at 58 (Sept. 9, 2022) (“Meetings with SEPTA and Wabtec (Who recently purchased the Rockwell Collins dispatch system known as ARINC used at Caltrain) were held recently. The use of a single code for an RWIC to provide to the dispatcher is essentially “turnkey.”); *Caltrain Passenger Train Collision with Hi-rail Construction Vehicles, National Transportation Safety Board*, RIR-24-01 at 11 (Feb. 27, 2024).

⁸⁷ White Paper at 6.

⁸⁸ See, e.g., *Amtrak signs nationwide contract for Rockwell Collins’ ARINC RailwayNetSM Positive Train Control service*, COLLINS AEROSPACE (Sep. 6, 2017), https://rockwellcollins.com/-/media/Files/Unsecure/Services-And-Support/Information-Management/ARINC-Rail/RC_Amtrak-Press-Release_09-06-17.ashx; *RailwayNet Positive Train Control Communication Solution*, WABTEC, <https://www.wabteccorp.com/digital-intelligence/signaling-and-train-control/communications/railwaynet-positive-train-control-communication-solution> (last visited July 7, 2025).

established work-zone limits, and train movement through a main-line switch that is in an improper position.”⁸⁹



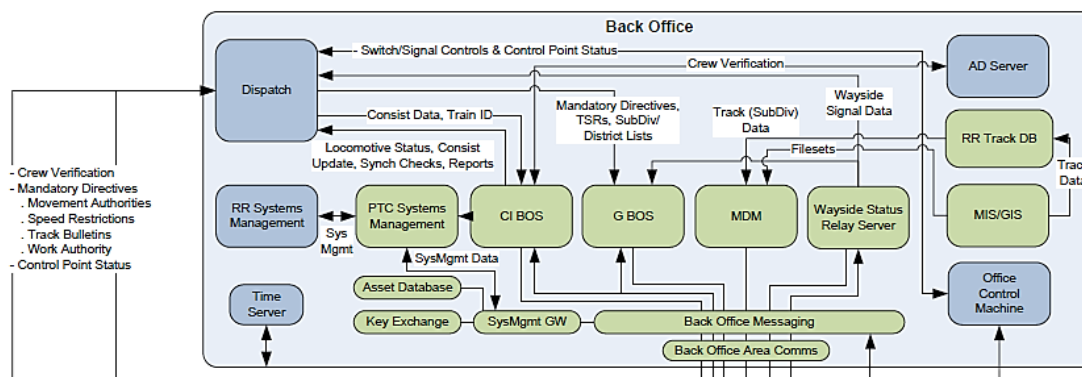
148. The RailwayNetSM system with EEPs and/or EEPs-like functionality and/or the AIM system with EEPs and/or EEPs-like functionality or any same or similar systems or methods was implemented and used and continues to be used throughout Caltrain’s routes.⁹⁰

149. As explained below, the RailwayNetSM system with EEPs and/or EEPs-like functionality and/or the AIM system with EEPs and/or EEPs-like functionality or any same or similar systems or methods is a hosted network, messaging and application platform, designed to assist operators in meeting the requirements mandated by the Rail Safety Improvement Act of 2008 (the “Act”). The Act directs the Federal Railroad Administration (FRA) to mandate new regulations focused on railroad safety. When used in conjunction with the operator’s train control

⁸⁹ White Paper at 3.

⁹⁰ ARINC MAINTENANCE AND SUPPORT SERVICES, JPB BOARD OF DIRECTORS at 2 (Sept. 5, 2019) (available at <https://www.caltrain.com/media/2443/download>); MODERNIZATION PROGRAM PENINSULA CORRIDOR ELECTRIFICATION PROJECT (PCEP): JULY 2017 MONTHLY PROGRESS REPORT, CALTRAIN at 18-1 (July 31, 2017) (available at <https://www.caltrain.com/media/616/download?inline>); MODERNIZATION PROGRAM PENINSULA CORRIDOR ELECTRIFICATION PROJECT (PCEP): APRIL 2017 MONTHLY PROGRESS REPORT (April 30, 2017) at 17-1 (available at <https://caltrain.com/media/613/download?inline>); *Peninsula Corridor Electrification Project*, TYLIN, <https://www.tylin.com/work/projects/peninsula-corridor-electrification-project> (last visited July 7, 2025) (“We are also providing implementation management services to oversee the design, development, testing, and commissioning of the Office SCADA systems based on the Advanced Integration Management (AIM) system supplied by Wabtec (formerly ARINC), the system integrator.”).

150. The RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods includes an “integration server and software” that “provides connectivity between the railroad IT systems and the hosted back-office components.”⁹² The integration server provides an interface with various system components.



⁹² See White Paper at 8 (illustrating “AIM[®] integration server”).

AIM® integration server

The ARINC RailwayNet integrations server and software provides connectivity between the railroad IT systems and the hosted back-office components. The functions of this application include:

- › Interface with customer's IT gateway
- › Interface with back office
- › Manage crew authentication through the customer's IT gateway
- › Functions to assign train ID to trains based on the clearance number
- › Functions to manage train consist through the customer's IT gateway
- › Functions to track, display, and store events and alarms

Centralized Traffic Control and SCADA

Collins designs and integrates state-of-the-art rail control solutions using our ARINC Advanced Information Management (AIM®) platform. AIM serves as an end-to-end solution for all rail control requirements, including SCADA, Centralized Traffic Control, Positive Train Control (PTC) and control center integration. Highly flexible and feature-rich, AIM enables railroads to maximize operational efficiency, cost-effectiveness and safety, all while providing an environment protected by the latest tools and techniques in cybersecurity.

KEY AREAS OF EXPERTISE

- | | |
|---|--|
| • Train monitoring and control | • Bulletins, authorities and restrictions management |
| • Automatic train tracking | • Employee in Charge (EIC) terminals |
| • Automatic route setting/automatic routing | • Emergency Operating Procedures (EOP) |
| • Automatic traffic regulation and schedule deviation | • Power planning |
| • Schedule management | • Playback and simulation |
| • Integrated yard management | • Data acquisition |
| | • Interface integration |

151. The RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods, implemented and used and continues to be used by Caltrain, provides the network connections and office applications required to exchange critical information among railroads. It is available on a subscription basis as hosted SaaS (software as a service) and IaaS (infrastructure as a service) solutions, and messaging from the back office to the locomotive through VHF, cellular, and Wi-Fi is also available.⁹³

152. The RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods as implemented and used and continues to be used by Caltrain, further controls plural railways and a plurality of railway traffic interlocks. Specifically, Centralized Train Control systems, such as that employed by Caltrain and its implementation and use of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality

⁹³ *News from Rockwell Collins: Shared-network PTC platform*, RAILWAY AGE 14 (July 2016), https://issuu.com/railwayage/docs/july_2016_railway_age; *RailwayNet Positive Train Control Communication Solution*, WABTEC, <https://www.wabteccorp.com/digital-intelligence/signaling-and-train-control/communications/railwaynet-positive-train-control-communication-solution> (last visited July 7, 2025).

1 or any same or similar systems or methods “consists of a centralized train dispatcher’s office that
 2 controls railroad interlocking and traffic flows in portions of the rail system designated as CTC
 3 territory.”⁹⁴ Train dispatchers in the control center have control over all interlockings on Caltrain’s
 4 railroads.⁹⁵

5 153. Caltrain implemented and used and continues to use the RailwayNetSM system with
 6 EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like
 7 functionality or any same or similar systems or methods—a hosted network, messaging and
 8 application platform as amended—on Caltrain’s railroads, including any commuter and freight
 9 routes that host Caltrain services.⁹⁶

10 154. Accordingly, Caltrain’s implementation and use of the RailwayNetSM system with
 11 EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like
 12 functionality or any same or similar systems or methods practices a “method for controlling
 13 railway access using a railway traffic control apparatus of a centralized railway control system
 14 configured for centralized control of traffic of a centrally controllable railway network including
 15 plural railways and a plurality of railway traffic interlocks dispersed in said plural railways
 16 constituting said railway network.”

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 18 ⁹⁴ CTC, WIKIPEDIA, https://en.wikipedia.org/wiki/Centralized_traffic_control.

19 ⁹⁵ THE CALTRAIN CORRIDOR VISION PLAN: APPENDIX A, SAN FRANCISCO BAY AREA PLANNING AND URBAN
 20 RESEARCH ASSOCIATION (2016) at 5, n. 5 (“On the Caltrain corridor, “interlocking” is generally synonymous with
 “control point,” i.e., a location in a Centralized Traffic Control (CTC) railroad network with signals and turnouts
 directly controlled by dispatchers.”) (available at https://www.spur.org/sites/default/files/2017-02/Appendix_A_Existing_Conditions_and_Methodology.pdf).

21 ⁹⁶ ARINC MAINTENANCE AND SUPPORT SERVICES, JPB BOARD OF DIRECTORS at 2 (Sept. 5, 2019) (available at
 22 <https://www.caltrain.com/media/2443/download>); MODERNIZATION PROGRAM PENINSULA CORRIDOR
 23 ELECTRIFICATION PROJECT (PCEP): JULY 2017 MONTHLY PROGRESS REPORT, CALTRAIN at 18-1 (July 31, 2017)
 (available at <https://www.caltrain.com/media/616/download?inline>); MODERNIZATION PROGRAM PENINSULA
 24 CORRIDOR ELECTRIFICATION PROJECT (PCEP): APRIL 2017 MONTHLY PROGRESS REPORT (April 30, 2017) at 17-1
 (available at <https://caltrain.com/media/613/download?inline>); *Peninsula Corridor Electrification Project*, TYLIN,
 25 <https://www.tylin.com/work/projects/peninsula-corridor-electrification-project> (last visited July 7, 2025) (“We are
 26 also providing implementation management services to oversee the design, development, testing, and
 commissioning of the Office SCADA systems based on the Advanced Integration Management (AIM) system
 supplied by Wabtec (formerly ARINC), the system integrator.”); *Caltrain Railroad Company Train Collision with*
 27 *On-Track Equipment and Derailment and Fire, National Transportation Safety Board Track and Engineering*
 28 *Group Chairman Factual Report*, RRD22MR007 at 58 (Sept. 9, 2022) (“Meetings with SEPTA and Wabtec (Who
 recently purchased the Rockwell Collins dispatch system known as ARINC used at Caltrain) were held recently. The
 use of a single code for an RWIC to provide to the dispatcher is essentially ““turnkey.””); *Caltrain Passenger Train*
Collision with Hi-rail Construction Vehicles, National Transportation Safety Board, RIR-24-01 at 11 (Feb. 27,
 2024).

1 155. Caltrain's implementation and use of the RailwayNetSM system with EEPS and/or
 2 EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any
 3 same or similar systems or methods provides "a user interface of the railway traffic control
 4 apparatus, including a block placing part to place a block on one or more specified track sections
 5 in any of said plural railways constituting said railway network that is managed by centralized
 6 control operation from the railway traffic control apparatus, the railway traffic control apparatus
 7 controlling, by said centralized control operation, one or more interlocks amongst the plurality of
 8 railway traffic interlocks dispersed in said plural railways constituting said railway network, to
 9 block railway traffic to the specified track sections and thereby to permit a railway field worker to
 10 enter the track sections."

11 156. Caltrain's implementation and use of the RailwayNetSM system with EEPS and/or
 12 EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any
 13 same or similar systems or methods includes an enhanced employee protection functionality.⁹⁷
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25 ⁹⁷ CALTRAIN SAFETY BRIEFING (April 19, 2023) at 18 (available at
 26 <https://www.caltrain.com/media/30177/download>); PENINSULA CORRIDOR JOINT POWERS BOARD, ANNUAL
 27 COMPREHENSIVE FINANCIAL REPORT (FISCAL YEARS ENDED JUNE 30, 2023 AND 2022) at ix (available at
 28 <https://www.caltrain.com/media/32501>); PENINSULA CORRIDOR JOINT POWERS BOARD, ANNUAL COMPREHENSIVE
 FINANCIAL REPORT (FISCAL YEARS ENDED JUNE 30, 2024 AND 2023) at xiii (available at
<https://www.caltrain.com/media/34732>); Project Monitoring Report (PMR) November 2024: Peninsula Corridor
 Electrification Project (PCEP) San Francisco to San Jose, CA at A-1 (2024) (available at
<https://www.caltrain.com/media/35145>).

Roadway Worker Protection

- March 10, 2022 Incident – NTSB Investigation
- Changes to Roadway Worker in Charge Training, Processes and Scheduling
- Bus Bridges, Safety Briefings, Planning
- Enhanced Employee Protection Systems



157. The RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods, as implemented and used and continues to be used by Caltrain, uses “track and time” in which “[b]efore granting track and time authority, the dispatcher must apply a ‘block’ through the dispatching system to prevent train movement into the limits.”⁹⁸

158. Additionally, the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods, implemented and used and continues to be used by Caltrain, that places track sections in “foul time” is a “block placing part” as recited in this claim element.

159. Specifically, FRA regulations 49 C.F.R. § 214.323 defines “foul time” as “a method of establishing working limits on controlled track in which a . . . [railway field worker] is notified by the train dispatcher or control operator that *no trains will operate within a specific segment of controlled track until the . . . [railway field worker] reports clear of the track.*” (emphasis added).

160. Caltrain’s implementation and use of the RailwayNetSM system with EEPS and/or

⁹⁸ Caltrain Passenger Train Collision with Hi-rail Construction Vehicles, National Transportation Safety Board, RIR-24-01 at 11 (Feb. 27, 2024).

1 EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any
2 same or similar systems or methods has the ability to place tracks in foul time.⁹⁹

3 161. Because Caltrain, through its implementation and use of the RailwayNetSM system
4 with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like
5 functionality or any same or similar systems or methods, has the ability to place tracks in foul time,
6 it includes “a block placing part to place a block on one or more specified track sections in any of
7 said plural railways constituting said railway network that is managed by centralized control
8 operation from the railway traffic control apparatus, the railway traffic control apparatus
9 controlling, by said centralized control operation, one or more interlocks amongst the plurality of
10 railway traffic interlocks dispersed in said plural railways constituting said railway network, to
11 block railway traffic to the specified track sections and thereby to permit a railway field worker to
12 enter the track sections.”

13 162. Moreover, in order to place a track segment in “foul time,” the system must provide
14 a “user interface of the railway traffic control apparatus” to permit the dispatcher to establish the
15 blocking protection. As illustrated in the below images, such interfaces exist in Caltrain’s control
16 centers.

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24 ⁹⁹ See, e.g., *Caltrain Railroad Company Train Collision with On-Track Equipment and Derailment and Fire*,
25 *National Transportation Safety Board Track and Engineering Group Chairman Factual Report*, RRD22MR007 at
26 15 (Sept. 9, 2022) (“The RWIC was asked if he were aware about whether the men or equipment fouled main track
one. . . .”); Roadway Worker Protection (RWP) Caltrain Training - Study Guide, Caltrain at 10 (“Form C -Track Out
Of Service . . . The track is taken out of service and not available for trains to use unless the RWIC provides
27 permission. . . .”) (available at
28 <https://www.caltrain.com/media/2098#:~:text=Fouling%20a%20track%2D%20is%20the%20placement%20of,field%20side%20of%20the%20nearest%20running%20rail.&text=safety%20at%20least%2015%20seconds%20prior%20to%20the%20train%20passing%20by%20the%20work%20zone.>).

CEMOF¹⁰⁰

163. The blocking protection is applied by controlling one or more interlocks.¹⁰¹

164. The RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods provides “train monitoring and control,” automatic route setting/automatic routing,” “automatic traffic regulation,” and “bulletins, authorities, and restrictions management,” as shown in the image below.¹⁰² One or more of these functionalities encompasses the claimed block placing part.

¹⁰⁰ *Peninsula Corridor Electrification Project*, TYLIN, <https://www.tylin.com/work/projects/peninsula-corridor-electrification-project> (last visited July 7, 2025).

¹⁰¹ See THE CALTRAIN CORRIDOR VISION PLAN: APPENDIX A, SAN FRANCISCO BAY AREA PLANNING AND URBAN RESEARCH ASSOCIATION (2016) at 1 (available at https://www.spur.org/sites/default/files/2017-02/Appendix_A_Existing_Conditions_and_Methodology.pdf); Roadway Worker Protection (RWP) Caltrain Training - Study Guide, Caltrain at 11 (available at [https://www.caltrain.com/media/2098#:~:text=Fouling%20a%20track%2D%20is%20the%20placement%20of,field%20side%20of%20the%20nearest%20running%20rail.&text=safety%20at%20least%2015%20seconds%20prior%20to%20the%20train%20passing%20by%20the%20work%20zone.\)](https://www.caltrain.com/media/2098#:~:text=Fouling%20a%20track%2D%20is%20the%20placement%20of,field%20side%20of%20the%20nearest%20running%20rail.&text=safety%20at%20least%2015%20seconds%20prior%20to%20the%20train%20passing%20by%20the%20work%20zone.)))

¹⁰² *Intelligence-Based Rail Solutions*, COLLINS AEROSPACE, <https://web.archive.org/web/20211122013021/https://www.collinsaerospace.com/-/media/project/collinsaerospace/collinsaerospace-website/product-assets/marketing/r/rail/arinc-rail-solutions-for-passengers.pdf?rev=e7e5ddbff2de4154ba265f03e27f14d3> (last visited July 7, 2025); see *Advanced Information Management (AIM) Rail Dispatch*, WABTEC, <https://www.wabteccorp.com/digital-intelligence/signaling-and-train-control/dispatch/advanced-information-management-aim-rail-dispatch> (last visited July 7, 2025).

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| • Integrated yard management | • Data acquisition |
| | • Interface integration |

165. The RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods, implemented and used and continues to be used by Caltrain, is a SaaS and IaaS product that provides “full-featured network management and infrastructure, hardware, network, operating systems, and applications for fault, performance, security and configuration management.”¹⁰³ Additionally, the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods is “designed to help meet the availability standards required for PTC operations.”¹⁰⁴ Because the system is designed to support railroads to meet the PTC requirements, it must be configured to manage train movements, including placing blocks on one or more sections of railway track to prevent trains from traversing the one or more sections of railway track.

166. In order to comply with and implement FRA’s regulations (communication-based/processor-based train control technology designed to address a number of railway safety

¹⁰³ White Paper at 6.

¹⁰⁴ *Id.*

1 issues including train-to-train collisions, over-speed derailments, incursions into established work-
 2 zone limits, and train movement through a main-line switch that is in an improper position), the
 3 RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with
 4 EEPS and/or EEPS-like functionality or any same or similar systems or methods is configured and
 5 used to place a block on one or more sections of railway track to prevent trains from traversing the
 6 one or more sections of railway track.¹⁰⁵

7 167. Accordingly, Caltrain's implementation and use of the RailwayNetSM system with
 8 EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like
 9 functionality or any same or similar systems or methods provides "a user interface of the railway
 10 traffic control apparatus, including a block placing part to place a block on one or more specified
 11 track sections in any of said plural railways constituting said railway network that is managed by
 12 centralized control operation from the railway traffic control apparatus, the railway traffic control
 13 apparatus controlling, by said centralized control operation, one or more interlocks amongst the
 14 plurality of railway traffic interlocks dispersed in said plural railways constituting said railway
 15 network, to block railway traffic to the specified track sections and thereby to permit a railway
 16 field worker to enter the track sections."

17 168. Caltrain's implementation and use of the system with EEPS and/or EEPS-like
 18 functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or
 19 similar systems or methods further "generat[es] a removal code, determin[es] an electronic contact
 20 address of the railway field worker by accessing a rail personnel contact database registering, for
 21 each railway personnel, electronic contact information of the railway personnel, and transmit[s]
 22 the removal code to the electronic contact address of the railway field worker."

23 169. In a report submitted to the U.S. Department of Transportation regarding the
 24 RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with
 25 EEPS and/or EEPS-like functionality or any same or similar systems or methods, communications
 26 to the railway field worker are generated in the "back office."¹⁰⁶ The below figure illustrates.

27 _____
 28 ¹⁰⁵ Final Report at 14.

¹⁰⁶ Final Report at 11.

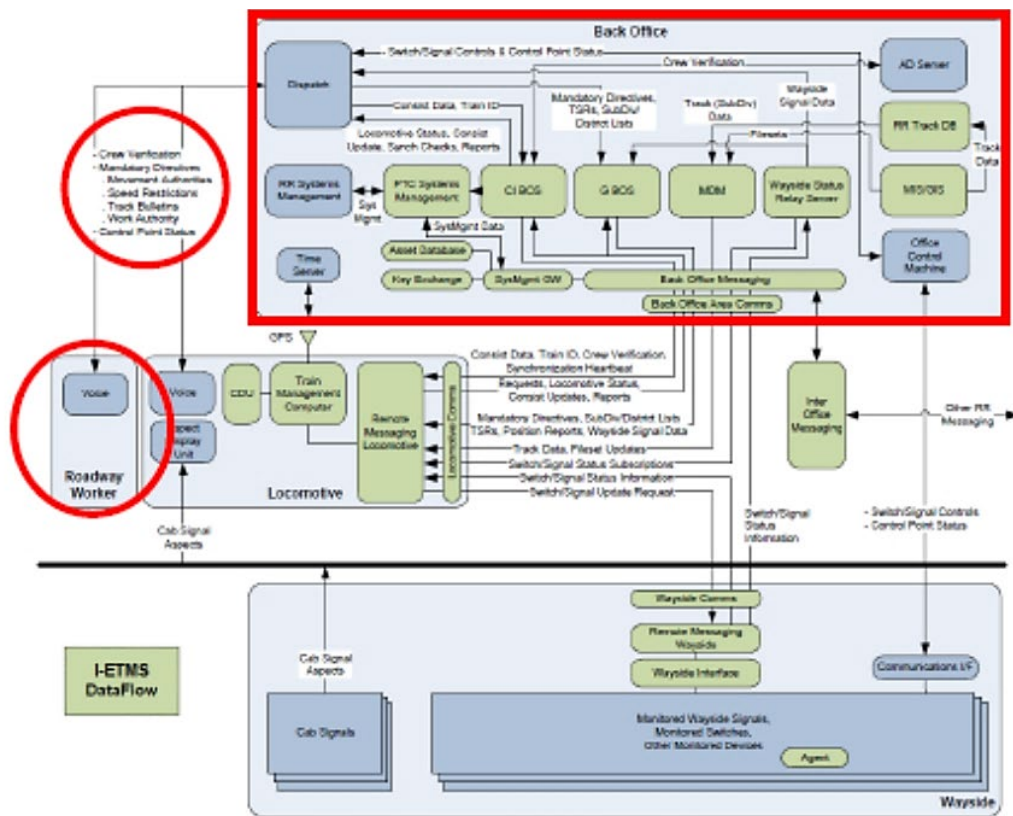


Figure 2 I-ETMS PTC Message Flows

170. The “back office” of Caltrain’s implementation and use of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods generates a release code which is transmitted to the railway field worker.¹⁰⁷

c. Release “Codes”

- i. Meetings with SEPTA and Wabtec (Who recently purchased the Rockwell Collins dispatch system known as ARINC used at Caltrain) were held recently. The use of a single code for an RWIC to provide to the dispatcher is essentially “turnkey.”

¹⁰⁷ See, e.g., *Caltrain Railroad Company Train Collision with On-Track Equipment and Derailment and Fire*, National Transportation Safety Board Track and Engineering Group Chairman Factual Report, RRD22MR007 at 58 (Sept. 9, 2022); *Caltrain Passenger Train Collision with Hi-rail Construction Vehicles*, National Transportation Safety Board, RIR-24-01 at 11 (Feb. 27, 2024); QUARTERLY PROGRESS REVIEW MEETING NO. 22: DECEMBER 5, 2022, PENINSULA CORRIDOR JOINT POWERS BOARD (JPB)/CALTRAIN at 4 (Dec. 19, 2022).

1.7.3 Redundant Safety Protections

Caltrain instituted a redundant safety process for dispatchers requiring them to click a checkbox verifying the release of track and time authority before its release. They also acquired software that will only allow the dispatcher to release track and time authority after both the RWIC and one other authorized person in the work group has entered a special pin code into the system.

Caltrain now requires that a RWIC be physically within the limits of track and time authority when requesting and releasing authority. They also modified On Track Safety Rule 6.3.1 to require the track and time authority form to be initialed by at least one other roadway worker/contractor in the work group confirming that they are clear of the track.

- The safety task force formed after the March 10, 2022 incident continues to meet.
 - A new protocol has been developed that requires both the Roadway Worker in Charge (RWIC) and the contractor's foreman to sign off before track and time protection can be released.
 - A new electronic process has just been implemented that requires a specific electronic code to be transmitted to the dispatcher. Before protection can be released.

171. In order for the code to be transmitted to the railway field worker, the “back office” of Caltrain’s implementation and use of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods must retrieve the phone number of the railway field worker (i.e., an “electronic contact address”) and then transmit the release code to an electronic contact address accessible by the railway field worker.

172. The RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods, as implemented and used and continues to be used by Caltrain, specifies providing back-office infrastructure and messaging, including “[s]torage and delivery of crew and consist information, train IDs and clearances.”¹⁰⁸ It further specified enabling ITC PTC interoperability and compliance with I-ETMS systems.¹⁰⁹ Because I-ETMS systems require communication of crew verification

¹⁰⁸ White Paper at 7.

¹⁰⁹ See Final Report at 43.

and employee authentication, Caltrain maintains electronic contact addresses of the railway field workers from a rail personnel contact database. RailwayNetSM messaging functions also include: “[k]ey exchange server,” described as “[s]ecurity keys with data store.”¹¹⁰

A summary of the ARINC RailwayNet PTC hosting service functionality is shown below.

Messaging functions	Description	Included
Back-office messaging	Message transmission for the railroad back office	•*
Inter-office messaging	Message transmission between assets and railroad back offices in support of train initialization	•*
Systems management gateway	Messaging systems management	•
Systems management	Remote asset monitoring and control	Optional
Back-office area communications	Communications infrastructure at the Annapolis facility in support of railroad remote asset connectivity via cellular and internet connections	•
Key exchange server	Security keys with data store	•

173. In order to know which mobile device to send the release code to, the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods, as implemented and used and continues to be used by Caltrain, must have a database storing the electronic contact address for the railway workers.

174. The RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods, implemented and used and continues to be used by Caltrain, is a SaaS and IaaS product that provides “full-featured network management and infrastructure, hardware, network, operating systems, and applications for fault, performance, security and configuration management.”¹¹¹ It additionally specifies enabling ITC PTC interoperability and compliance with I-ETMS systems.¹¹²

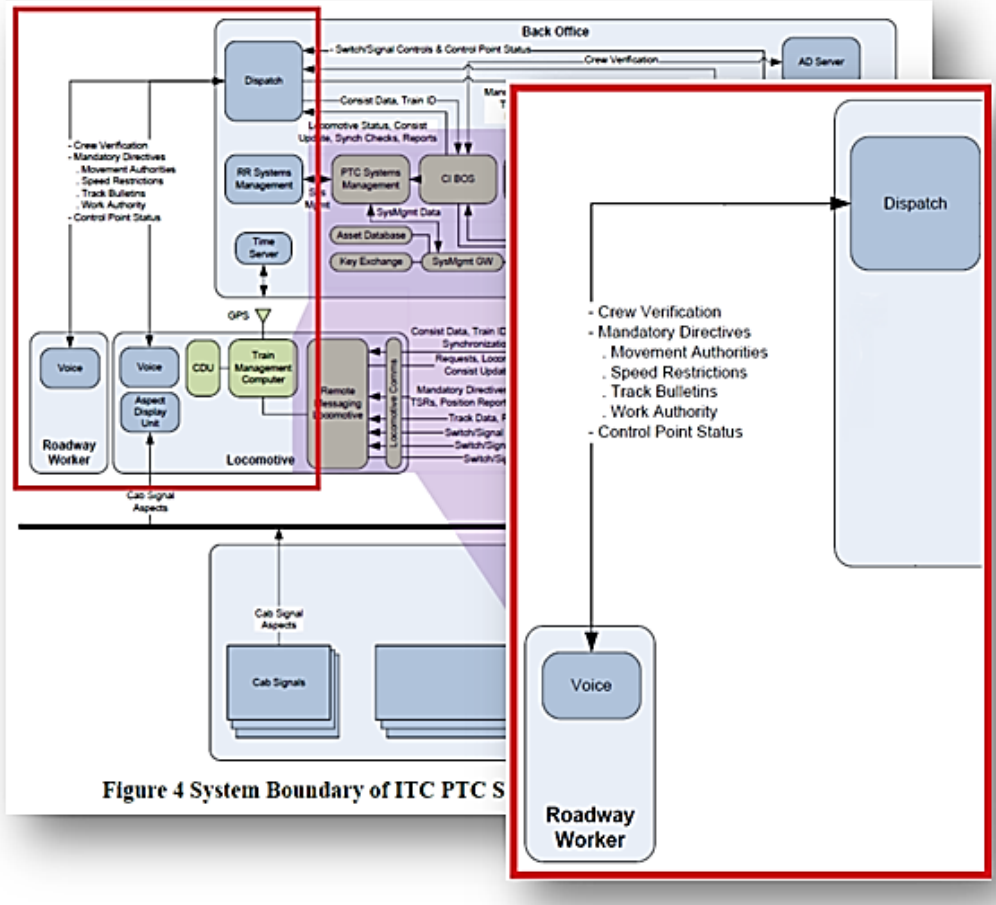
175. The RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods

¹¹⁰ White Paper at 7.

¹¹¹ White Paper at 6.

¹¹² Final Report at 43.

supports I-ETMS message flows, including communications with railway workers to communicate crew verification and mandatory directives.¹¹³ The below image illustrates.



176. Likewise, Wabtec acknowledges that it offers I-ETMS supported packages.¹¹⁴ Wabtec also advertise that RailwayNetSM “offers reliable, tailored, and scalable PTC messaging. Utilizing VHF, cellular, Wi-Fi and MPLS, RailwayNetSM PTC delivers initialization messages . . .”¹¹⁵

177. Accordingly, Caltrain’s implementation and use of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like

¹¹³ *Id.* at 14.

¹¹⁴ *I-ETMS Positive Train Control (PTC) Communications Package*, WABTEC, <https://www.wabteccorp.com/digital-intelligence/signaling-and-train-control/communications/i-etms-positive-train-control-ptc-communications-package> (last visited July 7, 2025).

¹¹⁵ *RailwayNet Positive Train Control Communication Solution*, WABTEC, <https://www.wabteccorp.com/digital-intelligence/signaling-and-train-control/communications/railwaynet-positive-train-control-communication-solution> (last visited July 7, 2025).

functionality or any same or similar systems or methods generates “a removal code, determin[es] an electronic contact address of the railway field worker by accessing a rail personnel contact database registering, for each railway personnel, electronic contact information of the railway personnel, and transmitting the removal code to the electronic contact address of the railway field worker.”

178. Caltrain’s implementation and use of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods permits “the block to said one or more track sections to be removed only upon entry of the removal code by said centralized control operation from the railway traffic control apparatus.”

179. Caltrain’s implementation and use of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods requires the entry of a release code in order to remove the protection from the track.¹¹⁶

c. Release “Codes”

- i. Meetings with SEPTA and Wabtec (Who recently purchased the Rockwell Collins dispatch system known as ARINC used at Caltrain) were held recently. The use of a single code for an RWIC to provide to the dispatcher is essentially “turnkey.”¹

¹¹⁶ See, e.g., *Caltrain Railroad Company Train Collision with On-Track Equipment and Derailment and Fire*, National Transportation Safety Board Track and Engineering Group Chairman Factual Report, RRD22MR007 at 58 (Sept. 9, 2022); *Caltrain Passenger Train Collision with Hi-rail Construction Vehicles*, National Transportation Safety Board, RIR-24-01 at 11 (Feb. 27, 2024); QUARTERLY PROGRESS REVIEW MEETING NO. 22: DECEMBER 5, 2022, PENINSULA CORRIDOR JOINT POWERS BOARD (JPB)/CALTRAIN at 4 (Dec. 19, 2022).

Caltrain Passenger Train Collision with Hi-rail Construction Vehicles
RIR-24-01

1.7.3 Redundant Safety Protections

Caltrain instituted a redundant safety process for dispatchers requiring them to click a checkbox verifying the release of track and time authority before its release. They also acquired software that will only allow the dispatcher to release track and time authority after both the RWIC and one other authorized person in the work group has entered a special pin code into the system.

Caltrain now requires that a RWIC be physically within the limits of track and time authority when requesting and releasing authority. They also modified On Track Safety Rule 6.3.1 to require the track and time authority form to be initialed by at least one other roadway worker/contractor in the work group confirming that they are clear of the track.

- The safety task force formed after the March 10, 2022 incident continues to meet.
 - A new protocol has been developed that requires both the Roadway Worker in Charge (RWIC) and the contractor's foreman to sign off before track and time protection can be released.
 - A new electronic process has just been implemented that requires a specific electronic code to be transmitted to the dispatcher. Before protection can be released.

180. Moreover, the FRA has recognized that the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods implemented and used and continues to be used by Caltrain complies with applicable recommended regulations (communication-based/processor-based train control technology designed to address a number of rail safety issues including train-to-train collisions, over-speed derailments, incursions into established work-zone limits, and train movement through a main-line switch that is in an improper position) in that the “dispatching system will not allow a dispatcher to release controlled track working limits until the RWIC affirmatively indicates via an electronic prompt that he or she is releasing working limits authority.”¹¹⁷

181. Accordingly, Caltrain’s implementation and use of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods permits “the block to said one or more

¹¹⁷ RRR, 81 Fed. Reg. at 37860.

1 track sections to be removed only upon entry of the removal code by said centralized control
2 operation from the railway traffic control apparatus.”

3 182. Therefore, Caltrain, through its implementation and use of the RailwayNetSM
4 system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-
5 like functionality or any same or similar systems or methods has infringed and continues to infringe
6 at least claim 19 of the '835 patent.

7 183. As direct and proximate result of Caltrain's infringement of the '835 patent,
8 Railware has been irreparably injured and has been caused significant harm and financial damages.

9 184. Caltrain has also induced and continues to induce infringement of at least claim 19
10 of the '835 patent in violation of 35 U.S.C. § 271(b).

11 185. Caltrain induces its users, and/or developers of its systems or methods to infringe
12 at least claim 19 of the '835 patent, and does so with the specific intent, by providing instructions,
13 directions, information, and/or knowledge on how to use its systems or methods and/or incorporate
14 its systems or methods into other products (including the RailwayNetSM system with EEPS and/or
15 EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any
16 same or similar systems or methods).

17 186. Caltrain had notice of and was aware or should have been aware of its infringement
18 of the '835 patent by at least February 4, 2020, or at the latest May 15, 2025.

19 187. Caltrain knew or should have known and received notice of the '835 patent at least
20 on its issue date: February 4, 2020.

21 188. To the extent the marking requirements of 35 U.S.C. § 287 apply, Caltrain had
22 constructive knowledge of the '835 patent at least since October 21, 2020.

23 189. Further, Caltrain knew or should have known and received notice of the '835 patent
24 on at least June 15, 2022, which is the date Railware filed suit against Amtrak for infringement of
25 the '835 patent, or earlier considering the business relationship between Caltrain and Amtrak, and
26 again on at least July 8, 2024, which is the date Railware filed suit against SEPTA for infringement
27 of the '835 patent, and again on the dates of any subsequent litigations filed by Railware regarding
28 the Asserted Patents.

1 190. Further, Caltrain knew or should have known and received notice of the '835 patent
 2 on at least September 8, 2022, which is the date Caltrain issued a report indicating that it had met
 3 with SEPTA regarding its CTC system, and discussed the "use of a single code for an RWIC to
 4 provide to the dispatcher."

5 191. Further, Caltrain knew or should have known and received notice of the '835 patent
 6 as of May 15, 2025, when Caltrain was sent a letter informing it of its infringement of the '835
 7 patent.

8 192. Caltrain's continued infringement on or after any of these dates is in spite of the
 9 objectively high likelihood that its activities constitute infringement of a valid patent, and this risk
 10 was either known or so obvious that it should have been known to Caltrain. Thus, Caltrain's
 11 continued infringement at least as of February 4, 2020, or at the latest May 15, 2025, is willful and
 12 deliberate.

13 193. Railware has suffered and continues to suffer damages and irreparable harm as a
 14 result of Caltrain's past and ongoing infringement. Unless and until Caltrain's infringement is
 15 enjoined, Railware will continue to be damaged and irreparably harmed.

16 194. Railware is entitled to all remedies at law and equity including, but not limited to,
 17 an injunction against Caltrain's infringement of the '835 patent pursuant to 35 U.S.C. § 283.

18 195. Railware is entitled to damages for Caltrain's infringement of the '835 patent
 19 including, but not limited to, damages pursuant to 35 U.S.C. §§ 284 and 285.

20 **THIRD CLAIM FOR RELIEF**
 21 **(Infringement of the '115 patent)**

22 196. Railware repeats and incorporates by reference all prior allegations of this
 23 Complaint as if fully set forth herein.

24 197. Railware is the owner by assignment of all right, title, and interest in and to the '115
 25 patent.

26 198. The '115 patent is valid and enforceable.

27 199. Claim 20 of the '115 patent recites:

28 A railway control apparatus for centralized control of a centrally controllable

1 railway network including plural railways and a plurality of railway interlocks
2 dispersed in said plural railways, comprising:

3 a processor for controlling a plurality of track sections in the railway
4 network, wherein each track section is associated with a corresponding
5 interlock and is disposed in any of said plural railways of said railway
6 network that is managed by centralized control operation from the railway
7 control apparatus, the processor controlling, by said centralized control
8 operation, one or more interlocks amongst the plurality of railway interlocks
9 dispersed in said plural railways of said railway network, to block railway
10 traffic to one or more specified track sections; and

11 a memory device storing computer-executable instructions, wherein
12 execution of the computer-executable instructions by the processor causes
13 the railway control apparatus to:

14 receive a selection of at least one track section amongst the plurality
15 of track sections;

16 transmit a block signal to the corresponding interlock associated
17 with the at least one selected track section, to place a block on the
18 selected track section by said centralized control operation from the
19 railway control apparatus;

20 generate a secret code associated with the at least one selected track
21 section; and

22 transmit the secret code to a remote user terminal.

23 200. In violation of 35 U.S.C. § 271(a), Caltrain has infringed and continues to infringe
24 one or more claims of the '115 patent by making, using, offering for sale, selling, and/or importing
25 in or into the United States a system or method covered by the '115 patent, including, but not
26 limited to, at least Caltrain's implementation and/or use of the RailwayNetSM system with EEPS
27 and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality
28 or any same or similar systems or methods.¹¹⁸

201. Caltrain, through its implementation and/or use of the RailwayNetSM system with
EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like
functionality or any same or similar systems or methods, infringes at least claim 20 of the '115
patent.

202. Caltrain's implementation and use of the RailwayNetSM system with EEPS and/or

¹¹⁸ Further investigation may reveal that others of Caltrain's products and systems also directly or indirectly infringe
at least claim 20 or other claims of the '115 patent.

1 EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any
 2 same or similar systems or methods is a “railway control apparatus for centralized control of a
 3 centrally controllable railway network including plural railways and a plurality of railway
 4 interlocks dispersed in said plural railways.”

5 203. Caltrain owns and/or operates one or more control centers, including the CEMOF
 6 located at 585 Lenzen Avenue, San Jose, California 95126.¹¹⁹ Control centers are centralized
 7 railway control systems using methods to control access to railway tracks configured for
 8 centralized control of traffic of a centrally controllable railway network including plural railways
 9 and a plurality of railway traffic interlocks dispersed in said plural railways constituting said
 10 railway network.

11 204. Caltrain’s control centers, examples of which are shown below, include a number
 12 of terminals through which train dispatchers control the movement of trains, including by placing
 13 blocks on specified track sections. The below image illustrates.

14 CEMOF¹²⁰



27 ¹¹⁹ See *Central Equipment & Maintenance Facility (CEMOF)*, CALTRAIN,
<https://www.caltrain.com/projects/central-equipment-maintenance-facility-cemof> (last visited July 7, 2025).

28 ¹²⁰ *Peninsula Corridor Electrification Project*, TYLIN,
<https://www.tylin.com/work/projects/peninsula-corridor-electrification-project> (last visited July 7, 2025).

205. Caltrain's control centers are "the 'nerve center,' of the commuter railroad, where dispatchers direct and monitor train traffic between San Francisco and Gilroy"¹²¹ and "control[] all train movement on the corridor."¹²²

206. The RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods provides "centralized traffic control," "train monitoring and control," "automatic route setting/automatic routing," "automatic traffic regulation," and "bulletins, authorities," and "restrictions management."¹²³

Centralized Traffic Control and SCADA

Collins designs and integrates state-of-the-art rail control solutions using our ARINC Advanced Information Management (AIM®) platform. AIM serves as an end-to-end solution for all rail control requirements, including SCADA, Centralized Traffic Control, Positive Train Control (PTC) and control center integration. Highly flexible and feature-rich, AIM enables railroads to maximize operational efficiency, cost-effectiveness and safety, all while providing an environment protected by the latest tools and techniques in cybersecurity.

KEY AREAS OF EXPERTISE

- | | |
|---|--|
| • Train monitoring and control | • Bulletins, authorities and restrictions management |
| • Automatic train tracking | • Employee in Charge (EIC) terminals |
| • Automatic route setting/automatic routing | • Emergency Operating Procedures (EOP) |
| • Automatic traffic regulation and schedule deviation | • Power planning |
| • Schedule management | • Playback and simulation |
| • Integrated yard management | • Data acquisition |
| | • Interface integration |

¹²¹ *Central Equipment & Maintenance Facility (CEMOF)*, CALTRAIN, <https://www.caltrain.com/projects/central-equipment-maintenance-facility-cemof> (last visited July 7, 2025).

¹²² *Caltrain: Behind the Scenes of a Major Service Disruption*, CALTRAIN, <https://www.caltrain.com/rider-information/caltrain-behind-scenes-major-service-disruption> (last visited July 7, 2025).

¹²³ *Intelligence-Based Rail Solutions*, COLLINS AEROSPACE, <https://web.archive.org/web/20211122013021/https://www.collinsaerospace.com/-/media/project/collinsaerospace/collinsaerospace-website/product-assets/marketing/r/rail/arinc-rail-solutions-for-passengers.pdf?rev=e7e5ddbff2de4154ba265f03e27f14d3> (last visited July 7, 2025); see also *Advanced Information Management (AIM) Rail Dispatch*, WABTEC, <https://www.wabteccorp.com/digital-intelligence/signaling-and-train-control/dispatch/advanced-information-management-aim-rail-dispatch> (last visited July 7, 2025).

207. Caltrain has implemented and used and continues to use the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods.¹²⁴

208. Caltrain implemented and used and continues to use the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods as a SaaS and/or IaaS—a software/infrastructure as a service—product that provides “full-featured network management and infrastructure, hardware, network, operating systems, and applications for fault, performance, security and configuration management.”¹²⁵

209. The RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods is advertised to help facilitate the increases in safety and reliability that train control systems provide.¹²⁶

210. The RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods, which Caltrain implemented and used and continues to use, improves rail safety. More particularly,

¹²⁴ ARINC MAINTENANCE AND SUPPORT SERVICES, JPB BOARD OF DIRECTORS at 2 (Sept. 5, 2019) (available at <https://www.caltrain.com/media/2443/download>); MODERNIZATION PROGRAM PENINSULA CORRIDOR ELECTRIFICATION PROJECT (PCEP): JULY 2017 MONTHLY PROGRESS REPORT, CALTRAIN at 18-1 (July 31, 2017) (available at <https://www.caltrain.com/media/616/download?inline>); MODERNIZATION PROGRAM PENINSULA CORRIDOR ELECTRIFICATION PROJECT (PCEP): APRIL 2017 MONTHLY PROGRESS REPORT (April 30, 2017) at 17-1 (available at <https://caltrain.com/media/613/download?inline>); *Peninsula Corridor Electrification Project*, TYLIN, <https://www.tylin.com/work/projects/peninsula-corridor-electrification-project> (last visited July 7, 2025) (“We are also providing implementation management services to oversee the design, development, testing, and commissioning of the Office SCADA systems based on the Advanced Integration Management (AIM) system supplied by Wabtec (formerly ARINC), the system integrator.”); *Caltrain Railroad Company Train Collision with On-Track Equipment and Derailment and Fire, National Transportation Safety Board Track and Engineering Group Chairman Factual Report*, RRD22MR007 at 58 (Sept. 9, 2022) (“Meetings with SEPTA and Wabtec (Who recently purchased the Rockwell Collins dispatch system known as ARINC used at Caltrain) were held recently. The use of a single code for an RWIC to provide to the dispatcher is essentially “turnkey.”); *Caltrain Passenger Train Collision with Hi-rail Construction Vehicles, National Transportation Safety Board*, RIR-24-01 at 11 (Feb. 27, 2024).

¹²⁵ White Paper at 6.

¹²⁶ See, e.g., *Amtrak signs nationwide contract for Rockwell Collins’ ARINC RailwayNetSM Positive Train Control service*, COLLINS AEROSPACE (Sep. 6, 2017), https://rockwellcollins.com/-/media/Files/Unsecure/Services-And-Support/Information-Management/ARINC-Rail/RC_Amtrak-Press-Release_09-06-17.ashx; *RailwayNet Positive Train Control Communication Solution*, WABTEC, <https://www.wabteccorp.com/digital-intelligence/signaling-and-train-control/communications/railwaynet-positive-train-control-communication-solution> (last visited July 7, 2025).

“[t]his system refers to communication-based/processor-based train control technology designed to address a number of rail safety issues, including train-to-train collisions, over-speed derailments, incursions into established work-zone limits, and train movement through a main-line switch that is in an improper position.”¹²⁷



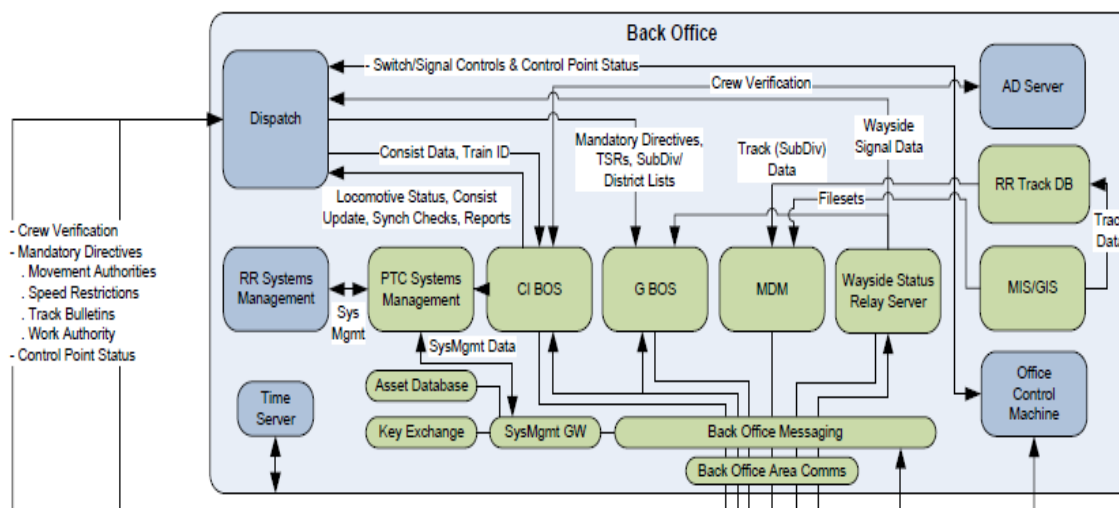
211. The RailwayNetSM system with EEPs and/or EEPs-like functionality and/or the AIM system with EEPs and/or EEPs-like functionality or any same or similar systems or methods was implemented and used and continues to be used throughout Caltrain’s routes.¹²⁸

212. As explained below, the RailwayNetSM system with EEPs and/or EEPs-like functionality and/or the AIM system with EEPs and/or EEPs-like functionality or any same or

¹²⁷ White Paper at 3.

¹²⁸ ARINC MAINTENANCE AND SUPPORT SERVICES, JPB BOARD OF DIRECTORS at 2 (Sept. 5, 2019) (available at <https://www.caltrain.com/media/2443/download>); MODERNIZATION PROGRAM PENINSULA CORRIDOR ELECTRIFICATION PROJECT (PCEP): JULY 2017 MONTHLY PROGRESS REPORT, CALTRAIN at 18-1 (July 31, 2017) (available at <https://www.caltrain.com/media/616/download?inline>); MODERNIZATION PROGRAM PENINSULA CORRIDOR ELECTRIFICATION PROJECT (PCEP): APRIL 2017 MONTHLY PROGRESS REPORT (April 30, 2017) at 17-1 (available at <https://caltrain.com/media/613/download?inline>); *Peninsula Corridor Electrification Project*, TYLIN, <https://www.tylin.com/work/projects/peninsula-corridor-electrification-project> (last visited July 7, 2025) (“We are also providing implementation management services to oversee the design, development, testing, and commissioning of the Office SCADA systems based on the Advanced Integration Management (AIM) system supplied by Wabtec (formerly ARINC), the system integrator.”); *Caltrain Railroad Company Train Collision with On-Track Equipment and Derailment and Fire, National Transportation Safety Board Track and Engineering Group Chairman Factual Report*, RRD22MR007 at 58 (Sept. 9, 2022) (“Meetings with SEPTA and Wabtec (Who recently purchased the Rockwell Collins dispatch system known as ARINC used at Caltrain) were held recently. The use of a single code for an RWIC to provide to the dispatcher is essentially “turnkey.”); *Caltrain Passenger Train Collision with Hi-rail Construction Vehicles, National Transportation Safety Board*, RIR-24-01 at 11 (Feb. 27, 2024).

213. The RailwayNetSM system with EEPs and/or EEPs-like functionality and/or the AIM system with EEPs and/or EEPs-like functionality or any same or similar systems or methods includes an “integration server and software” that “provides connectivity between the railroad IT systems and the hosted back-office components.”¹³⁰ The integration server provides an interface with various system components.



¹³⁰ See White Paper at 8 (illustrating “AIM[®] integration server”).

AIM® integration server

The ARINC RailwayNet integrations server and software provides connectivity between the railroad IT systems and the hosted back-office components. The functions of this application include:

- > Interface with customer's IT gateway
- > Interface with back office
- > Manage crew authentication through the customer's IT gateway
- > Functions to assign train ID to trains based on the clearance number
- > Functions to manage train consist through the customer's IT gateway
- > Functions to track, display, and store events and alarms

Centralized Traffic Control and SCADA

Collins designs and integrates state-of-the-art rail control solutions using our ARINC Advanced Information Management (AIM®) platform. AIM serves as an end-to-end solution for all rail control requirements, including SCADA, Centralized Traffic Control, Positive Train Control (PTC) and control center integration. Highly flexible and feature-rich, AIM enables railroads to maximize operational efficiency, cost-effectiveness and safety, all while providing an environment protected by the latest tools and techniques in cybersecurity.

KEY AREAS OF EXPERTISE

- | | |
|---|--|
| • Train monitoring and control | • Bulletins, authorities and restrictions management |
| • Automatic train tracking | • Employee in Charge (EIC) terminals |
| • Automatic route setting/automatic routing | • Emergency Operating Procedures (EOP) |
| • Automatic traffic regulation and schedule deviation | • Power planning |
| • Schedule management | • Playback and simulation |
| • Integrated yard management | • Data acquisition |
| | • Interface integration |

214. The RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods, as implemented and used and continues to be used by Caltrain, provides the network connections and office applications required to exchange critical information among railroads and their partner short line commuter railroads. It is available on a subscription basis as hosted SaaS (software as a service) and IaaS (infrastructure as a service) solutions, and messaging from the back office to the locomotive through VHF, cellular, and Wi-Fi is also available.¹³¹

215. The RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods, as implemented and used and continues to be used by Caltrain, further controls plural railways and a plurality of railway traffic interlocks. Specifically, Centralized Train Control systems, such as that employed by Caltrain and its implementation and use of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods “consists of a centralized train dispatcher’s office that

¹³¹ New from Rockwell Collins: Shared-network PTC platform, RAILWAY AGE 14 (July 2016), https://issuu.com/railwayage/docs/july_2016_railway_age; RailwayNet Positive Train Control Communication Solution, WABTEC, <https://www.wabteccorp.com/digital-intelligence/signaling-and-train-control/communications/railwaynet-positive-train-control-communication-solution> (last visited July 7, 2025).

controls railroad interlocking and traffic flows in portions of the rail system designated as CTC territory.”¹³² Train dispatchers in the control center have control over all interlockings on Caltrain’s railroads.¹³³

216. Caltrain implemented and used and continues to use the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods—a hosted network, messaging and application platform as amended—throughout Caltrain’s routes.¹³⁴

217. Accordingly, Caltrain’s implementation and use of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods is a “railway control apparatus for centralized control of a centrally controllable railway network including plural railways and a plurality of railway interlocks dispersed in said plural railways.”

218. Caltrain’s implementation and use of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods includes “a processor for controlling a plurality of track sections in the railway network, wherein each track section is associated with a corresponding

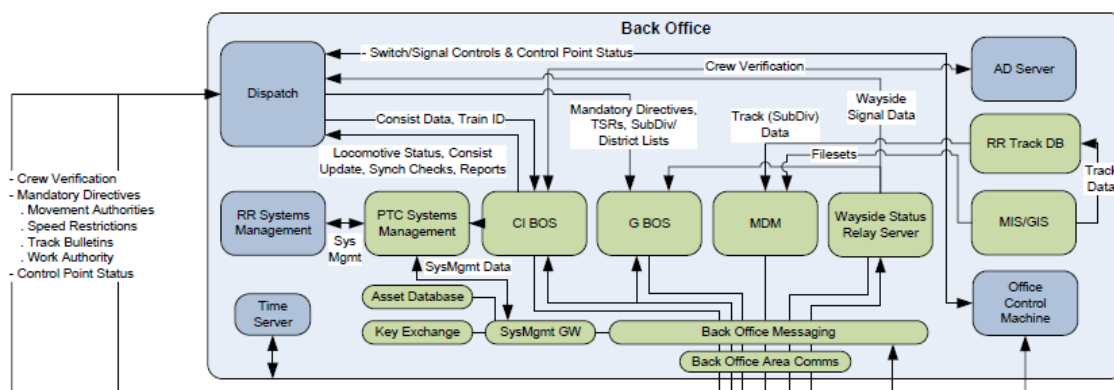
¹³² CTC, WIKIPEDIA, https://en.wikipedia.org/wiki/Centralized_traffic_control.

¹³³ THE CALTRAIN CORRIDOR VISION PLAN: APPENDIX A, SAN FRANCISCO BAY AREA PLANNING AND URBAN RESEARCH ASSOCIATION (2016) at 5, n. 5 (“On the Caltrain corridor, “interlocking” is generally synonymous with “control point,” i.e., a location in a Centralized Traffic Control (CTC) railroad network with signals and turnouts directly controlled by dispatchers.”) (available at https://www.spur.org/sites/default/files/2017-02/Appendix_A_Existing_Conditions_and_Methodology.pdf).

¹³⁴ ARINC MAINTENANCE AND SUPPORT SERVICES, JPB BOARD OF DIRECTORS at 2 (Sept. 5, 2019) (available at <https://www.caltrain.com/media/2443/download>); MODERNIZATION PROGRAM PENINSULA CORRIDOR ELECTRIFICATION PROJECT (PCEP): JULY 2017 MONTHLY PROGRESS REPORT, CALTRAIN at 18-1 (July 31, 2017) (available at <https://www.caltrain.com/media/616/download?inline>); MODERNIZATION PROGRAM PENINSULA CORRIDOR ELECTRIFICATION PROJECT (PCEP): APRIL 2017 MONTHLY PROGRESS REPORT (April 30, 2017) at 17-1 (available at <https://caltrain.com/media/613/download?inline>); *Peninsula Corridor Electrification Project*, TYLIN, <https://www.tylin.com/work/projects/peninsula-corridor-electrification-project> (last visited July 7, 2025) (“We are also providing implementation management services to oversee the design, development, testing, and commissioning of the Office SCADA systems based on the Advanced Integration Management (AIM) system supplied by Wabtec (formerly ARINC), the system integrator.”); *Caltrain Railroad Company Train Collision with On-Track Equipment and Derailment and Fire, National Transportation Safety Board Track and Engineering Group Chairman Factual Report*, RRD22MR007 at 58 (Sept. 9, 2022) (“Meetings with SEPTA and Wabtec (Who recently purchased the Rockwell Collins dispatch system known as ARINC used at Caltrain) were held recently. The use of a single code for an RWIC to provide to the dispatcher is essentially “turnkey.”); *Caltrain Passenger Train Collision with Hi-rail Construction Vehicles, National Transportation Safety Board*, RIR-24-01 at 11 (Feb. 27, 2024).

219. The RailwayNetSM system with EEPs and/or EEPs-like functionality and/or the AIM system with EEPs and/or EEPs-like functionality or any same or similar systems or methods, which Caltrain implemented and used and continues to use, improves rail safety. More specifically, “[t]his system refers to *communication-based/processor-based* train control technology designed to address a number of rail safety issues, including train-to-train collisions, over-speed derailments, incursions into established work-zone limits, and train movement through a main-line switch that is in an improper position.”¹³⁵

220. The RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods includes an “integration server and software” that “provides connectivity between the railroad IT systems and the hosted back-office components.”¹³⁶ The integration server provides an interface with various system components.



¹³⁶ See White Paper at 8 (illustrating “AIM[®] integration server”).

AIM® integration server

The ARINC RailwayNet integrations server and software provides connectivity between the railroad IT systems and the hosted back-office components. The functions of this application include:

- › Interface with customer's IT gateway
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KEY AREAS OF EXPERTISE

- | | |
|---|--|
| • Train monitoring and control | • Bulletins, authorities and restrictions management |
| • Automatic train tracking | • Employee in Charge (EIC) terminals |
| • Automatic route setting/automatic routing | • Emergency Operating Procedures (EOP) |
| • Automatic traffic regulation and schedule deviation | • Power planning |
| • Schedule management | • Playback and simulation |
| • Integrated yard management | • Data acquisition |
| | • Interface integration |

221. The RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods, as implemented and used and continues to be used by Caltrain, provides the network connections and office applications required to exchange critical information among railroads. It is available on a subscription basis as hosted SaaS (software as a service) and IaaS (infrastructure as a service) solutions, and messaging from the back office to the locomotive through VHF, cellular, and Wi-Fi is also available.¹³⁷

222. The RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods, as implemented and used and continues to be used by Caltrain, further controls plural railways and a plurality of railway traffic interlocks. Specifically, Centralized Train Control systems, such as that employed by Caltrain and its implementation of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any

¹³⁷ New from Rockwell Collins: Shared-network PTC platform, RAILWAY AGE 14 (July 2016), https://issuu.com/railwayage/docs/july_2016_railway_age_RailwayNet_Positive_Train_Control_Communication_Solution, WABTEC, <https://www.wabteccorp.com/digital-intelligence/signaling-and-train-control/communications/railwaynet-positive-train-control-communication-solution> (last visited July 7, 2025).

1 same or similar systems or methods “consists of a centralized train dispatcher’s office that controls
2 railroad interlocking and traffic flows in portions of the rail system designated as CTC territory.”¹³⁸

3 Train dispatchers in the control center have control over all interlockings on Caltrain’s railroads.¹³⁹

4 223. Caltrain implemented and used and continues to use the RailwayNetSM system with
5 EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like
6 functionality or any same or similar systems or methods—a hosted network, messaging and
7 application platform as amended—throughout Caltrain’s routes.¹⁴⁰

8 224. The RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the
9 AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods,
10 as implemented and used and continues to be used by Caltrain, uses “track and time” in which
11 “[b]efore granting track and time authority, the dispatcher must apply a ‘block’ through the
12 dispatching system to prevent train movement into the limits.”¹⁴¹

13 225. The RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the
14 AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods,
15 as implemented and used and continues to be used by Caltrain, has the ability to take tracks out of

16
17 ¹³⁸ CTC, WIKIPEDIA, https://en.wikipedia.org/wiki/Centralized_traffic_control.

18 ¹³⁹ THE CALTRAIN CORRIDOR VISION PLAN: APPENDIX A, SAN FRANCISCO BAY AREA PLANNING AND URBAN
19 RESEARCH ASSOCIATION (2016) at 5, n. 5 (“On the Caltrain corridor, “interlocking” is generally synonymous with
20 “control point,” i.e., a location in a Centralized Traffic Control (CTC) railroad network with signals and turnouts
21 directly controlled by dispatchers.”) (available at https://www.spur.org/sites/default/files/2017-02/Appendix_A_Existing_Conditions_and_Methodology.pdf).

22 ¹⁴⁰ ARINC MAINTENANCE AND SUPPORT SERVICES, JPB BOARD OF DIRECTORS at 2 (Sept. 5, 2019) (available at
23 <https://www.caltrain.com/media/2443/download>); MODERNIZATION PROGRAM PENINSULA CORRIDOR
24 ELECTRIFICATION PROJECT (PCEP): JULY 2017 MONTHLY PROGRESS REPORT, CALTRAIN at 18-1 (July 31, 2017)
25 (available at <https://www.caltrain.com/media/616/download?inline>); MODERNIZATION PROGRAM PENINSULA
26 CORRIDOR ELECTRIFICATION PROJECT (PCEP): APRIL 2017 MONTHLY PROGRESS REPORT (April 30, 2017) at 17-1
27 (available at <https://caltrain.com/media/613/download?inline>); *Peninsula Corridor Electrification Project*, TYLIN,
28 <https://www.tylin.com/work/projects/peninsula-corridor-electrification-project> (last visited July 7, 2025) (“We are
also providing implementation management services to oversee the design, development, testing, and
commissioning of the Office SCADA systems based on the Advanced Integration Management (AIM) system
supplied by Wabtec (formerly ARINC), the system integrator.”); *Caltrain Railroad Company Train Collision with
On-Track Equipment and Derailment and Fire, National Transportation Safety Board Track and Engineering
Group Chairman Factual Report*, RRD22MR007 at 58 (Sept. 9, 2022) (“Meetings with SEPTA and Wabtec (Who
recently purchased the Rockwell Collins dispatch system known as ARINC used at Caltrain) were held recently. The
use of a single code for an RWIC to provide to the dispatcher is essentially “turnkey.””); *Caltrain Passenger Train
Collision with Hi-rail Construction Vehicles, National Transportation Safety Board*, RIR-24-01 at 11 (Feb. 27,
2024).

¹⁴¹ *Caltrain Passenger Train Collision with Hi-rail Construction Vehicles, National Transportation Safety Board*,
RIR-24-01 at 11 (Feb. 27, 2024).

1 service and/or place track sections in “foul time” as an example of a “processor controlling, by
2 said centralized control operation one or more interlocks dispersed in said plural railways of said
3 railway network, to block railway traffic to one or more specified track sections” as recited in this
4 claim element.

5 226. Specifically, FRA regulations 49 C.F.R. § 214.323 defines “foul time” as “a method
6 of establishing working limits on controlled track in which a . . . [railway field worker] is notified
7 by the train dispatcher or control operator that *no trains will operate within a specific segment of*
8 *controlled track until the . . . [railway field worker] reports clear of the track.*” (Emphasis added).

9 227. Caltrain’s implementation and use of the RailwayNetSM system with EEPS and/or
10 EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any
11 same or similar systems or methods has the ability to take tracks out of service and/or place tracks
12 in foul time.¹⁴²

13 228. Because Caltrain, through its implementation and use of the RailwayNetSM system
14 with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like
15 functionality or any same or similar systems or methods, has the ability to take tracks out of service
16 and/or place tracks in foul time, it includes the capability to “block railway traffic to one or more
17 specified track sections.”

18 229. Moreover, in order to place a track segment in “foul time,” the system must contain
19 “a processor for controlling a plurality of track sections in the railway network, wherein each track
20 section is associated with a corresponding interlock and is disposed in any of said plural railways
21 of said railway network that is managed by centralized control operation from the railway control
22 apparatus, the processor controlling, by said centralized control operation, one or more interlocks
23

24 ¹⁴² See, e.g., *Caltrain Railroad Company Train Collision with On-Track Equipment and Derailment and Fire,*
25 *National Transportation Safety Board Track and Engineering Group Chairman Factual Report*, RRD22MR007 at
26 15 (Sept. 9, 2022) (“The RWIC was asked if he were aware about whether the men or equipment fouled main track
27 one. . . .”); Roadway Worker Protection (RWP) Caltrain Training - Study Guide, Caltrain at 10 (“Form C - Track
28 Out Of Service . . . The track is taken out of service and not available for trains to use unless the RWIC provides
permission. . . .”) (available at
<https://www.caltrain.com/media/2098#:~:text=Fouling%20a%20track%2D%20is%20the%20placement%20of,field%20side%20of%20the%20nearest%20running%20rail.&text=safety%20at%20least%2015%20seconds%20prior%20to%20the%20train%20passing%20by%20the%20work%20zone.>)

amongst the plurality of railway interlocks dispersed in said plural railways of said railway network” to permit the dispatcher to establish the blocking protection.

230. Caltrain owns and/or operates one or more control centers, including the CEMOF located at 585 Lenzen Avenue, San Jose, California 95126.¹⁴³ Control centers are centralized railway control systems using methods to control access to railway tracks configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network.

231. Caltrain’s control centers, examples of which are shown below, include a number of terminals through which train dispatchers control the movement of trains, including by placing blocks on specified track sections. The below images illustrate.

CEMOF¹⁴⁴



232. Caltrain’s control centers are “the ‘nerve center,’ of the commuter railroad, where

¹⁴³ See *Central Equipment & Maintenance Facility (CEMOF)*, CALTRAIN, <https://www.caltrain.com/projects/central-equipment-maintenance-facility-cemof> (last visited July 7, 2025).

¹⁴⁴ *Peninsula Corridor Electrification Project*, TYLIN, <https://www.tylin.com/work/projects/peninsula-corridor-electrification-project> (last visited July 7, 2025).

dispatchers direct and monitor train traffic between San Francisco and Gilroy”¹⁴⁵ and “control[] all train movement on the corridor.”¹⁴⁶

233. The RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods provides “train monitoring and control,” automatic route setting/automatic routing,” “automatic traffic regulation,” and “bulletins, authorities, and restrictions management,” as shown, for example, in the image below.¹⁴⁷ One or more of these functionalities encompasses the claimed “block railway traffic” part.

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KEY AREAS OF EXPERTISE

- | | |
|---|--|
| • Train monitoring and control | • Bulletins, authorities and restrictions management |
| • Automatic train tracking | • Employee in Charge (EIC) terminals |
| • Automatic route setting/automatic routing | • Emergency Operating Procedures (EOP) |
| • Automatic traffic regulation and schedule deviation | • Power planning |
| • Schedule management | • Playback and simulation |
| • Integrated yard management | • Data acquisition |
| | • Interface integration |

234. The RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the

¹⁴⁵ *Central Equipment & Maintenance Facility (CEMOF)*, CALTRAIN, <https://www.caltrain.com/projects/central-equipment-maintenance-facility-cemof> (last visited July 7, 2025).

¹⁴⁶ *Caltrain: Behind the Scenes of a Major Service Disruption*, CALTRAIN, <https://www.caltrain.com/rider-information/caltrain-behind-scenes-major-service-disruption> (last visited July 7, 2025).

¹⁴⁷ *Intelligence-Based Rail Solutions*, COLLINS AEROSPACE, [\[https://web.archive.org/web/20211122013021/https://www.collinsaerospace.com/-/media/project/collinsaerospace/collinsaerospace-website/product-assets/marketing/r/rail/arinc-rail-solutions-for-passengers.pdf?rev=e7e5ddbff2de4154ba265f03e27f14d3\]](https://web.archive.org/web/20211122013021/https://www.collinsaerospace.com/-/media/project/collinsaerospace/collinsaerospace-website/product-assets/marketing/r/rail/arinc-rail-solutions-for-passengers.pdf?rev=e7e5ddbff2de4154ba265f03e27f14d3) (last visited July 7, 2025); *Advanced Information Management (AIM) Rail Dispatch*, WABTEC, <https://www.wabteccorp.com/digital-intelligence/signaling-and-train-control/dispatch/advanced-information-management-aim-rail-dispatch> (last visited July 7, 2025).

1 AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods,
 2 as implemented and used and continues to be used by Caltrain, is a SaaS and IaaS product that
 3 provides “full-featured network management and infrastructure, hardware, network, operating
 4 systems, and applications for fault, performance, security and configuration management.”¹⁴⁸
 5 Additionally, the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM
 6 system with EEPS and/or EEPS-like functionality or any same or similar systems or methods is
 7 “designed to help meet the availability standards required for PTC operations.”¹⁴⁹ Because the
 8 system is designed to support railroads to meet the PTC requirements, it should be configured to
 9 manage train movements, including placing blocks on one or more sections of railway track to
 10 prevent trains from traversing the one or more sections of railway track.

11 235. In order to comply with and implement FRA’s recommended regulations
 12 (communication-based/processor-based train control technology designed to address a number of
 13 railway safety issues including train-to-train collisions, over-speed derailments, incursions into
 14 established work-zone limits, and train movement through a main-line switch that is in an improper
 15 position) the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM
 16 system with EEPS and/or EEPS-like functionality or any same or similar systems or methods is
 17 configured and used to place a block on one or more specified sections of railway track to prevent
 18 trains from traversing the one or more sections of railway track.¹⁵⁰

19 236. Accordingly, Caltrain’s implementation and use of the RailwayNetSM system with
 20 EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like
 21 functionality or any same or similar systems or methods includes “a processor for controlling a
 22 plurality of track sections in the railway network, wherein each track section is associated with a
 23 corresponding interlock and is disposed in any of said plural railways of said railway network that
 24 is managed by centralized control operation from the railway control apparatus, the processor
 25 controlling, by said centralized control operation, one or more interlocks amongst the plurality of
 26

27 ¹⁴⁸ White Paper at 6.

28 ¹⁴⁹ *Id.*

¹⁵⁰ See Final Report at 14; see also *NEC One-Year Plan 2019* at 233.

1 railway interlocks dispersed in said plural railways of said railway network, to block railway traffic
2 to one or more specified track sections.”

3 237. Caltrain’s implementation and use of the RailwayNetSM system with EEPS and/or
4 EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any
5 same or similar systems or methods further includes “a memory device storing computer-
6 executable instructions.”

7 238. The RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the
8 AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods,
9 which Caltrain implemented and used and continues to use, improves rail safety. More specifically,
10 “[t]his system refers to communication-based/processor-based train control technology designed
11 to address a number of rail safety issues, including train-to-train collisions, over-speed derailments,
12 incursions into established work-zone limits, and train movement through a main-line switch that
13 is in an improper position.”¹⁵¹



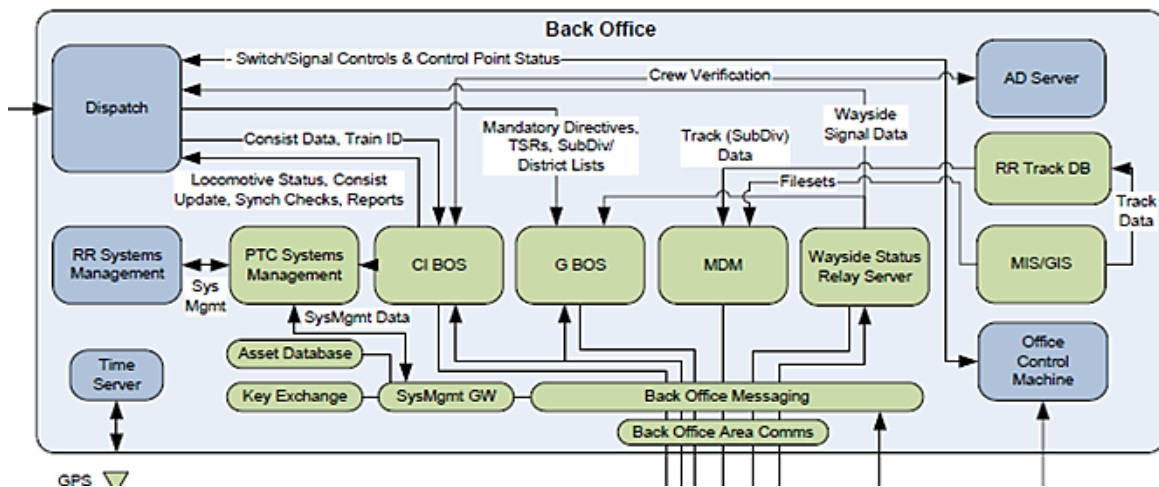
25 239. Because Caltrain’s implementation and use of the RailwayNetSM system with EEPS
26 and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality
27

28 ¹⁵¹ White Paper at 3.

or any same or similar systems or methods is a processor-based system, there must be a memory device configured to store computer-executable instructions (*e.g.*, code) for the processor to execute.¹⁵²

240. The RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods, implemented and used and continues to be used by Caltrain, is a SaaS and IaaS product that provides “full-featured network management and infrastructure, hardware, network, operating systems, and applications for fault, performance, security and configuration management.”¹⁵³

241. Moreover, Caltrain’s implementation and use of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods utilizes a “back office” which contains numerous databases and servers, which are memory devices used for storing computer-executable instructions related functions performed by the back office.¹⁵⁴ The below image illustrates.¹⁵⁵



242. Caltrain utilizes a memory device to store the computer-executable instructions for its enhanced employee protection functionality.

243. Accordingly, Caltrain’s implementation and use of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like

¹⁵² *Id.*

¹⁵³ *Id.* at 6.

¹⁵⁴ Final Report at 14.

¹⁵⁵ *Id.*

1 functionality or any same or similar systems or methods includes “a memory device storing
2 computer-executable instructions.”

3 244. Caltrain’s implementation and use of the RailwayNetSM system with EEPS and/or
4 EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any
5 same or similar systems or methods includes a railway control apparatus that executes computer-
6 executable instructions to “receive a selection of at least one track section amongst the plurality of
7 track sections.”

8 245. Caltrain’s implementation and use of the RailwayNetSM system with EEPS and/or
9 EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any
10 same or similar systems or methods is a CTC system which, by definition, is configured and used
11 for centralized control of traffic of a centrally controllable railway network including plural
12 railways and a plurality of railway traffic interlocks dispersed in the plural railways and controls
13 access to the railway tracks.¹⁵⁶

14 246. The RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the
15 AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods,
16 as implemented and used and continues to be used by Caltrain, uses “track and time” in which
17 “[b]efore granting track and time authority, the dispatcher must apply a ‘block’ through the
18 dispatching system to prevent train movement into the limits.”¹⁵⁷

19 247. Further, Caltrain’s implementation and use of the RailwayNetSM system with EEPS
20 and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality
21 or any same or similar systems or methods can place tracks in “foul time.”¹⁵⁸

22 248. Foul time is defined as “a method of establishing working limits on controlled track
23

24 ¹⁵⁶ See THE CALTRAIN CORRIDOR VISION PLAN: APPENDIX A, SAN FRANCISCO BAY AREA PLANNING AND URBAN
25 RESEARCH ASSOCIATION (2016) at 1, 5 (available at https://www.spur.org/sites/default/files/2017-02/Appendix_A_Existing_Conditions_and_Methodology.pdf); CTC, WIKIPEDIA,
https://en.wikipedia.org/wiki/Centralized_traffic_control (last visited July 7, 2025).

26 ¹⁵⁷ Caltrain Passenger Train Collision with Hi-rail Construction Vehicles, National Transportation Safety Board,
RIR-24-01 at 11 (Feb. 27, 2024).

27 ¹⁵⁸ See, e.g., *Caltrain Railroad Company Train Collision with On-Track Equipment and Derailment and Fire*,
28 *National Transportation Safety Board Track and Engineering Group Chairman Factual Report*, RRD22MR007 at 15 (Sept. 9, 2022) (“The RWIC was asked if he were aware about whether the men or equipment fouled main track one. . . .”).

in which a . . . [railway field worker] is notified by the train dispatcher or control operator that no trains will operate within a specific segment of controlled track until the. . . [railway field worker] reports clear of the track.” 49 C.F.R. Part 214.7. The “specified segments” referred to in the rule are the “selection of at least one track section amongst the plurality of track sections” referred to in this claim element.

249. In Caltrain’s implementation and use of the system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods, a dispatcher can take sections of track out of service and/or put it in foul time.¹⁵⁹

250. In order for the dispatcher to complete these functions, the system must be able to receive a selection of at least one track section amongst the plurality of track sections.¹⁶⁰

251. Accordingly, Caltrain’s implementation and use of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods includes a railway control apparatus that executes computer-executable instructions to “receive a selection of at least one track section amongst the plurality of track sections.”

252. Caltrain’s implementation and use of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods includes a railway control apparatus that executes computer-executable instructions to “transmit a block signal to the corresponding interlock associated with the at least one selected track section, to place a block on the selected track section by said centralized control operation from the railway control apparatus.”

¹⁵⁹ See Roadway Worker Protection (RWP) Caltrain Training - Study Guide, Caltrain at 10 (“Form C - Track Out Of Service . . . The track is taken out of service and not available for trains to use unless the RWIC provides permission. . . .”) (available at <https://www.caltrain.com/media/2098#:~:text=Fouling%20a%20track%2D%20is%20the%20placement%20of,field%20side%20of%20the%20nearest%20running%20rail.&text=safety%20at%20least%2015%20seconds%20prior%20to%20the%20train%20passing%20by%20the%20work%20zone.>)

¹⁶⁰ Cf. 49 C.F.R. § 214.323 (Foul time) (“Working limits established on controlled track through the use of foul time procedures shall comply with the following requirements: . . . (c) The train dispatcher or control operator shall not permit the movement of trains or other on-track equipment into working limits protected by foul time until the . . . [railway field worker] in charge who obtained the foul time has reported clear of the track.”).

253. Train dispatchers in Caltrain’s control center have control over all interlockings on Caltrain’s railroads.¹⁶¹

254. The RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods, as implemented and used and continues to be used by Caltrain, uses “track and time” in which “[b]efore granting track and time authority, the dispatcher must apply a ‘block’ through the dispatching system to prevent train movement into the limits.”¹⁶²

255. The RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods, as implemented and used and continues to be used by Caltrain, that takes tracks out of service and/or places track sections in “foul time” “transmit[s] a block signal to the corresponding interlock associated with the at least one selected track section, to place a block on the selected track section by said centralized control operation from the railway control apparatus.” as recited in this claim element.

256. Specifically, FRA regulations 49 C.F.R. § 214.323 defines “foul time” as “a method of establishing working limits on controlled track in which a . . . [railway field worker] is notified by the train dispatcher or control operator that *no trains will operate within a specific segment of controlled track until the . . . [railway field worker] reports clear of the track.*” (emphasis added).

257. Caltrain’s implementation and use of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods has the ability to take tracks out of service and/or place tracks in foul time.¹⁶³

¹⁶¹ THE CALTRAIN CORRIDOR VISION PLAN: APPENDIX A, SAN FRANCISCO BAY AREA PLANNING AND URBAN RESEARCH ASSOCIATION (2016) at 5, n. 5 (“On the Caltrain corridor, “interlocking” is generally synonymous with “control point,” i.e., a location in a Centralized Traffic Control (CTC) railroad network with signals and turnouts directly controlled by dispatchers.”) (available at https://www.spur.org/sites/default/files/2017-02/Appendix_A_Existing_Conditions_and_Methodology.pdf).

¹⁶² Caltrain Passenger Train Collision with Hi-rail Construction Vehicles, National Transportation Safety Board, RIR-24-01 at 11 (Feb. 27, 2024).

¹⁶³ See Roadway Worker Protection (RWP) Caltrain Training - Study Guide, Caltrain at 10 (“Form C - Track Out Of Service . . . The track is taken out of service and not available for trains to use unless the RWIC provides

258. Because Caltrain, through its implementation and use of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods, has the ability to place tracks in foul time, it includes an ability to place blocks.

259. Caltrain places blocks by transmitting a block signal to the corresponding interlock associated with the at least one selected track section.¹⁶⁴

260. The RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods provides “train monitoring and control,” “automatic route setting/automatic routing,” “automatic traffic regulation,” and “bulletins, authorities, and restrictions management.”¹⁶⁵ One or more of these functionalities encompass the claimed ability to place blocks.

permission. . . .) (available at <https://www.caltrain.com/media/2098#:~:text=Fouling%20a%20track%2D%20is%20the%20placement%20of,field%20side%20of%20the%20nearest%20running%20rail.&text=safety%20at%20least%2015%20seconds%20prior%20to%20the%20train%20passing%20by%20the%20work%20zone>).

¹⁶⁴ See THE CALTRAIN CORRIDOR VISION PLAN: APPENDIX A, SAN FRANCISCO BAY AREA PLANNING AND URBAN RESEARCH ASSOCIATION (2016) at 5, n. 5 (“On the Caltrain corridor, “interlocking” is generally synonymous with “control point,” i.e., a location in a Centralized Traffic Control (CTC) railroad network with signals and turnouts directly controlled by dispatchers.”) (available at https://www.spur.org/sites/default/files/2017-02/Appendix_A_Existing_Conditions_and_Methodology.pdf); see also GLOSSARY OF TERMS, CALTRAIN at 1, 3 (“Centralized Traffic Control (CTC) - A remotely controlled block signal system under which train movements are authorized by block signals whose indicators supersede the superiority of trains” . . . Block Signal - A fixed signal at the entrance of a block to govern trains and engines entering and using that block.”) (March 22, 2010) (available at <https://caltrain.com/media/1257/download>).

¹⁶⁵ *Intelligence-Based Rail Solutions*, COLLINS AEROSPACE, <https://web.archive.org/web/20211122013021/https://www.collinsaerospace.com/-/media/project/collinsaerospace/collinsaerospace-website/product-assets/marketing/r/rail/arinc-rail-solutions-for-passengers.pdf?rev=e7e5ddbff2de4154ba265f03e27f14d3>] (last visited July 7, 2025); *Advanced Information Management (AIM) Rail Dispatch*, WABTEC, <https://www.wabteccorp.com/digital-intelligence/signaling-and-train-control/dispatch/advanced-information-management-aim-rail-dispatch> (last visited July 7, 2025).

Centralized Traffic Control and SCADA

Collins designs and integrates state-of-the-art rail control solutions using our ARINC Advanced Information Management (AIM®) platform. AIM serves as an end-to-end solution for all rail control requirements, including SCADA, Centralized Traffic Control, Positive Train Control (PTC) and control center integration. Highly flexible and feature-rich, AIM enables railroads to maximize operational efficiency, cost-effectiveness and safety, all while providing an environment protected by the latest tools and techniques in cybersecurity.

KEY AREAS OF EXPERTISE

- | | |
|---|--|
| • Train monitoring and control | • Bulletins, authorities and restrictions management |
| • Automatic train tracking | • Employee in Charge (EIC) terminals |
| • Automatic route setting/automatic routing | • Emergency Operating Procedures (EOP) |
| • Automatic traffic regulation and schedule deviation | • Power planning |
| • Schedule management | • Playback and simulation |
| • Integrated yard management | • Data acquisition |
| | • Interface integration |

261. The RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods, as implemented and used and continues to be used by Caltrain, is a SaaS and IaaS product that provides “full-featured network management and infrastructure, hardware, network, operating systems, and applications for fault, performance, security and configuration management.”¹⁶⁶ Additionally, the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods is “designed to help meet the availability standards required for PTC operations.”¹⁶⁷ Because the system is designed to support railroads to meet the PTC requirements, it is configured to manage train movements, including placing blocks on one or more sections of railway track to prevent trains from traversing the one or more sections of railway track.

262. In order to comply with and implement FRA’s recommended regulations (communication-based/processor-based train control technology designed to address a number of railway safety issues including train-to-train collisions, over-speed derailments, incursions into established work-zone limits, and train movement through a main-line switch that is in an improper

¹⁶⁶ White Paper at 6.

¹⁶⁷ *Id.*

position), the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods is configured and used to place a block on one or more sections of railway track to prevent trains from traversing the one or more sections of railway track.¹⁶⁸

263. Accordingly, Caltrain's implementation and use of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods includes a railway control apparatus that executes computer-executable instructions to "transmit a block signal to the corresponding interlock associated with the at least one selected track section, to place a block on the selected track section by said centralized control operation from the railway control apparatus."

264. Caltrain's implementation and use of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods includes a railway control apparatus that executes computer-executable instructions to "generate a secret code associated with the at least one selected track section."

265. Caltrain's implementation and use of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods includes an "Enhanced Employee Protection System."¹⁶⁹

¹⁶⁸ See Final Report at 14; see also *NEC One-Year Plan 2019* at 233.

¹⁶⁹ *Caltrain Railroad Company Train Collision with On-Track Equipment and Derailment and Fire*, National Transportation Safety Board Track and Engineering Group Chairman Factual Report, RRD22MR007 at 58 (Sept. 9, 2022); see also CALTRAIN SAFETY BRIEFING (April 19, 2023) at 18 (available at <https://www.caltrain.com/media/30177/download>); PENINSULA CORRIDOR JOINT POWERS BOARD, ANNUAL COMPREHENSIVE FINANCIAL REPORT (FISCAL YEARS ENDED JUNE 30, 2023 AND 2022) at ix (available at <https://www.caltrain.com/media/32501>); PENINSULA CORRIDOR JOINT POWERS BOARD, ANNUAL COMPREHENSIVE FINANCIAL REPORT (FISCAL YEARS ENDED JUNE 30, 2024 AND 2023) at xiii (available at <https://www.caltrain.com/media/34732>); Project Monitoring Report (PMR) November 2024: Peninsula Corridor Electrification Project (PCEP) San Francisco to San Jose, CA at A-1 (2024) (available at <https://www.caltrain.com/media/35145>).

Roadway Worker Protection

- March 10, 2022 Incident – NTSB Investigation
- Changes to Roadway Worker in Charge Training, Processes and Scheduling
- Bus Bridges, Safety Briefings, Planning
- Enhanced Employee Protection Systems



266. As part of this system, Caltrain's implementation and use of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods generates a "release code" or "pin code" associated with a block.¹⁷⁰

c. Release "Codes"

- i. Meetings with SEPTA and Wabtec (Who recently purchased the Rockwell Collins dispatch system known as ARINC used at Caltrain) were held recently. The use of a single code for an RWIC to provide to the dispatcher is essentially "turnkey."

¹⁷⁰ See, e.g., *Caltrain Railroad Company Train Collision with On-Track Equipment and Derailment and Fire*, National Transportation Safety Board Track and Engineering Group Chairman Factual Report, RRD22MR007 at 58 (Sept. 9, 2022); *Caltrain Passenger Train Collision with Hi-rail Construction Vehicles*, National Transportation Safety Board, RIR-24-01 at 11 (Feb. 27, 2024); QUARTERLY PROGRESS REVIEW MEETING NO. 22: DECEMBER 5, 2022, PENINSULA CORRIDOR JOINT POWERS BOARD (JPB)/CALTRAIN at 4 (Dec. 19, 2022).

Caltrain Passenger Train Collision with Hi-rail Construction Vehicles
RIR-24-01

1.7.3 Redundant Safety Protections

Caltrain instituted a redundant safety process for dispatchers requiring them to click a checkbox verifying the release of track and time authority before its release. They also acquired software that will only allow the dispatcher to release track and time authority after both the RWIC and one other authorized person in the work group has entered a special pin code into the system.

Caltrain now requires that a RWIC be physically within the limits of track and time authority when requesting and releasing authority. They also modified On Track Safety Rule 6.3.1 to require the track and time authority form to be initialed by at least one other roadway worker/contractor in the work group confirming that they are clear of the track.

- The safety task force formed after the March 10, 2022 incident continues to meet.
 - A new protocol has been developed that requires both the Roadway Worker in Charge (RWIC) and the contractor's foreman to sign off before track and time protection can be released.
 - A new electronic process has just been implemented that requires a specific electronic code to be transmitted to the dispatcher. Before protection can be released.

267. The “release code” generated is secret. It is unique to the railway worker and not readily available to the dispatcher.¹⁷¹

268. Moreover, the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods, implemented and used and continues to be used by Caltrain, specifies providing back office infrastructure and messaging, including “[s]torage and delivery of crew and consist information, train IDs and clearances.”¹⁷² It further specifies enabling ITC PTC interoperability and compliance with I-ETMS systems.¹⁷³ Because I-ETMS systems require communication of crew verification and employee authentication, Caltrain maintains electronic contact addresses of the railway field workers from a rail personnel contact database. The systems messaging functions

¹⁷¹ See, e.g., *Caltrain Railroad Company Train Collision with On-Track Equipment and Derailment and Fire*, National Transportation Safety Board Track and Engineering Group Chairman Factual Report, RRD22MR007 at 58 (Sept. 9, 2022); *Caltrain Passenger Train Collision with Hi-rail Construction Vehicles*, National Transportation Safety Board, RIR-24-01 at 11 (Feb. 27, 2024).

¹⁷² See White Paper at 7.

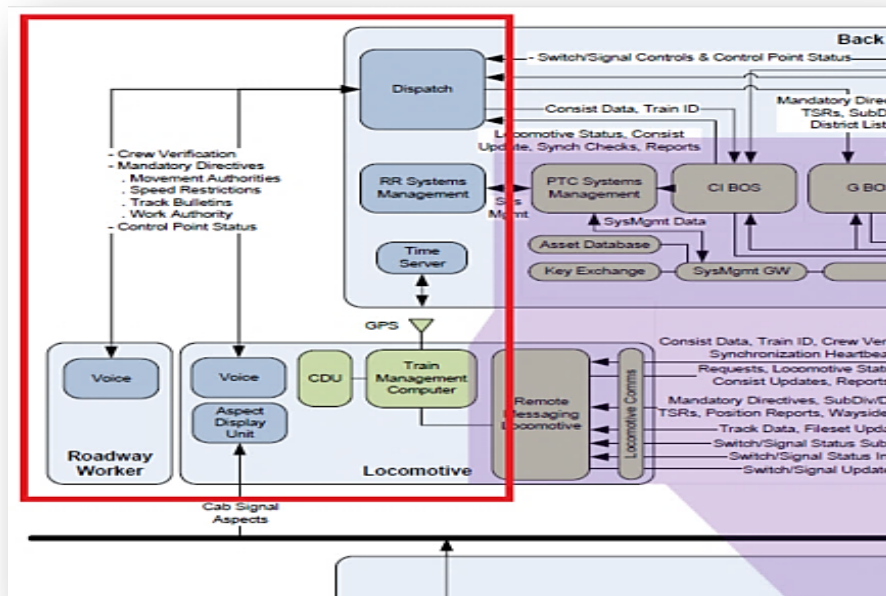
¹⁷³ See Final Report at 43.

also include: “[k]ey exchange server,” described as “[s]ecurity keys with data store.”¹⁷⁴

A summary of the ARINC RailwayNet PTC hosting service functionality is shown below.

Messaging functions	Description	Included
Back-office messaging	Message transmission for the railroad back office	•*
Inter-office messaging	Message transmission between assets and railroad back offices in support of train initialization	•*
Systems management gateway	Messaging systems management	•
Systems management	Remote asset monitoring and control	Optional
Back-office area communications	Communications infrastructure at the Annapolis facility in support of railroad remote asset connectivity via cellular and internet connections	•
Key exchange server	Security keys with data store	•

269. Moreover, the RailwayNetSM system with EEPs and/or EEPs-like functionality and/or the AIM system with EEPs and/or EEPs-like functionality or any same or similar systems or methods, as implemented and used and continues to be used by Caltrain, specifies providing back-office infrastructure and messaging that allows railway workers to communicate, *inter alia*, crew verification and mandatory directives with the dispatch.¹⁷⁵



¹⁷⁴ White Paper at 7.

¹⁷⁵ Final Report at 14.

270. The secret code generated by the “back office” is associated with at least one section of track. In Caltrain’s implementation and use of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods, a dispatcher can take a section of track out of service and/or put it in foul time.¹⁷⁶ In order for the dispatcher to complete these functions, the secret code (which must be transmitted to the dispatcher prior to taking an individual track out of service and/or putting it in foul time) must be associated with at least one section of track.

271. Accordingly, Caltrain’s implementation and use of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods includes a railway control apparatus that executes computer-executable instructions to “generate a secret code associated with the at least one selected track section.”

272. Caltrain’s implementation and use of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods includes a railway control apparatus that executes computer-executable instructions to “transmit the secret code to a remote user terminal.”

273. Caltrain’s implementation and use of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods requires that a railway field worker be provided with a “release code” or a “pin code.”¹⁷⁷

¹⁷⁶ See Roadway Worker Protection (RWP) Caltrain Training - Study Guide, Caltrain at 10 (“Form C - Track Out Of Service . . . The track is taken out of service and not available for trains to use unless the RWIC provides permission. . . .”) (available at <https://www.caltrain.com/media/2098#:~:text=Fouling%20a%20track%2D%20is%20the%20placement%20of,field%20side%20of%20the%20nearest%20running%20rail.&text=safety%20at%20least%2015%20seconds%20prior%20to%20the%20train%20passing%20by%20the%20work%20zone.>).

¹⁷⁷ See, e.g., *Caltrain Railroad Company Train Collision with On-Track Equipment and Derailment and Fire*, National Transportation Safety Board Track and Engineering Group Chairman Factual Report, RRD22MR007 at 58 (Sept. 9, 2022); *Caltrain Passenger Train Collision with Hi-rail Construction Vehicles*, National Transportation Safety Board, RIR-24-01 at 11 (Feb. 27, 2024); QUARTERLY PROGRESS REVIEW MEETING NO. 22: DECEMBER 5, 2022, PENINSULA CORRIDOR JOINT POWERS BOARD (JPB)/CALTRAIN at 4 (Dec. 19, 2022).

c. **Release “Codes”**

- i. Meetings with SEPTA and Wabtec (Who recently purchased the Rockwell Collins dispatch system known as ARINC used at Caltrain) were held recently. The use of a single code for an RWIC to provide to the dispatcher is essentially “turnkey.”]

Caltrain Passenger Train Collision with Hi-rail Construction Vehicles
RIR-24-01

1.7.3 Redundant Safety Protections

Caltrain instituted a redundant safety process for dispatchers requiring them to click a checkbox verifying the release of track and time authority before its release. They also acquired software that will only allow the dispatcher to release track and time authority after both the RWIC and one other authorized person in the work group has entered a special pin code into the system.

Caltrain now requires that a RWIC be physically within the limits of track and time authority when requesting and releasing authority. They also modified On Track Safety Rule 6.3.1 to require the track and time authority form to be initialed by at least one other roadway worker/contractor in the work group confirming that they are clear of the track.

- The safety task force formed after the March 10, 2022 incident continues to meet.
 - A new protocol has been developed that requires both the Roadway Worker in Charge (RWIC) and the contractor’s foreman to sign off before track and time protection can be released.
 - A new electronic process has just been implemented that requires a specific electronic code to be transmitted to the dispatcher. Before protection can be released.

274. Caltrain provides mobile devices to railway field workers, through which the railway field worker receives the code via remote user terminal, *i.e.*, the mobile device issued to the railway field worker.¹⁷⁸

275. Accordingly, Caltrain’s implementation and use of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods includes a railway control apparatus that executes computer-executable instructions to “transmit the secret code to a remote user terminal.”

¹⁷⁸ See, e.g., Roadway Worker Protection (RWP) Caltrain Training - Study Guide, Caltrain at 5 (available at <https://www.caltrain.com/media/2098#:~:text=Fouling%20a%20track%2D%20is%20the%20placement%20of,field%20side%20of%20the%20nearest%20running%20rail.&text=safety%20at%20least%2015%20seconds%20prior%20to%20the%20train%20passing%20by%20the%20work%20zone>); *Caltrain Passenger Train Collision with Hi-rail Construction Vehicles*, National Transportation Safety Board, RIR-24-01 at 5 (Feb. 27, 2024) (“About 9:58 a.m., the RWIC contacted the dispatcher by phone and released Track and Time Authority . . .”).

276. Therefore, Caltrain, through its implementation and use of the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods, has infringed and continues to infringe at least claim 20 of the '115 patent.

277. As direct and proximate result of Caltrain's infringement of the '115 patent, Railware has been irreparably injured and has been caused significant harm and financial damages.

278. Caltrain has also induced and continues to induce infringement of at least claim 20 of the '115 patent in violation of 35 U.S.C. § 271(b).

279. Caltrain induces its users, and/or developers of its systems or methods to infringe at least claim 20 of the '115 patent, and does so with the specific intent, by providing instructions, directions, information, and/or knowledge on how to use its systems or methods and/or incorporate its systems or methods into other products (including the RailwayNetSM system with EEPS and/or EEPS-like functionality and/or the AIM system with EEPS and/or EEPS-like functionality or any same or similar systems or methods).

280. Caltrain had notice of and was aware or should have been aware of its infringement of the '115 patent as of at least October 21, 2020, or at the latest May 15, 2025.

281. To the extent the marking requirements of 35 U.S.C. § 287 apply, Caltrain had constructive knowledge of the '115 patent at least since October 21, 2020.

282. Further, Caltrain knew or should have known and received notice of the '115 patent on at least June 15, 2022, which is the date Railware filed suit against Amtrak for infringement of the '115 patent, or earlier considering the business relationship between Caltrain and Amtrak, and again on at least July 8, 2024, which is the date Railware filed suit against SEPTA for infringement of the '115 patent, and again on the dates of any subsequent litigations filed by Railware regarding the Asserted Patents.

283. Further, Caltrain knew or should have known and received notice of the '115 patent on at least its issue date: June 28, 2022.

284. Further, Caltrain knew or should have known and received notice of the '115 patent on at least September 8, 2022, which is the date Caltrain issued a report indicating that it had meet

1 with SEPTA regarding its CTC system, and discussed the “use of a single code for an RWIC to
2 provide to the dispatcher.”

3 285. Further, Caltrain knew or should have known and received notice of the ’115 patent
4 as of May 15, 2025, when Caltrain was sent a letter informing it of its infringement of the ’115
5 patent.

6 286. Caltrain’s continued infringement on or after any of these dates is in spite of the
7 objectively high likelihood that its activities constitute infringement of a valid patent, and this risk
8 was either known or so obvious that it should have been known to Caltrain. Thus, Caltrain’s
9 continued infringement at least as of October 21, 2020, or at the latest May 15, 2025, is willful and
10 deliberate.

11 287. Railware has suffered and continues to suffer damages and irreparable harm as a
12 result of Caltrain’s past and ongoing infringement. Unless and until Caltrain’s infringement is
13 enjoined, Railware will continue to be damaged and irreparably harmed.

14 288. Railware is entitled to all remedies at law and equity including, but not limited to,
15 an injunction against Caltrain’s infringement of the ’115 patent pursuant to 35 U.S.C. § 283.

16 289. Railware is entitled to damages for Caltrain’s infringement of the ’115 patent
17 including, but not limited to, damages pursuant to 35 U.S.C. §§ 284 and 285.

18 JURY DEMAND

19 Railware respectfully requests a jury trial on all triable issues.

20 REQUEST FOR RELIEF

21 Railware respectfully asks that the Court enter judgment in its favor as follows:

22 A. Judgment in favor of Railware and against Caltrain on each cause of action
23 alleged herein;

24 B. Finding that Caltrain has infringed and is infringing the Asserted Patents;

25 C. Finding that Caltrain’s infringement of the Asserted Patents has been and
26 continues to be willful;

27 D. Awarding Railware damages adequate to compensate it for Caltrain’s past and
28 present infringement, but in no event less than a reasonable royalty;

1 E. Awarding an accounting and supplemental damages for those acts of infringement
2 committed by Caltrain subsequent to the discovery cut-off date in this action through the date
3 Final Judgment is entered;

4 F. Ordering that damages for infringement of the Asserted Patents be trebled as
5 provided for by 35 U.S.C. § 284 for Caltrain's willful infringement of the Asserted Patents;

6 G. Finding that this case is exceptional;

7 H. Awarding Railware its attorneys' fees and costs, together with prejudgment and
8 post-judgment interest;

9 I. A preliminary and permanent injunction against Caltrain's continued direct and
10 indirect infringement;

11 J. To the extent injunctive relief is not awarded, awarding Railware damages
12 adequate to compensate Railware for Caltrain's future infringement, but in no event less than a
13 reasonable royalty; and

14 K. Any further relief that this Court deems just and proper.
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1 Dated: July 8, 2025

Respectfully submitted,

2 By: /s/ Li Zhu

3 Li Zhu (Bar No. 302210)

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SILICON VALLEY

EXHIBIT A



US009517782B2

(12) **United States Patent**
Pirtle

(10) **Patent No.:** **US 9,517,782 B2**
(45) **Date of Patent:** **Dec. 13, 2016**

(54) **TOOLS FOR RAILWAY TRAFFIC CONTROL**

(71) Applicant: **Railware, Inc.**, Hauppauge, NY (US)

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(52) **U.S. Cl.**

CPC **B61L 27/0038** (2013.01); **B61L 23/06** (2013.01)

(58) **Field of Classification Search**

CPC B61L 23/06; B61L 23/16; B61L 27/00
USPC 246/3, 4, 124, 122 R, 167 R
See application file for complete search history.

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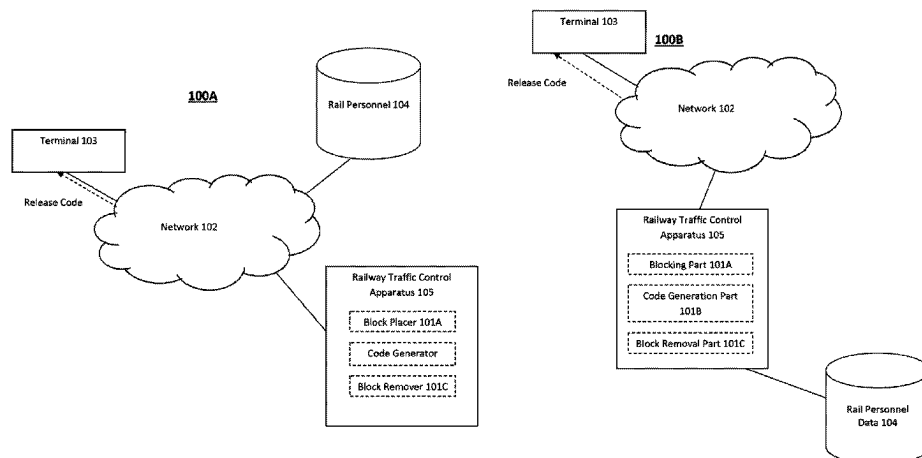
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(57) **ABSTRACT**

Tools (such as system, apparatus, methodology, etc.) may be provided to control traffic over a railway track section, when a railway worker is working on or near the track section. Move particularly, when traffic over the track section is to be blocked, a release code is generated and sent to an electronic contact address of the railway worker. Traffic through the track section is blocked until the release code is entered in the system.

8 Claims, 11 Drawing Sheets



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FIGURE 1A

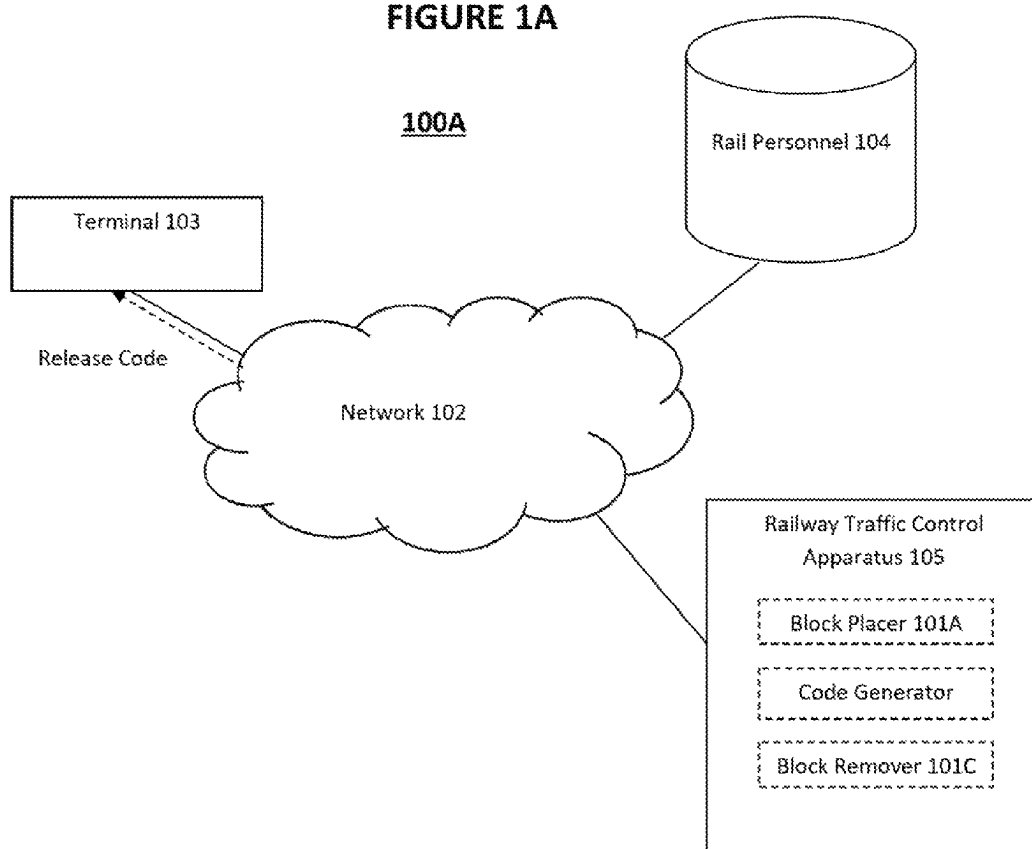


FIGURE 1B

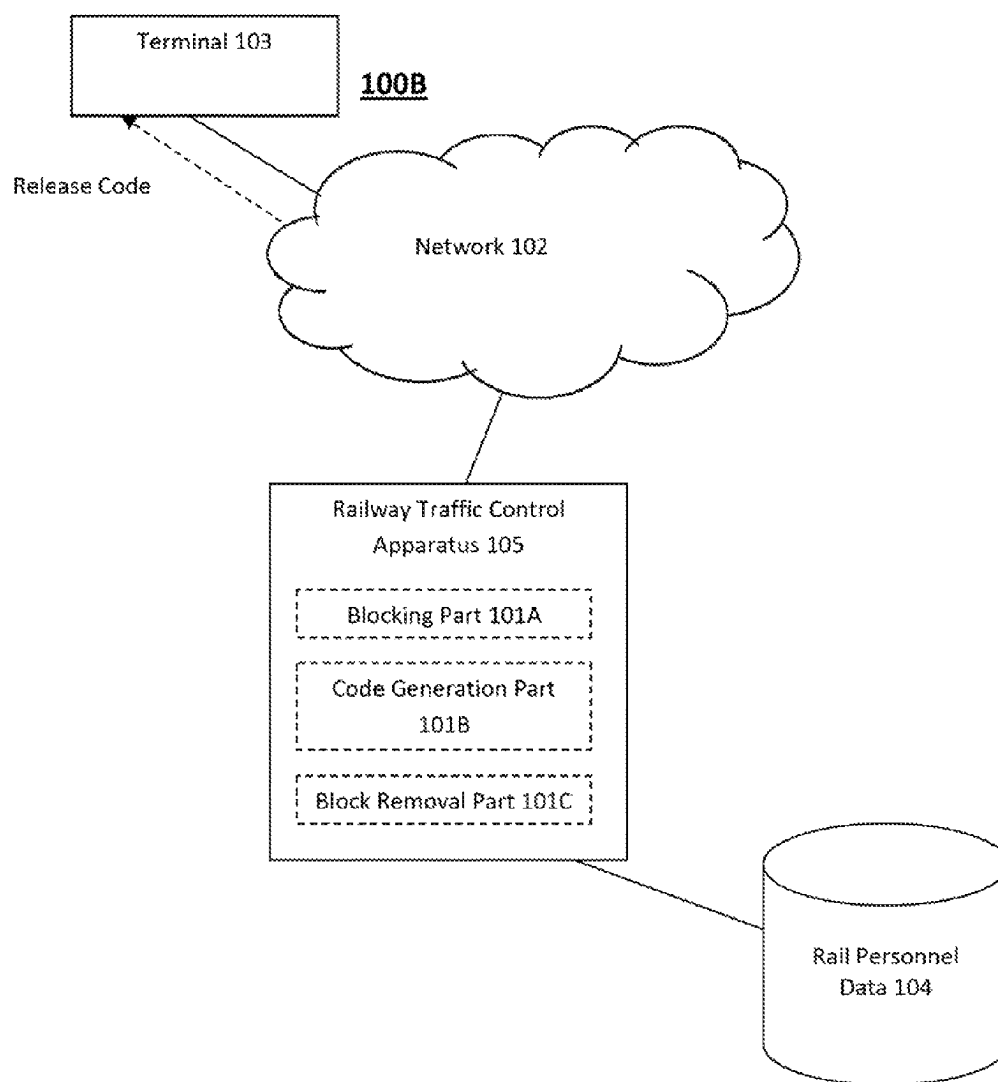


FIGURE 2

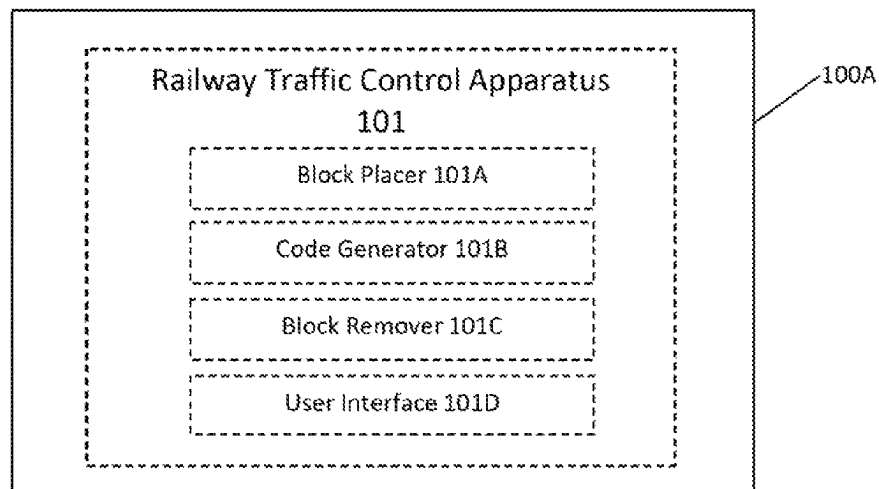


FIGURE 3A

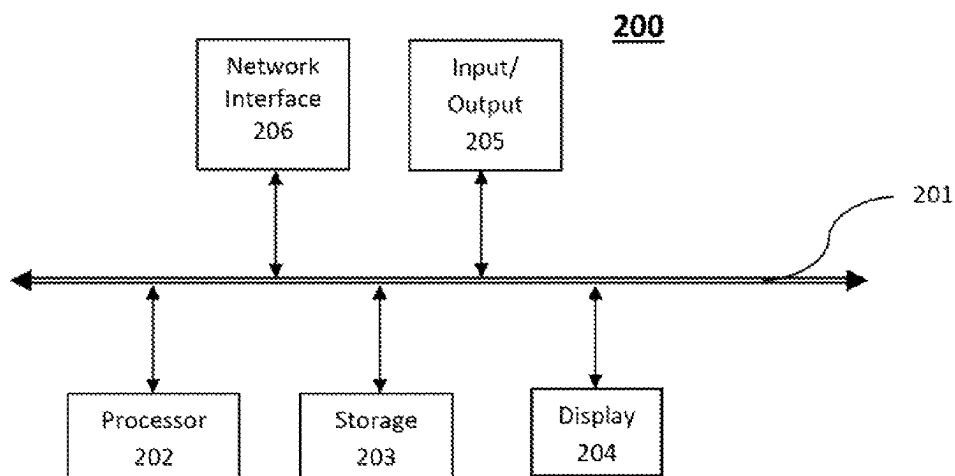


FIGURE 3B

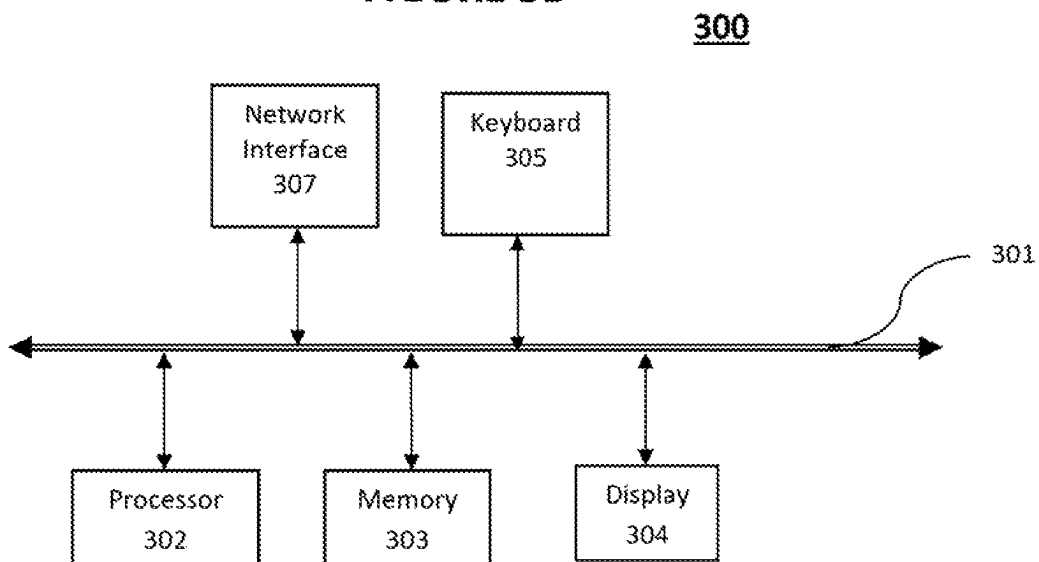


FIGURE 4

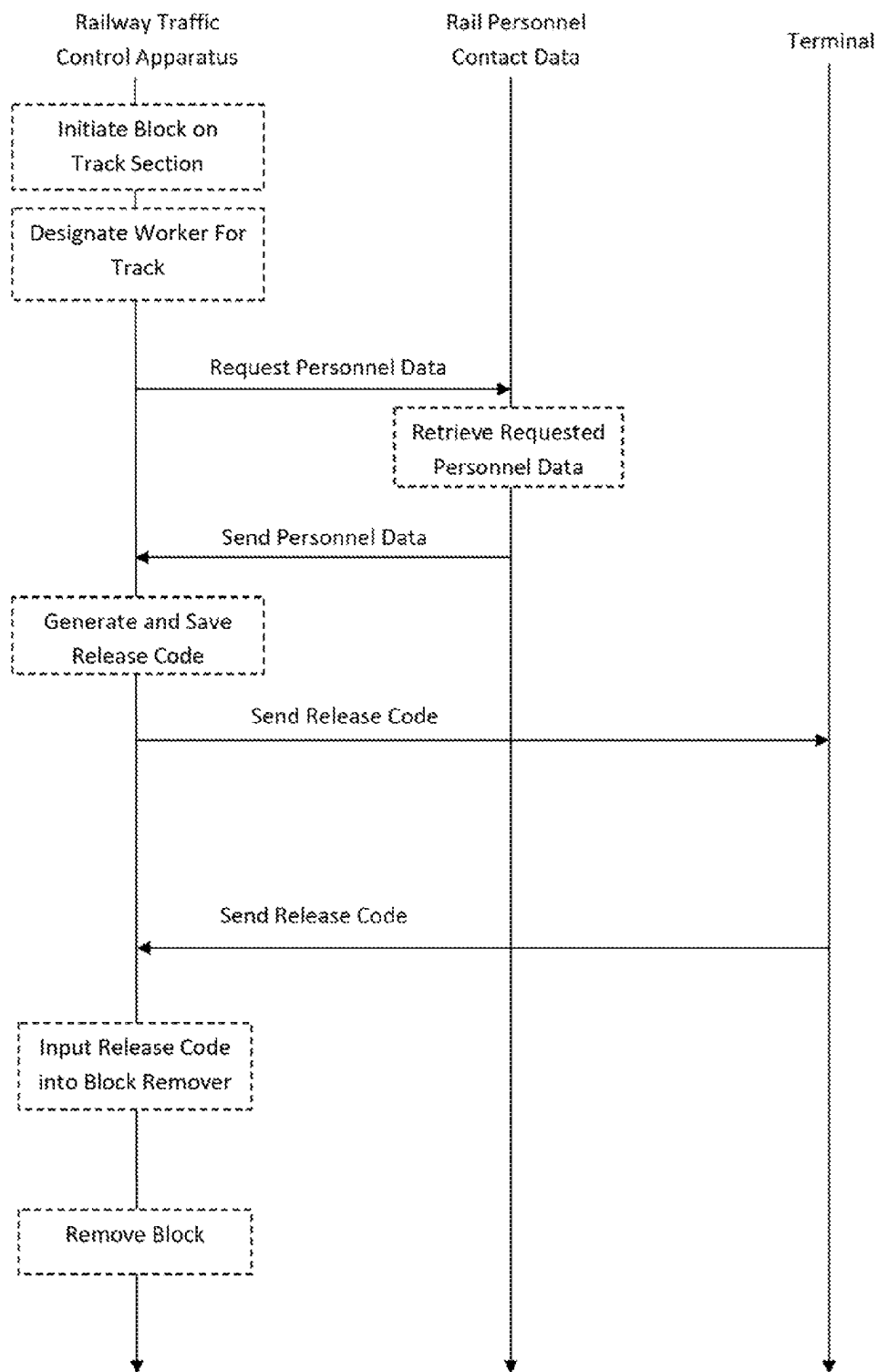


FIGURE 5

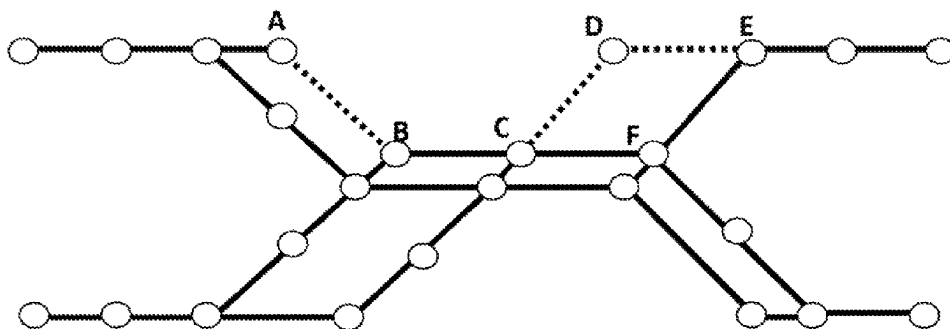


FIGURE 6

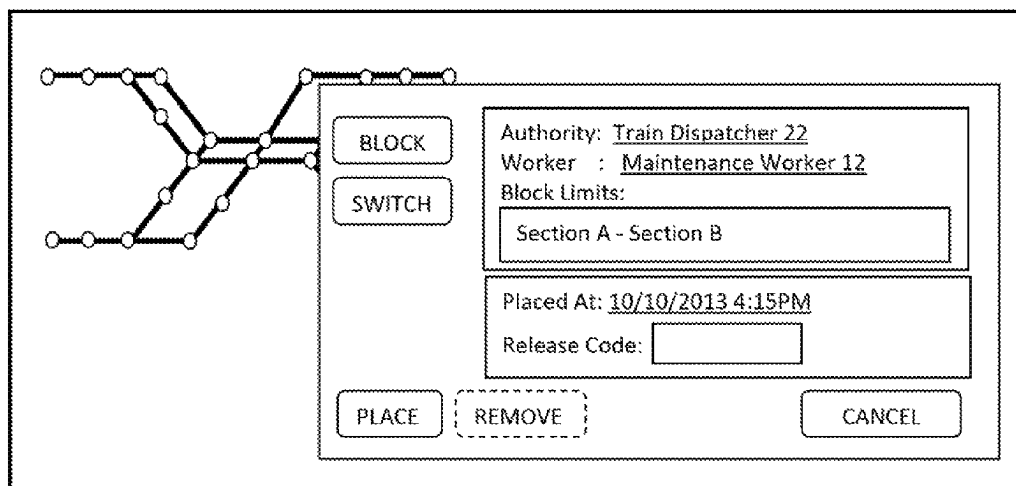


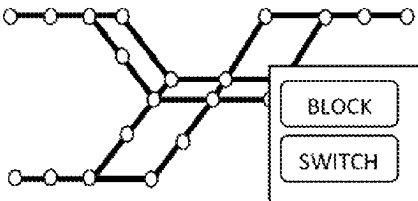
FIGURE 7



#	Type	Placed On	Issued To	Limits	Placed By	Removed	Removed By
1	Maint.	10/10/2013 4:15PM	Maintenance Worker 12	Sec. A- Sec. B	Train Dispatcher 22	10/10/2013 10:00PM	Train Dispatcher 22
2	Maint.	10/11/2013 12:00PM	Maintenance Worker 35; Maintenance Worker 36	Sec. C- Sec. D- Sec. F	Train Dispatcher 44	N/A	N/A

REMOVE CANCEL INFO

FIGURE 8



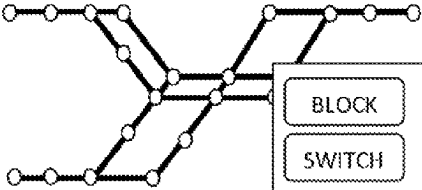
BLOCK
SWITCH

Authority: Train Dispatcher 22
 Worker : Maintenance Worker 12
 Block Limits:
Section A - Section B

Placed At: 10/10/2013 4:15PM
 Release Code: 912478

PLACE REMOVE CANCEL

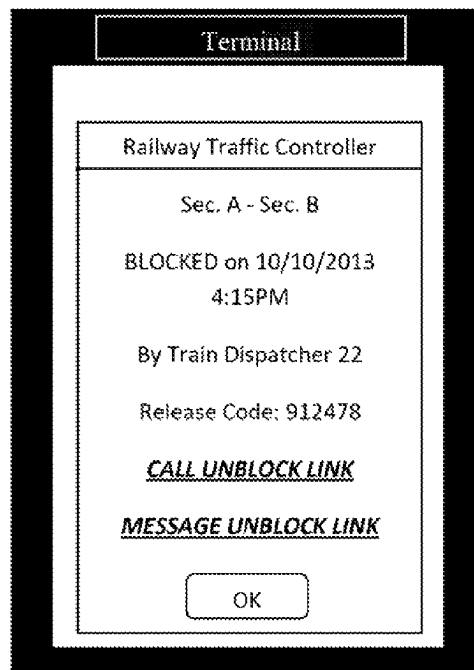
FIGURE 9



A diagram of a railway track layout with a pop-up menu for blocking a section. The menu contains the following fields and buttons:

- BLOCK** (button)
- SWITCH** (button)
- Authority: Train Dispatcher 22
- Worker : Maintenance Worker 12
- Block Limits:
Section A - Section B
- Placed At: 10/10/2013 4:15PM
- Release Code: 912478
- Railway Section Cleared ☐
- PLACE** (button)
- REMOVE** (button)
- CANCEL** (button)

FIGURE 10



A terminal screen displaying a message from the Railway Traffic Controller. The message content is as follows:

Terminal

Railway Traffic Controller

Sec. A - Sec. B

BLOCKED on 10/10/2013
4:15PM

By Train Dispatcher 22

Release Code: 912478

CALL UNBLOCK LINK

MESSAGE UNBLOCK LINK

OK

FIGURE 11

Maintenance Worker 12 Profile



Name: John Smith
Age: 30
Primary Contact: 718-555-5555 (work)
Secondary Contact: 718-555-5554 (pager)
E-mail: smith1@railwayworker.gov
Last Assignment: Sec. A - Sec. B [maintenance]
Current Assignment: N/A

OK CANCEL

FIGURE 12

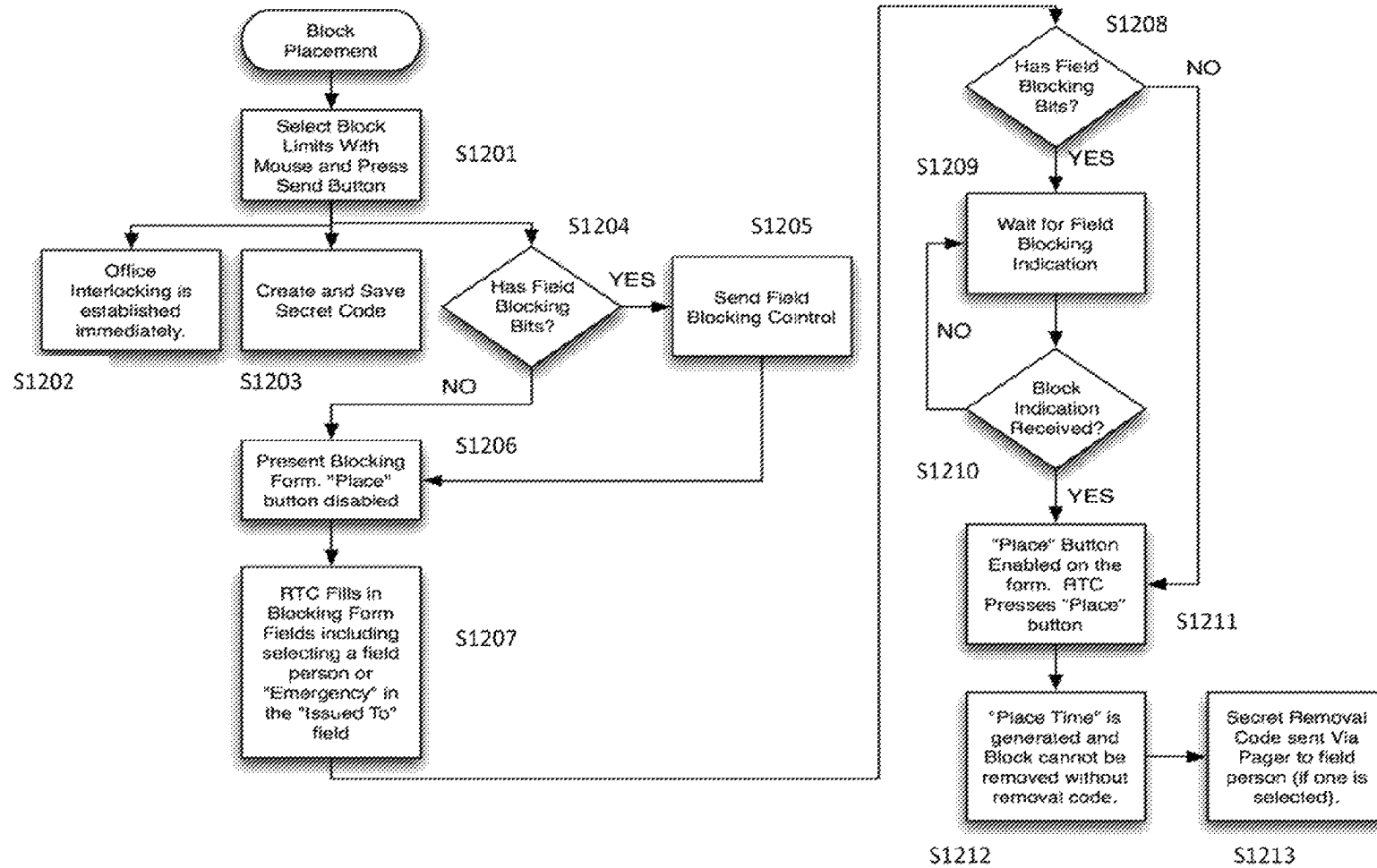
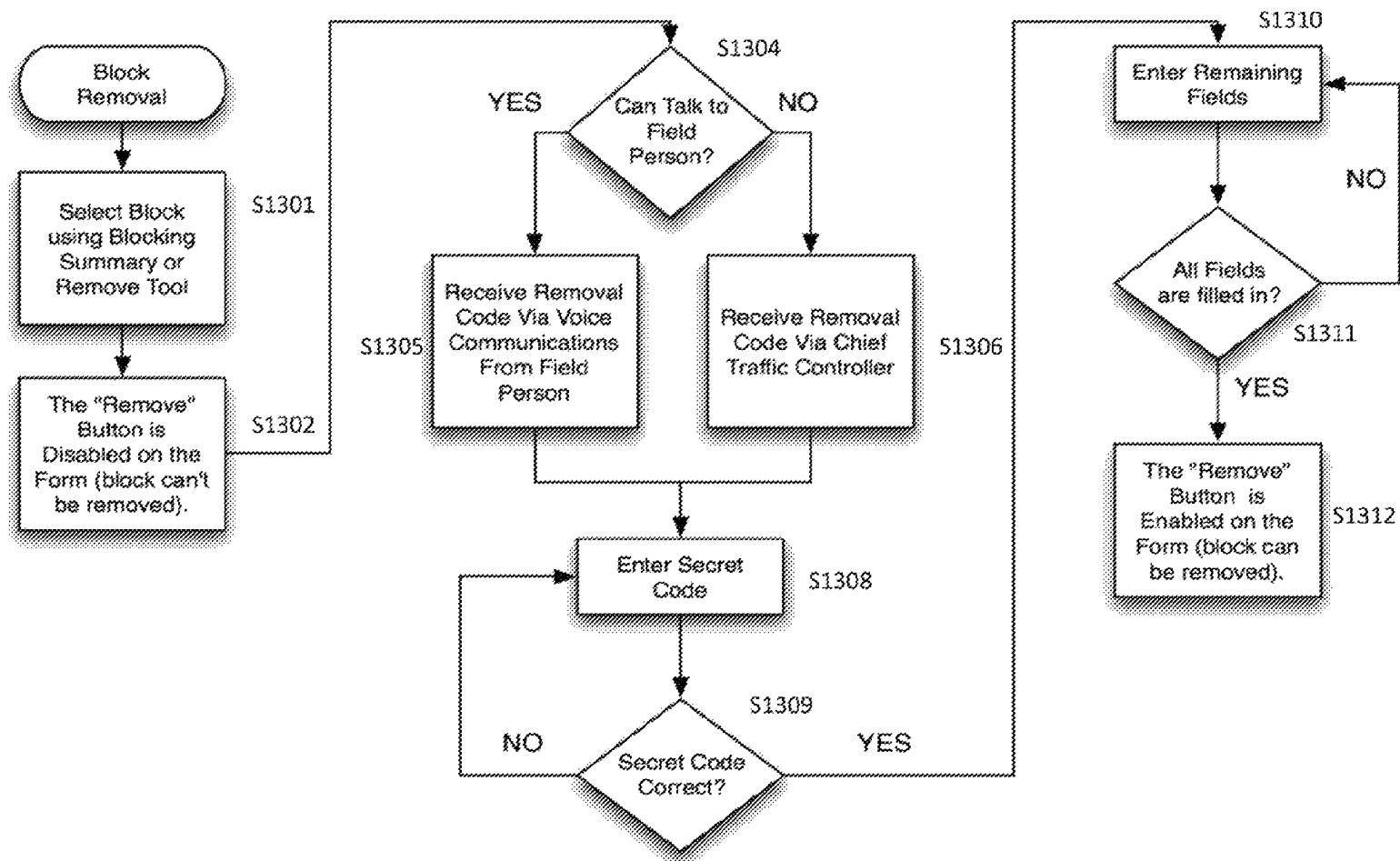


FIGURE 13



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TOOLS FOR RAILWAY TRAFFIC CONTROL**CROSS-REFERENCE TO RELATED APPLICATION**

This application is a Rule 1.53(b) continuation of application Ser. No. 14/519,727 filed Oct. 21, 2014, claiming the benefit of U.S. Provisional Application No. 61/893,547 filed Oct. 21, 2013 and entitled "SYSTEM, APPARATUS AND METHOD FOR RAILWAY TRAFFIC CONTROL".

TECHNICAL FIELD

This disclosure relates to railway traffic control, and more specifically, a system, apparatus, and method for railway traffic control to address concerns for safety of railway workers working on or near railroad tracks.

BACKGROUND

Railway transportation is run under strict operational guidelines or rules, in order to operate safely. Most of these guidelines are standard amongst commercial railway traffic. Examples of transport standards include interlock signals, centralized traffic control (CTC), rule 251, etc.

Interlocking signals govern movement within a sector controlled by an interlock. For example, on a specific track line, a track may be divided into sections of 400 to 2500 m, on each of which trains move at a speed depending on an interlocking signal exhibited by an interlock at an entrance to the section. That is, the interlocking signal displays a color system which instructs the conductor of the train, or the train operating by automated response, how to move through the upcoming section of track. Interlocking systems usually incorporate a 3-color system by which the train, or train conductor, is informed to proceed at regular speed, is informed to proceed at a reduced speed or is prohibited from proceeding through the upcoming section.

While interlocking systems may be operated manually, currently most interlocking systems are controlled electronically. One method of controlling all of interlocks within a rail system is through a centralized traffic control (CTC), or traffic control system (TCS). A CTC is used for monitoring, tracking and operating trains traversing tracks throughout a network. The CTC is controlled by a single person known as a train dispatcher.

In order for the train dispatcher to make appropriate train control decisions regarding how the train should be operated, various information and data must be obtained and presented. Information regarding track conditions, train traffic, scheduling, etc., is presented on a control console which may include a map of the entire rail system controlled by the CTC. Through the control console, the dispatcher has control of each interlock signal (that is, the dispatcher controls the train traffic and flow of train traffic using the interlocks) and is constantly made aware of the positions of trains in the railway system as such positions are electronically reported by signals present throughout the railway system. In addition, in order to provide for safe traffic control and avoid accidents or collisions, signals are provided throughout the track network, or interlocks.

The interlocks may be controlled from the CTC in any of various different ways, including, e.g., direct wiring, by pulse codes sent over a wire to distant locations etc. In addition, interlocks can also be controlled by a native mechanism detecting presence of a train on the track. That

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is, when a train occupies a certain section of track, the interlock prevents other trains from proceeding onto the same

Further, there are additional safety systems on the train itself, such as automatic train control (ATC). A common feature of many of such automated train control systems is the need for constant or nearly constant communications between onboard train control systems and offboard hub radio connected to control equipment located along the wayside or in a central office. In some systems, the offboard control equipment generates movement authorities which authorize the train to move in one or sections of track. In some systems, the offboard equipment informs the onboard train control system of the presence of other trains in the vicinity. In yet other systems, the offboard equipment provides information such as temporary speed restrictions and work zone information to the onboard train control system. Such systems protect against a number of human errors on the part of the train drivers, one of the basics of the system being that the train is provided with a computer which receives traffic information, such as stop signals and speed limits, from a plurality of transmitters along the track. Thus, the computer may bring the train to a standstill regardless of what the train driver does when the train arrives at a stop signal.

Even with all these safety features present in a railway system, railway accidents occur, with many being fatal. For example, one study reported that there were 39 roadway worker accidents that occurred between January 1997 and the end of 2011, in which 41 roadway workers perished while attending to tasks such as inspection, construction, maintenance, or repair of railroad track, bridges, roadway, signal and communication systems, electric traction systems, roadway facilities or roadway maintenance machinery on or near track, operating as flagmen or watchmen/lookouts for other roadway workers, etc.

There remains a need for further safety measures to protect the lives of railway workers.

BRIEF SUMMARY

This disclosure provides tools (in the form of systems, apparatuses, methodologies, etc.) for enhancing railway traffic control, as supplemental measures directed to safety of railway workers.

For example, a centralized railway control system may be adapted (such as via computer hardware, software, or combination) to include providing on a user terminal a user interface including a block placing part to place a block on one or more specified track sections to permit a railway field worker to enter the track sections while blocking railway traffic to said track sections, generating a removal code and transmitting the removal code to the electronic contact address of the railway field worker, and permitting the block to the track sections to be removed only upon entry of the removal code in the centralized railway control system. Such process may be largely automated via programming such that upon placement, by the block placing part, of the block of railway traffic to the specified track sections, the removal code is automatically transmitted, by a code generation part, to the electronic contact address of the railway field worker, and the block of railway traffic to the specified track sections remains in place in the centralized railway control system until the entry of the removal code in the centralized railway control system to cause a block removal part to remove the block on said one or more track sections.

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In another aspect, the adaptation may include a RTC user interface to permit a user (e.g., train dispatcher) to specify a track section(s) to be blocked, specify an instruction to the centralized railway control system to block the railway traffic to the specified track section(s), and specify identifying information of the railway field worker performing (or to be performing) work in the specified track section(s).

In another aspect, the adaptation includes a block removal user interface to permit a user to enter the removal code to cause the block removal part to remove the block on said one or more track sections. Such block removal user interface may be provided in any of various ways. For example, the block removal user interface may be provided within a mobile application or web page through which the railway field worker can enter the removal code manually or orally (i.e. including a voice or speech interface part). As another example, the removal code may be embedded in a link in a message transmitted by email or messaging to the electronic contact address of the railway field worker, and the railway field worker can simply cause the removal code to be entered by activating the link in the message received by the railway field worker. In another example, the block removal user interface may be provided on the same user terminal on which the block placing part is disposed. Further, a voice or speech interface part may be disposed on the system-side to process a voice message (such as received via a telephone call from the railway field worker), extract the removal code from the voice message, and enter the block removal code. In each instance, the block of railway traffic to the specified track sections remains in place in the centralized railway control system until the entry of the removal code through the block removal user interface. Further, entry of the removal code may also require entry of identification of the user entering the removal code, and removal of the block may also require not only the removal code but also confirmation that the user entering the removal code is authorized to remove the block. The block removal user interface may further require, in addition to entry of the removal code, the user to specify that confirmation that the track sections have been cleared has been obtained from the railway field worker associated with the block, before the block removal user interface permits the removal code to be transmitted to the block removal part.

In another aspect, the system may include a railway control database registering block identifying information, including block limits identifying the one or blocked track sections, along with the removal code for removing the block of the track sections. Further, the railway control database may register additional information, such as identification of the user who specified the instruction to block the track sections, notes specifying reasons for the block, date and time at which the block was placed, etc. The railway control database may further register block removal information identifying date and time at which the block was removed and identifying the user who entered the removal code and who specified that confirmation that the track sections have been cleared was obtained from the railway field worker associated with the block.

BRIEF DESCRIPTION OF THE DRAWINGS

The aforementioned and other aspects, features and advantages can be more readily understood from the following detailed description with reference to the accompanying drawings wherein:

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FIG. 1A shows a block diagram illustrating a railway control system, in accordance with an exemplary embodiment;

FIG. 1B shows a block diagram illustrating a railway control system, in accordance with another exemplary embodiment;

FIG. 2 shows a block diagram of a railway traffic control apparatus, in accordance with an exemplary embodiment;

FIG. 3A shows a block diagram of an exemplary configuration of a terminal;

FIG. 3B shows a block diagram of an exemplary configuration of a computing device;

FIG. 4 shows a schematic diagram illustrating communication flow in the system shown in FIG. 1A or in the system shown in FIG. 1B;

FIG. 5 shows an example of a graphical portrayal of a railway network;

FIGS. 6-9 show examples of a user interface display, in accordance with an exemplary embodiment;

FIG. 10 shows an example of a user interface display that may be provided on the field worker side for triggering block removal;

FIG. 11 shows another example of a user interface display;

FIG. 12 shows a flow chart illustrating a block placement method, in accordance with an exemplary embodiment;

FIG. 13 shows a flow chart illustrating a block removal method, in accordance with an exemplary embodiment;

DETAILED DESCRIPTION

This patent specification describes tools (in the form of methods, apparatuses and systems) that controls train traffic within a railway system using, but not limited to, standardized rules or timetables described in the Background section of this specification.

In describing exemplary embodiments illustrated in the drawings, specific terminology is employed for the sake of clarity. However, the subject matter of this patent specification is not intended to be limited to the specific terminology so selected and it is to be understood that each specific element includes all technical equivalents that operate in a similar manner.

The drawings show examples of implementations of the subject matter of this patent disclosure in several computing environments. However, it should be understood that the subject matter of this disclosure can be utilized by any computing device including but not limited to PDAs, cell phones, personal, notebook and workstation computers, kiosks, other information terminals, WIC (or another) pager etc. In addition, the subject matter of this disclosure might be provided as services in a modular fashion by other devices connected by a communication network.

Referring now to the drawings, wherein like reference numerals designate identical or corresponding parts throughout the several views, there are described tools (systems, apparatuses, methodologies, computer program products, etc.) that can be integrated in a railway traffic control system.

FIG. 1A shows schematically an exemplary embodiment in which a system 100A includes a railway traffic control terminal 105, rail personnel data 104 and a terminal 103, each connected to the network 102. FIG. 1B shows schematically another exemplary embodiment, in which rail personnel contact data 104 is accessed directly by the railway traffic control apparatus 105. While only one terminal is connected to the network 102 in the example shown

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in FIG. 1A as well as in the example shown in FIG. 1B, it should be appreciated that the network environment can have an arbitrary number of devices (of various types).

The network 102 can be any data network, a local area network, a wide area network or any type of network such as an intranet, an extranet (for example, to provide controlled access to external users, for example through the Internet), a private or public cloud network, the Internet, etc., or a combination thereof. Further, other communications links (such as a virtual private network, a wireless link, etc.) may be used as well for the network 102. In addition, the network 102 preferably uses TCP/IP (Transmission Control Protocol/Internet Protocol), but other protocols such as SNMP (Simple Network Management Protocol) and HTTP (Hypertext Transfer Protocol) can also be used. How devices can connect to and communicate over networks is well-known in the art and is discussed for example, in "How Networks Work", by Frank J. Derfner, Jr. and Les Freed (Que Corporation 2000) and "How Computers Work", by Ron White, (Que Corporation 1999), the entire contents of each of which are incorporated herein by reference.

The rail personnel 104 is a database that can be either connected to or inside the railway traffic control terminal 105. The rail personnel data 104 stores information regarding the maintenance workers used for traveling, inspecting and working on blocked rails. For example, the information stored can include name of the maintenance worker, primary contact, secondary contact, previous assignment, current assignment, etc. as shown via user interface display in FIG. 11.

FIG. 2 shows a terminal 100A which is configured (such as via one or more programs of instructions executable by processor of a computer or another electronic device) with a railway traffic blocking apparatus 101 to include a block placer 101A, a code generator 101B, a block remover 101C and a user interface 101D. The terminal 100A can be any electronic device including processor, storage and display, such as shown by way of examples in FIGS. 3A and 3B.

The railway traffic blocking apparatus is programmed to control the traffic of an entire railway network. The block placer 101A is configured to stop traffic within a certain length of rail line. That is, once a block is placed, no train can traverse the blocked section of rail. For example, in the case of a railway controlled by multiple interlocks, the block placer 101A causes those interlocks to output a STOP signal, therefore, stopping any train traffic within the rails controlled by that interlock. By doing this, maintenance workers and railway personnel can travel, inspect and work on the rails without the danger of oncoming train traffic. Trains that are scheduled to traverse said blocked tracks either come to a complete stop, electronically or mechanically, before passing the interlock or are rerouted using tracks that are not in a blocked state. However, this disclosure is not limited to a railway traffic control system implementing interlocks. This system can be implemented on any configuration in which there is control of the traffic of a railway system.

The code generator 101B is configured to produce removal code (such as a cipher which is random, pseudo-random, secret, etc., and stored on the terminal. A new random cipher may be generated for each instance of traffic blocking. This random cipher is then sent to another terminal belonging to the railway personnel who are scheduled to travel, inspect or work on the specific rails being blocked.

The block remover 101C is programmed to remove the previous block, or plurality of blocks set by the block placer 101A. The block remover 101C is dependent on the code

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produced by the code generator 101B. As described in detail below, a block cannot be removed without the input of the release code.

The user interface 101D is configured preferably for the ease of use for the railway traffic controller. As shown by way of examples in FIGS. 6-9 and 11, the user interface 101D displays information and tools needed to enable/disable blocks on rail sections.

The user interface 101D may be a mobile application, a web page or some other software component, on a terminal device. Such terminal preferably is configured to communicate through a computer or data network to obtain content and data from an external source. However, it should be appreciated that the inventive aspects described herein can be employed even if the mobile device is not configured to connect to a data network, and/or is not connected to a data network.

An example of a configuration of a user terminal (e.g., the terminal 103) or computer is shown schematically in FIG. 3A. In the example of FIG. 3A, terminal device 200 includes a controller (or processor) 202 that communicates with a number of other components, including storage 203, display 204, input/output (such as mouse, touchpad, stylus, microphone and/or speaker with voice/speech interface and/or recognition software, etc.) 205 and a network interface 206, by way of an internal bus 201.

The storage 203 can provide storage for program and data, and may include a combination of assorted conventional storage devices such as buffers, registers and memories [for example, read-only memory (ROM), programmable ROM (PROM), erasable PROM (EPROM), electrically erasable PROM (EEPROM), static random access memory (SRAM), dynamic random access memory (DRAM), non-volatile random access memory (NOVRAM), etc.].

The network interface 206 provides a connection (for example, by way of an Ethernet connection or other network connection which supports any desired network protocol such as, but not limited to TCP/IP, IPX, IPX/SPX, or NetBEUI) to a network (e.g., network 102) to enable the terminal device to communicate with another device through the network.

FIG. 3B shows an exemplary constitution of a computer 300 which can be configured by appropriate programming to operate as the railway traffic control apparatus 105 (FIG. 1A). The computer 300 shown in FIG. 3B includes a processor 302, and various elements connected to the processor 302 by an internal bus 301, such as a memory 303, display 304, keyboard 305 and network interface 306. The processor 302 processes incoming requests transmitted through the network interface 306. The network interface 306 enables the railway traffic control terminal to communicate with other network-connected devices such as a terminal (e.g., the terminal 103 of FIG. 1A or FIG. 1B) and receive data or service requests.

Each of the terminal 103, rail personnel database 104 and railway traffic control apparatus 105 can be configured to communicate with each other through the network 102. The railway traffic control terminal 105 can be configured to request data from the rail personnel contact data 104 through the network 102, as shown in FIG. 4. When the railway traffic control apparatus 105 initiates a block on a track section, the railway traffic control apparatus 105 may also designate a worker in association with the block on the track section. With this information, the railway traffic control apparatus 105 requests the specific personnel data pertaining to the designated worker. The rail personnel contact data retrieves the requested personnel data and sends it to the

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railway traffic control apparatus **105**. By receiving this data, the railway traffic control apparatus **105** may then generate a release code and save it to an internal storage.

The release code is then sent to the terminal **102**. This terminal **102** is the contact associated with the designated worker, and the electronic address of this terminal is found within the personnel data received from the rail personnel contact data **104**. By this system, only the railway traffic control apparatus **105** and terminal **102** receive the release code generated by the railway traffic control apparatus **105**.

Additionally, FIG. **4** shows the communication between the terminal **102** and the railway traffic control apparatus **105** in the event that a block on a certain track is to be lifted. In order for a block on a certain track to be lifted, the release code has to be input into the railway traffic control apparatus. The terminal **102** sends the release code to the railway traffic control apparatus **105**. The release code is then input into the block remover **101C**. After which, the block is removed and traffic to that section of rail is then allowed.

FIG. **5** illustrates an example of a railway network **500**. Labeled are interlocks A-F which control sections of railway of the network **500**. For example, the rail traffic controller might choose to block the section of rail corresponding to the track between interlock A and interlock B. This way, train traffic between those two interlocks is prohibited. The railway network is present on screen of the railway traffic control terminal **105** at all times for the convenience of the rail traffic controller. By being on screen at all times, the rail traffic controller knows the status of certain sections of rail in real time.

As shown in the example illustrated in FIG. **5**, the railway between interlocks A and B, and interlocks C, D and E is blocked. Train traffic is prohibited between these sections and shown to the railway traffic controller on screen. As further explained below, the railway traffic controller lift the blocks on these sections of track if the release code is input into the railway traffic control terminal **105**.

FIG. **6** is an exemplary illustration of the user interface of the railway traffic control terminal **105**. The railway traffic controller may place blocks on any section of traffic using this user interface. In this exemplary embodiment, the train traffic controller inputs authority, worker and block limits. This information corresponds to the train traffic controller username, maintenance worker designated to work on the specific blocked track and the sections of track being blocked, respectively. In addition, the railway traffic control terminal **105** applies a timestamp to the order once the block is placed.

Once the block is put into place, the corresponding section on the railway network **500** displays the section of track being blocked. In addition, the railway traffic control terminal **105** generates a release code, stores the release code, and sends the code to the maintenance worker designated for track work, i.e. maintenance worker **12**. As shown in FIG. **6**, the railway traffic controller may place blocks on track sections but may not remove the track blocks without the input of the release code in the allotted area labeled release code. FIG. **6** shows that the remove action is dashed out, meaning it cannot be selected (unless a release code is first entered). In the example illustrated in FIG. **6**, it is shown that only one worker, maintenance worker **12** is designated to work on track Section A to Section B. However, as shown in later embodiments, the train traffic controller is not limited to the amount of maintenance workers designated for any track section. In addition, the train traffic controller may apply a block to any number of additional track sections.

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The blocks are then tabulated by the railway traffic control apparatus **105** as depicted in FIG. **7**. The table in FIG. **7** lists all the blocks that are in place and in addition lists blocks that were previously set. The information that can be found in this table includes, but is not limited to, the type of work being done on the track sections, when the block was placed, who is designated to work on the sections of track who placed the block, when was the block removed and who removed the block.

Additional information can be accessed though this table by highlighting a cell the table and selecting info, as shown in FIG. **7**. For example, by highlighting the cell labeled maintenance worker **12** and selecting info, the train traffic controller may access the bio of the maintenance worker **12**, as shown in detail below. The train traffic controller may also highlight a different cell, such as the limits cell label "Sec. A-Sec. B". By selecting this cell and selecting the info command, the past history of maintenance work and operation of the section(s) may be displayed to the train traffic controller.

FIG. **8** shows the user interface of the railway traffic control terminal **105** as the railway traffic controller inputs the release code to remove the block on certain track sections. In the exemplary embodiment of FIG. **8**, the remove option is now able to be selected with the input of the release code provided by the designated worker assigned for track work, maintenance worker **12**.

Without input of release code, the remove option is not available to be selected. In a different embodiment, the release code may be obtained from the storage of the railway traffic control terminal **105**.

In the case where there are multiple maintenance workers assigned to a certain track section, there may be provided one release code to one, multiple or all of maintenance workers assigned. That is, The train traffic controller may input that the release code be specified to one maintenance worker, preferably a supervisor or foreman, to multiple maintenance workers or to all of the maintenance workers assigned to work on a given track section. Also, in another embodiment, in a case where there are multiple workers assigned for a certain track section, there may be provided multiple unique release codes which would then all be required to be input into the train traffic control terminal **105** by the train traffic controller in order to be able to remove blocks on certain track sections.

In another embodiment, the train traffic controller may be asked to verify that a railway section is cleared before receiving the option to remove a train block. As shown in FIG. **9**, the user interface displayed by the railway traffic control terminal **105** does not allow a removal of a block until the option corresponding to "Railway Section Cleared" is checked. This option allows for a further protection of the maintenance workers assigned to the block track sections.

FIG. **10** shows an exemplary illustration of a message sent by the railway traffic control terminal **105** to terminal **103** at a corresponding address of a maintenance worker assigned to work on a blocked track. The message is meant to deliver the release code to the maintenance worker assigned to work on a blocked track. In addition to relaying the code, the message may include, but not limited to, information regarding the section of track that is being blocked, the date and time that the track was blocked, who initiated the track block, and links to quickly respond to the message. By selecting one of the links embedded in the message, the terminal **103** sends the release code to the railway traffic control terminal **105**. The code can be transmitted through, but not limited to, text message, e-mail or voice message. In

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the present embodiment being illustrated, the terminal **103** is depicted as a mobile phone. The terminal **103** could be any communication device such as, but not limited to, mobile phone or smartphone, tablet, WIC (or another) pager, PDA, etc.

In another embodiment, once the rail traffic controller unblocks a section of track, the railway traffic control terminal **105** may send a message to the worker, or plurality of workers, associated with working on the previously blocked track in order to inform them that the track has been unblocked and is no longer a safe environment to work in.

FIG. **11** depicts an exemplary embodiment of a profile of a maintenance worker. This profile may be accessed directly by highlighting the corresponding maintenance worker cell in the table depicted in FIG. **7** and selecting the info tab. This command brings up the profile and the maintenance worker and displays information regarding the worker including, but not limited to, the name, age, primary contact, secondary contact, e-mail, last assignment and current assignment of the maintenance worker. Additionally in this screen, the railway traffic controller may contact the maintenance worker directly using one of the plurality of addresses provided.

Next, the method of placing a block on a track section will be described with reference to FIG. **12**. In **S1201**, the rail traffic controller selects the sections to be blocked using the railway traffic control terminal **105**. Once the block limits are designated and sent, the railway traffic control terminal **105** established office interlocking immediately in **S1202**. That is, the railway traffic control terminal **105** immediately sends a signal to the corresponding interlocks corresponding to the section of track designated to be blocked. Additionally, the railway traffic control terminal **105** generates and saves a random secret code in **S1203**.

After a request to block a certain section of track is sent, the railway traffic control terminal **105** checks if there are sections currently having a block placed (**S1204**). If one or more of the designated sections does not have a block placed, then the railway traffic control terminal **105** opens a user interface for the railway traffic controller to designate a type of block to set and a maintenance worker for the blocked section in **S1206**. If the railway traffic control terminal sees that a block is already in effect (**S1205**), then the railway traffic control terminal **105** allows the railway traffic controller to change the existing block type and maintenance worker using the same interface. The interface is then opened in **S1206**.

The railway traffic controller then inputs the type of block and assigns a worker to work on the blocked section. The railway traffic controller also has the option to block the track for purposes of an emergency and not necessarily for maintenance work in **S1207**. Once the railway traffic controller assigns a block type and/or a corresponding maintenance worker, the railway traffic control terminal **105** checks the status of the selected block in **S1208**. If the current selected section has an existing block, the railway traffic control terminal **105** waits for a response from the interlocks of the corresponding section to send an indication that a new block can be established in **S1209**. Once this indication is received in **S1210**, the railway traffic control terminal **105** enables the button of the user interface (**S1211**). If the selected section has no previous active block, the railway traffic control terminal **105** immediately enables the place button on the user interface.

Once the place button is selected, the railway traffic control terminal **105** generates a place time and enables safety measures so that the block cannot be removed without

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the input of the secret code generated (**S1212**). Finally, the railway traffic control terminal **105** sends the secret removal code to the corresponding one or more maintenance workers if the railway traffic controller has selected maintenance workers for the given block.

FIG. **13** describes a method for removing a block placed on a section of track. In **S1301**, the railway traffic controller selects an existing block by using either the network rail map, shown in FIG. **5**, the remove tool, shown in FIGS. **6**, **8** and **9**, or the summary table, shown in FIG. **7**. The remove button is disabled without the input of the secret code from either the maintenance worker or the railway traffic control terminal **105** (**S1302**). In **S1304**, the railway traffic control terminal **105** checks if there is a maintenance worker that is eligible to transmit the random secret code. If there is an eligible maintenance worker available, the maintenance worker transmits the random secret code to the railway traffic control center **105** (**S1305**). If there is no maintenance worker available to transmit the random secret code, the code can be retrieved from the train traffic control terminal **105** by the train traffic controller (**S1306**).

Once the secret code is received, the secret code may be input to the designated field (**S1308**). The railway traffic control terminal **105** checks the secret code with the code saved in its memory (**S1309**). If the code is incorrect, the railway traffic control terminal **105** will prompt the user to input the code again. If the code is correct, the railway traffic control terminal will prompt the user to enter information into any remaining fields (**S1310**). In **S1311**, the railway traffic control terminal **105** checks that all information input into all fields is correct and that all fields are filled in. After this check is performed by the railway traffic control terminal **105**, the remove button is enabled on the form (**01312**) and the railway traffic controller may remove the block on the corresponding track section.

The aforementioned specific embodiments are illustrative, and many variations can be introduced on these embodiments without departing from the spirit of the disclosure or from the scope of the appended claims. For example, elements and/or features of different examples and illustrative embodiments may be combined with each other and/or substituted for each other within the scope of this disclosure and appended claims.

The orders in which the steps are performed in the aforementioned methods are not limited to those shown in the examples of FIGS. **12** and **13**, and may be switched as long as similar results are achieved. Also, it should be noted that the methods illustrated in the examples of FIGS. **12** and **13** may be implemented using any of the embodiments shown in FIGS. **1A-1B**.

Further, conventional systems can be modified to include the aspects described herein. As an example, a means may be added to a conventional interlock system by which the railway worker has partial control of the interlock system at the times that maintenance work is needed on a certain train block. In such modification, a system, apparatus and/or method may be provided to control the interlocks in a railway system as an interface between the railway workers and the interlock control. Thus, in a case in which maintenance is to be performed on a certain rail block, which is controlled by an interlock, the interlock can be configured to send out a stop signal for all incoming trains, to block train traffic to such portion of the rail system. In addition, once the interlock is placed in a "stop traffic" state, a release code is transmitted to an electronic content address corresponding to the railway worker.

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Once a block has been placed, the interlock remains in a blocked state, until the maintenance worker supplies the release code, which was received at the time the interlock started, and the release code is entered in the interlock control system. So long as the block is in place, maintenance worker can perform on-track work, without interference of oncoming train traffic. After the maintenance worker finishes the assigned work and is clear of the train tracks, he/she may then supply the interlock control system with the release code, and the interlock control system in turn can release the interlock over the block.

Accordingly, the railway worker has more control over the traffic through the rail block in which the worker is working, and fatal on-track accidents can be reduced.

Additional variations may be apparent to one of ordinary skill in the art from reading U.S. Provisional Application No. 61/893,547, filed Oct. 21, 2013 and entitled "SYSTEM, APPARATUS AND METHOD FOR RAILWAY TRAFFIC CONTROL", the entire contents of which are incorporated herein by reference.

What is claimed is:

1. A system to enhance railway control, to protect safety of railway workers on or near railway tracks, the system comprising:

a railway control apparatus comprising a processor, a non-transitory medium storing one or more programs of executable instructions, and a network interface through which the railway control apparatus communicates via a network; and

a user terminal provided to a railway field worker and configured to communicate via the network with the railway control apparatus and to provide a user interface to display information received from the railway control apparatus and to permit the railway field worker to respond to prompts displayed thereon,

wherein the railway control apparatus, by execution of said one or more programs of executable instructions by the processor, includes:

a block placing part to place a block on one or more specified track sections to permit the railway field worker to enter the track sections while blocking railway traffic to said track sections;

a code generation part to generate a release code and transmit the release code to an electronic contact address accessible by the railway field worker via operation of the user interface of the user terminal; and

a block removal part to remove only upon receiving the release code from the user terminal in return, the block placed by the block placing part on said one or more track sections.

2. The system of claim 1, wherein upon the railway control apparatus placing the block of railway traffic to said

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one or more specified track sections and transmitting the release code to the electronic contact address accessible by the railway field worker, the user interface provided on the user terminal displays a message and permits the railway field worker to respond to the message to release the block.

3. The system of claim 2, wherein upon the railway field worker responding to the message to release the block, the release code is returned to the railway control apparatus.

4. The system of claim 2, wherein the message displayed by the user interface on the user terminal includes an embedded link for activating a return transmission of the release code to the railway control apparatus.

5. A method to enhance railway control, to protect safety of railway workers on or near railway tracks, said method comprising:

configuring a mobile user device of a railway field worker to provide a device user interface to display information received via a network from a railway control apparatus and to permit the railway field worker to respond to prompts displayed thereon;

providing a terminal user interface on a terminal to permit a terminal user of the terminal request the railway control apparatus to place a block on one or more specified track sections to permit a railway field worker to enter the track sections while blocking railway traffic to said track sections;

generating by the railway control apparatus a release code and transmitting the release code to an electronic contact address accessible by the railway field worker via operation of the user interface of the user terminal; and

permitting the block to said one or more track sections to be removed by the railway control apparatus only upon receiving the release code from the user terminal in return.

6. The method of claim 1, further comprising: displaying, upon the railway control apparatus placing the block of railway traffic to said one or more specified track sections and transmitting the release code to the electronic contact address accessible by the railway field worker, a message through the device user interface provided on the mobile user device and permitting the railway field worker to respond to the message to release the block.

7. The method of claim 6, further comprising: upon the railway field worker responding to the message to release the block, returning the release code to the railway control apparatus.

8. The method of claim 2, wherein the message displayed by the device user interface on the mobile user device includes an embedded link for activating a return transmission of the release code to the railway control apparatus.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 9,517,782 B2
APPLICATION NO. : 15/177506
DATED : December 13, 2016
INVENTOR(S) : Ross Pirtle

Page 1 of 1

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the Claims

In Column 12, Line 36 replace “claim 1” with “claim 5”.

In Column 12, Line 49 replace “claim 2” with “claim 7”.

Signed and Sealed this
Thirtieth Day of January, 2018

A handwritten signature in dark ink, reading "Joseph Matal", is written over a faint, circular official seal of the United States Patent and Trademark Office.

Joseph Matal
*Performing the Functions and Duties of the
Under Secretary of Commerce for Intellectual Property and
Director of the United States Patent and Trademark Office*

EXHIBIT B



US00RE47835E

(19) **United States**
 (12) **Reissued Patent**
Pirtle

(10) **Patent Number:** **US RE47,835 E**
 (45) **Date of Reissued Patent:** ***Feb. 4, 2020**

(54) **TOOLS FOR RAILWAY TRAFFIC CONTROL**

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(71) Applicant: **RAILWARE, INC.**, Hauppauge, NY
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(72) Inventor: **Ross Pirtle**, Commack, NY (US)

(73) Assignee: **RAILWARE, INC.**, Hauppauge, NY
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(*) Notice: This patent is subject to a terminal disclaimer.

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(21) Appl. No.: **15/928,955**

(22) Filed: **Mar. 22, 2018**

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(64) Patent No.: **9,403,545**
 Issued: **Aug. 2, 2016**
 Appl. No.: **14/519,727**
 Filed: **Oct. 21, 2014**

U.S. Applications:

(60) Provisional application No. 61/893,547, filed on Oct. 21, 2013.

(51) **Int. Cl.**
B61L 23/06 (2006.01)
B61L 25/06 (2006.01)
 (Continued)

(52) **U.S. Cl.**
 CPC **B61L 27/0038** (2013.01); **B61L 23/06**
 (2013.01); **B61L 25/06** (2013.01); **B61L 27/00**
 (2013.01); **B61L 25/08** (2013.01)

(58) **Field of Classification Search**
 CPC .. B61L 27/0038; B61L 27/0005; B61L 27/02;
 B61L 27/00; B61L 23/00;
 (Continued)

{Amended}

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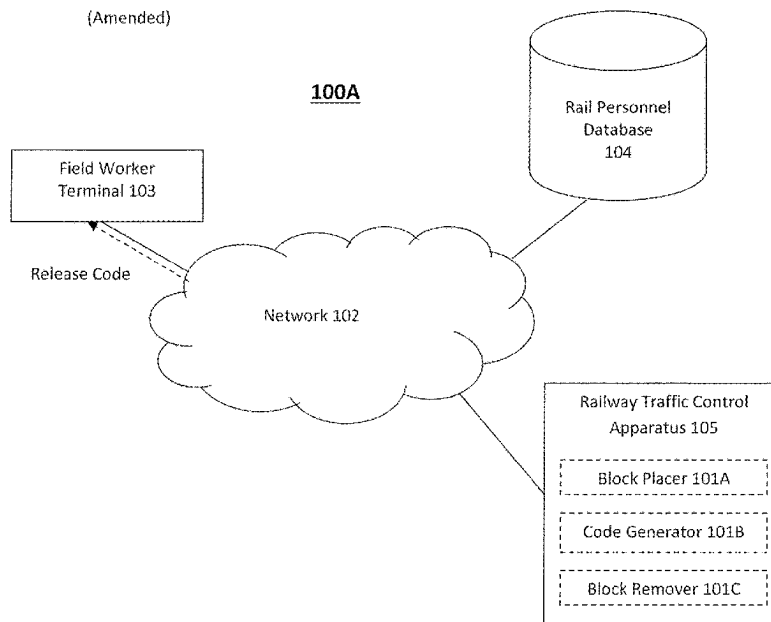
(Continued)

Primary Examiner — Peter C English

(57) **ABSTRACT**

Tools [(such as system, apparatus, methodology, etc.)] may be provided to control traffic over a railway track section, *and more particularly*, when a railway worker is working on or near the track section[. Move particularly, when traffic over the track section is to be blocked], *a block is placed to prevent trains from traversing the track section. Further, a release code is generated and sent to [an electronic contact address of the railway worker. Traffic through the track section is blocked until the release code is entered in] a user terminal. The block is removed from the track section when the release code is received by the system.*

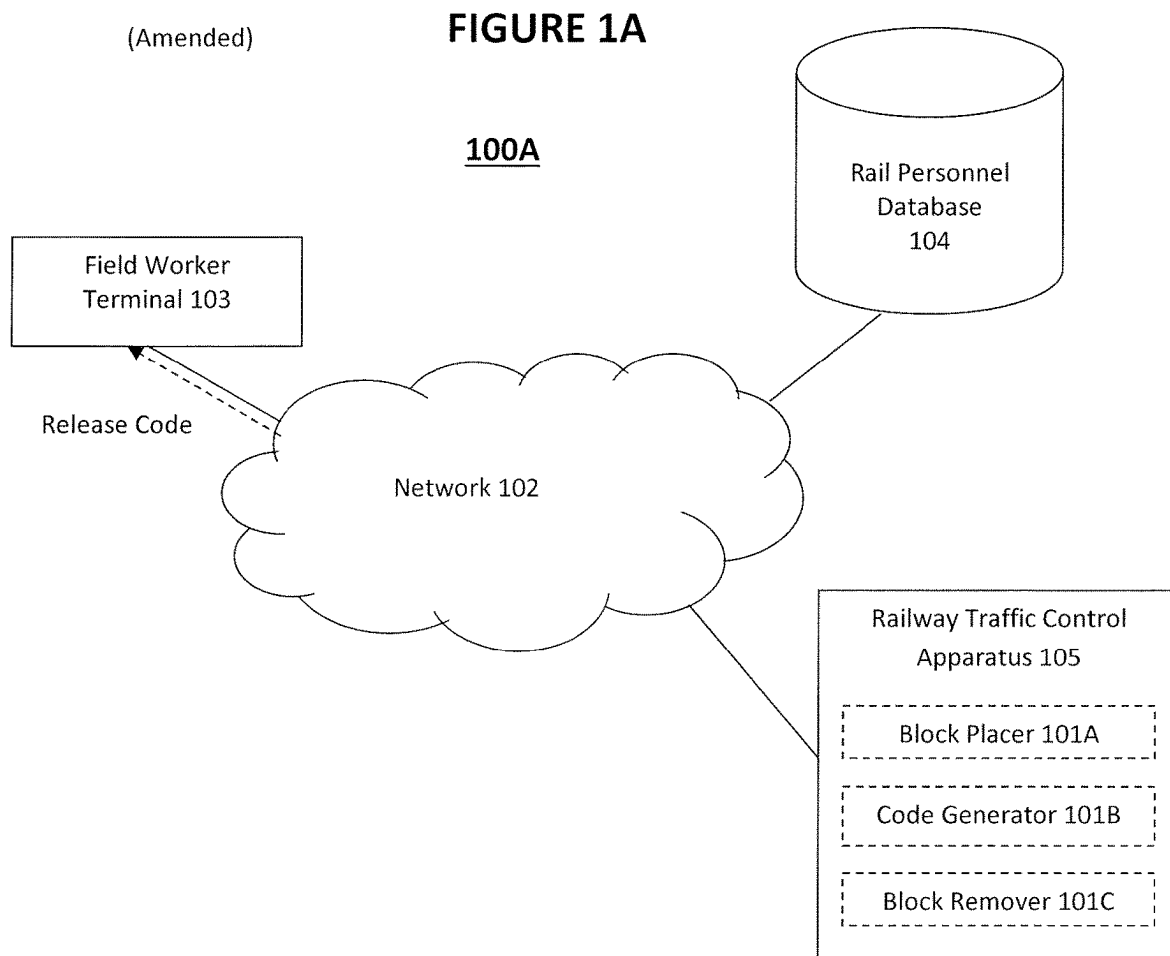
39 Claims, 11 Drawing Sheets



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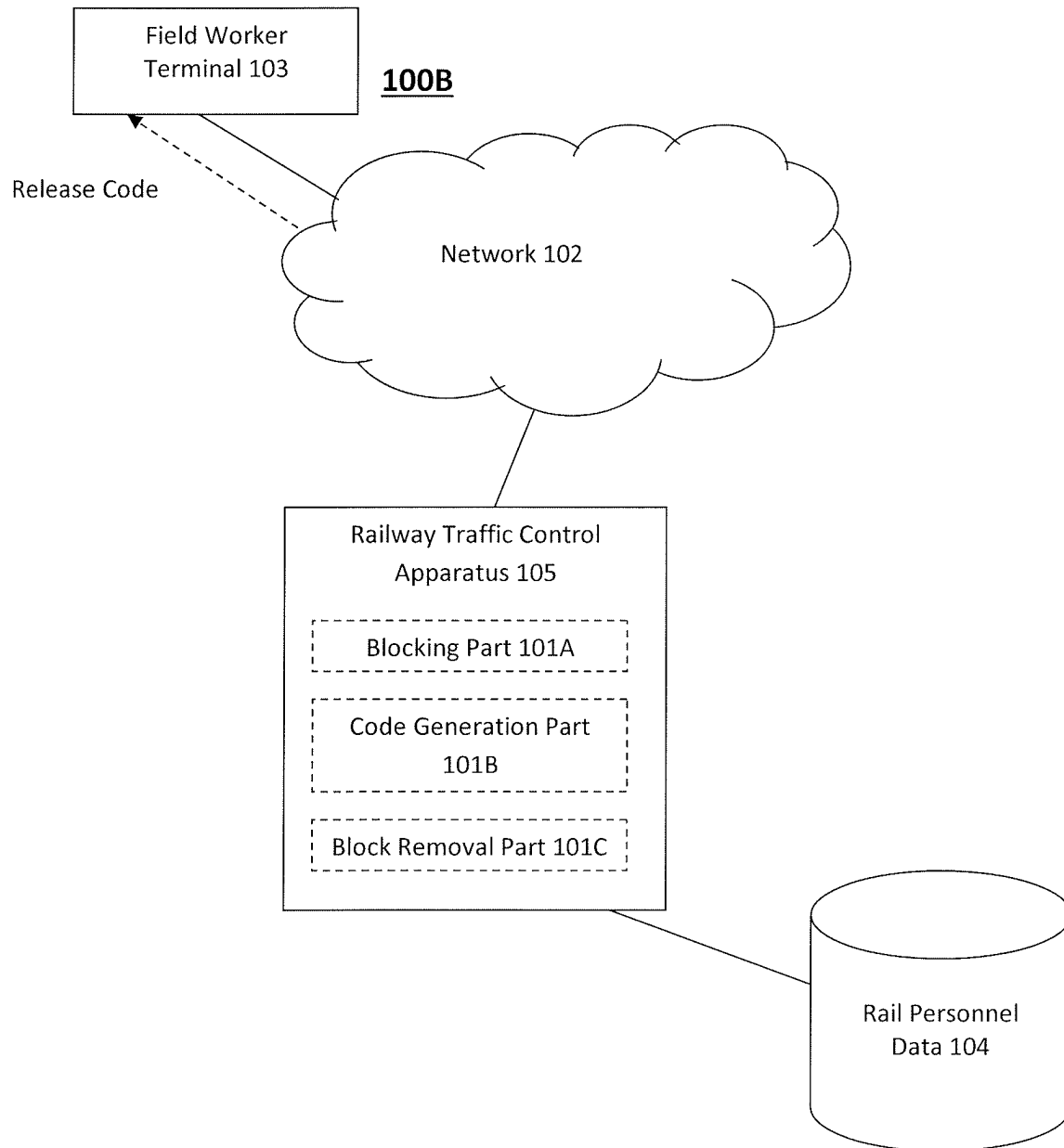
Page 2

- (51) **Int. Cl.**
B61L 27/00 (2006.01)
B61L 25/08 (2006.01)
- (58) **Field of Classification Search**
CPC B61L 23/06; B61L 23/10; B61L 19/06;
B61L 2019/065; B61L 25/06; B61L 25/08
See application file for complete search history.
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(Amended)

FIGURE 1B



(Amended)

FIGURE 2

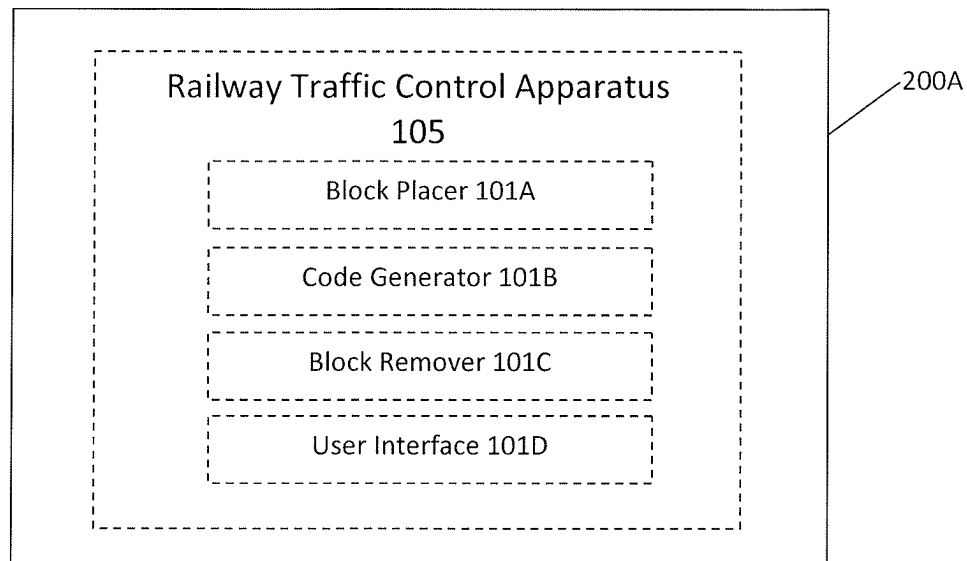
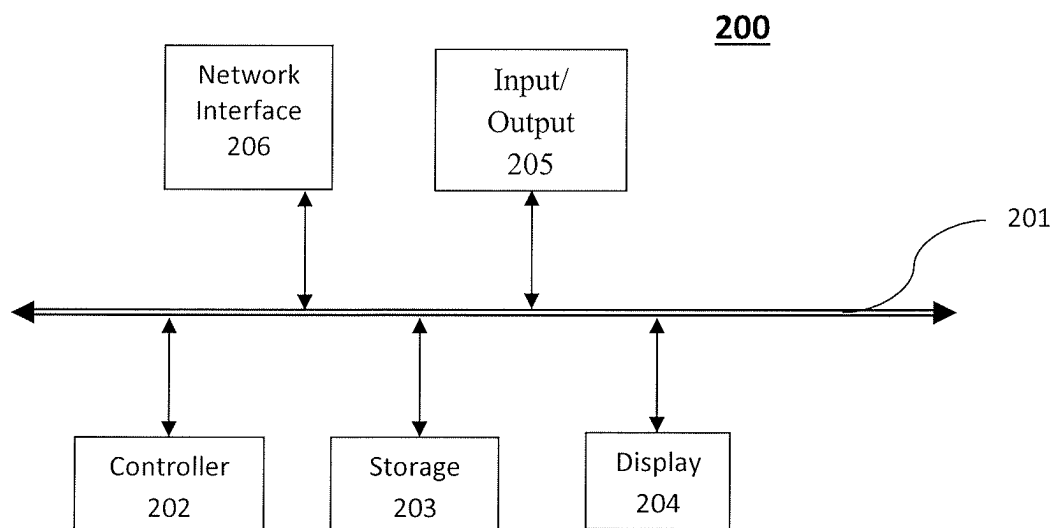


FIGURE 3A



(Amended) **FIGURE 3B**

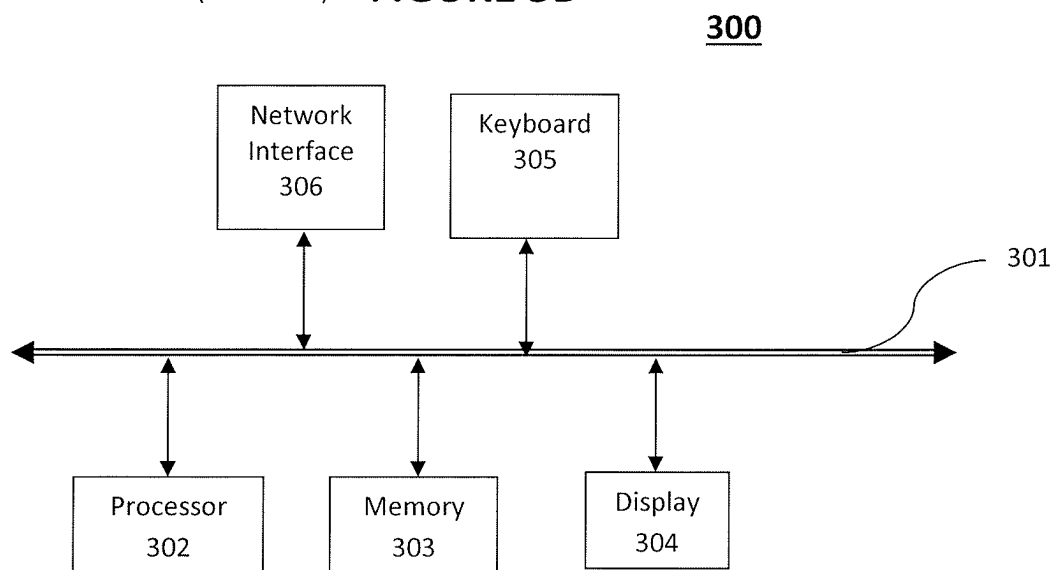
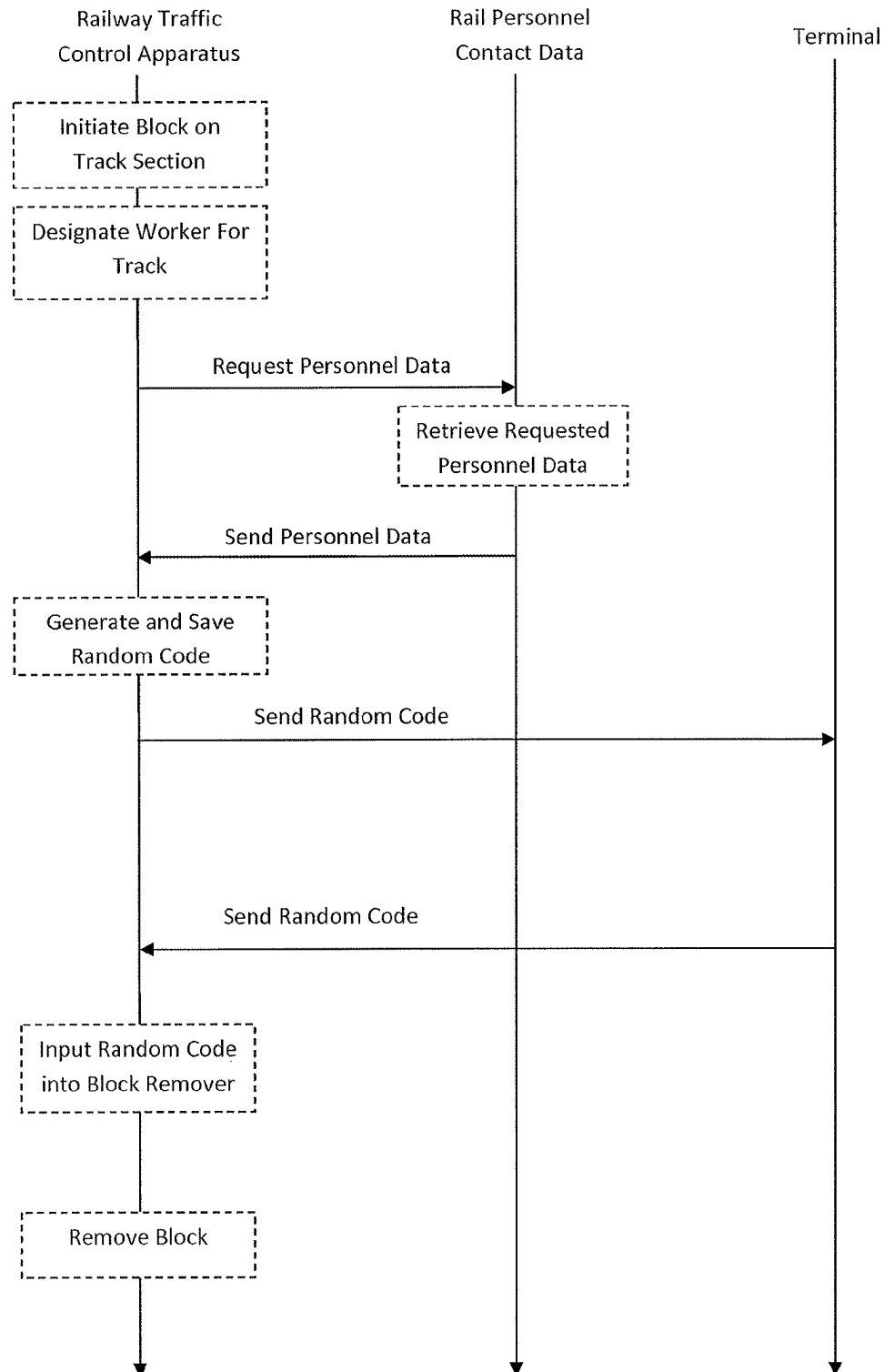


FIGURE 4



(Amended)

FIGURE 5

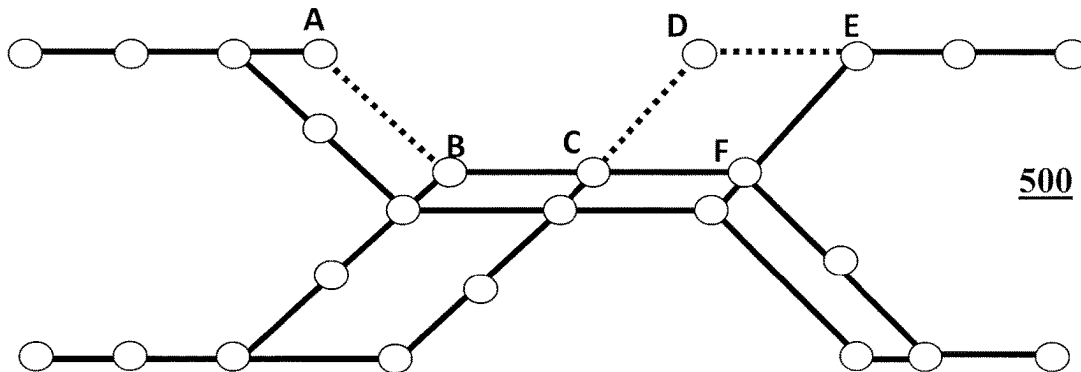
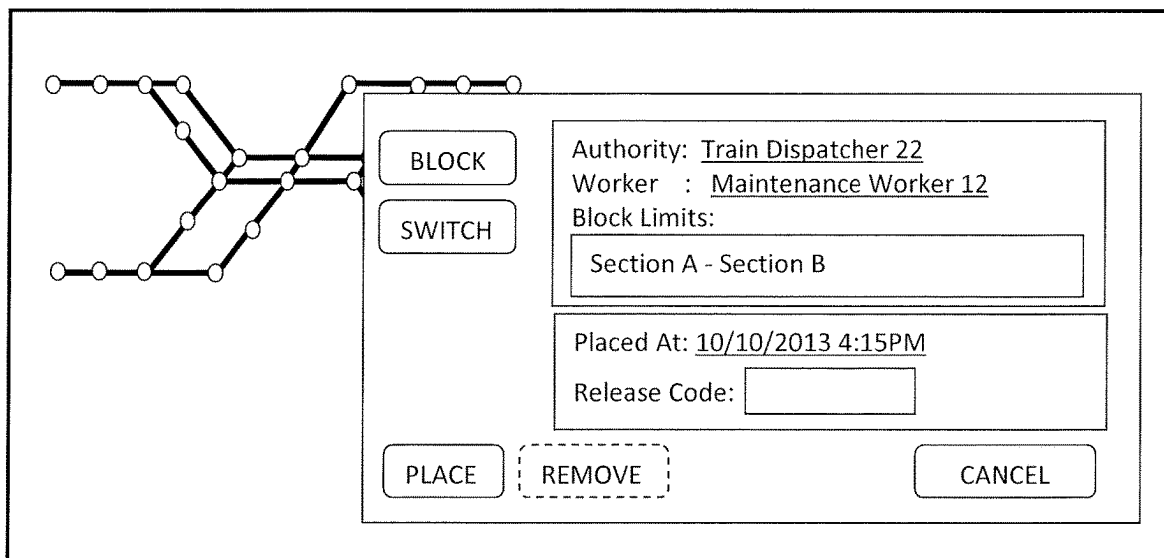
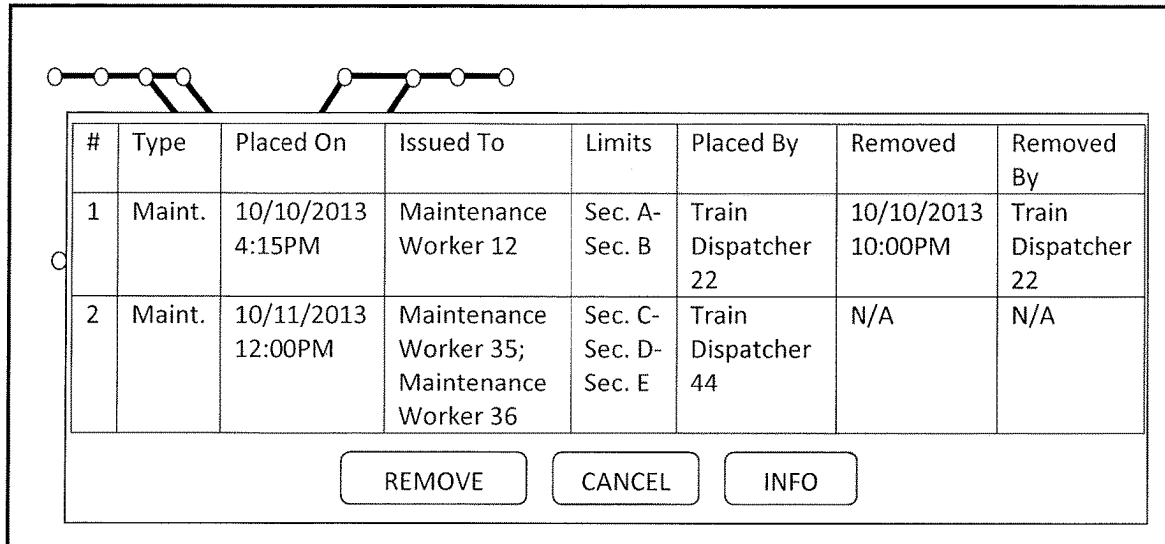


FIGURE 6



(Amended)

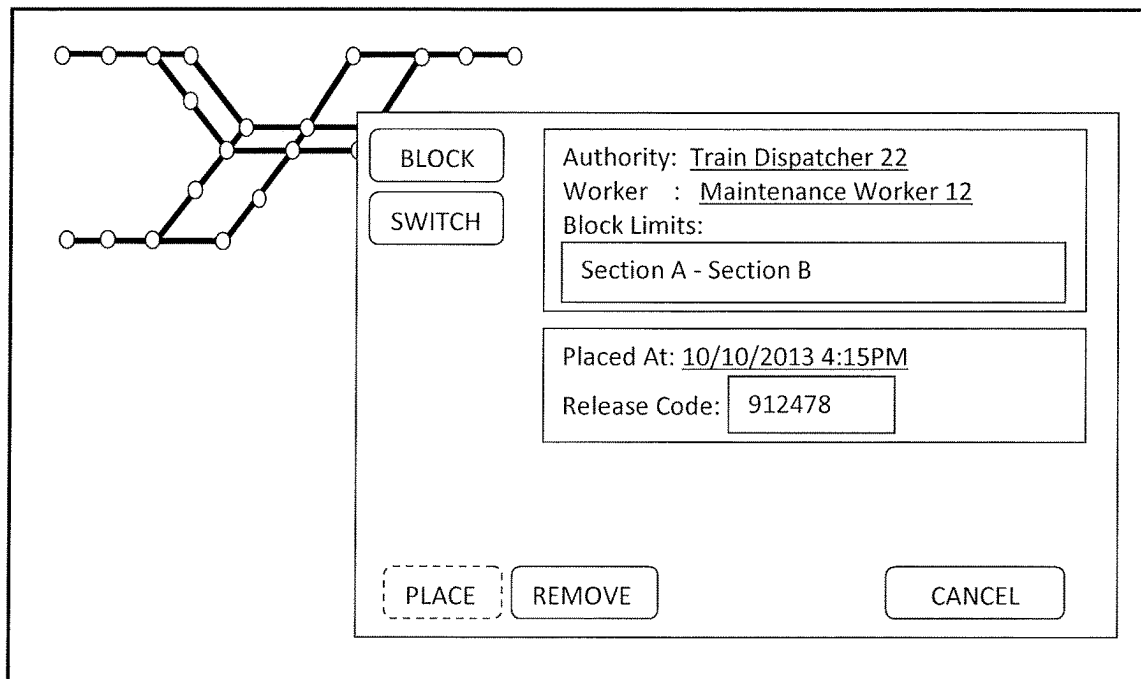
FIGURE 7



#	Type	Placed On	Issued To	Limits	Placed By	Removed	Removed By
1	Maint.	10/10/2013 4:15PM	Maintenance Worker 12	Sec. A- Sec. B	Train Dispatcher 22	10/10/2013 10:00PM	Train Dispatcher 22
2	Maint.	10/11/2013 12:00PM	Maintenance Worker 35; Maintenance Worker 36	Sec. C- Sec. D- Sec. E	Train Dispatcher 44	N/A	N/A

REMOVE CANCEL INFO

FIGURE 8



BLOCK SWITCH

Authority: Train Dispatcher 22
Worker : Maintenance Worker 12
Block Limits:
Section A - Section B

Placed At: 10/10/2013 4:15PM
Release Code: 912478

PLACE REMOVE CANCEL

FIGURE 9

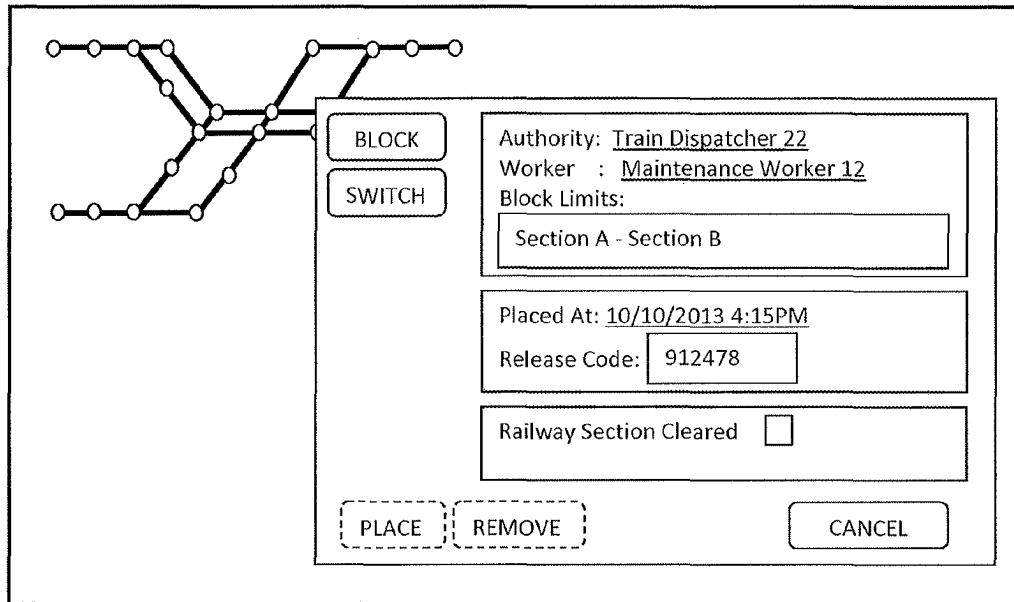


FIGURE 10

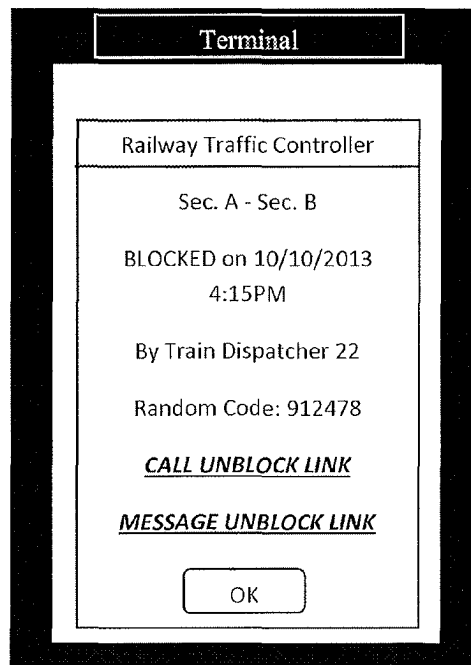
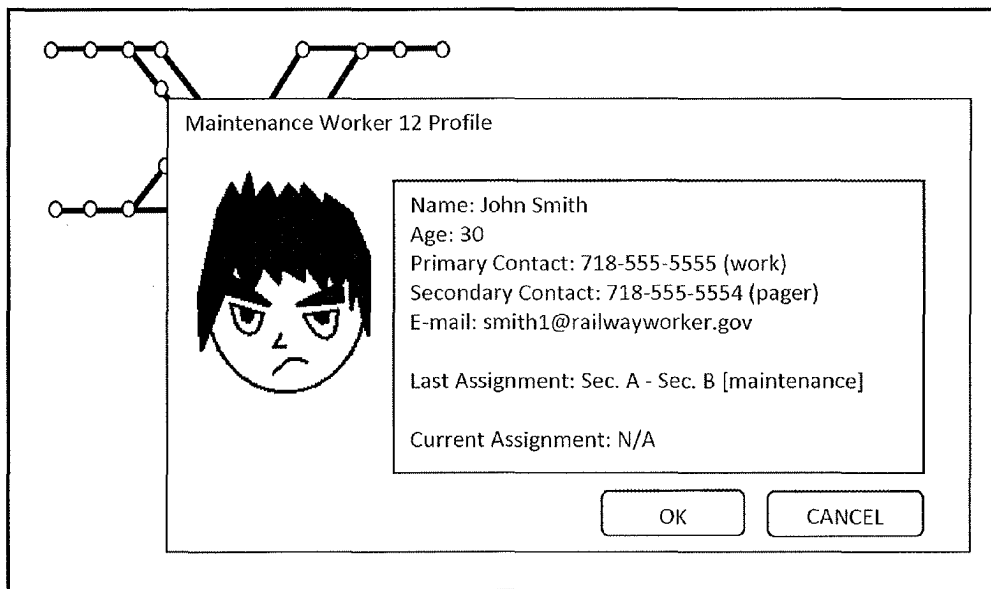


FIGURE 11



The diagram shows a railway track layout with several segments and switches. A rectangular window titled "Maintenance Worker 12 Profile" is overlaid on the track. The window contains a cartoon illustration of a man's face on the left and a text box on the right. The text box lists the worker's details: Name, Age, Primary and Secondary contact numbers, email address, and current and last assignments. At the bottom right of the window are "OK" and "CANCEL" buttons.

Maintenance Worker 12 Profile



Name: John Smith
Age: 30
Primary Contact: 718-555-5555 (work)
Secondary Contact: 718-555-5554 (pager)
E-mail: smith1@railwayworker.gov

Last Assignment: Sec. A - Sec. B [maintenance]
Current Assignment: N/A

OK CANCEL

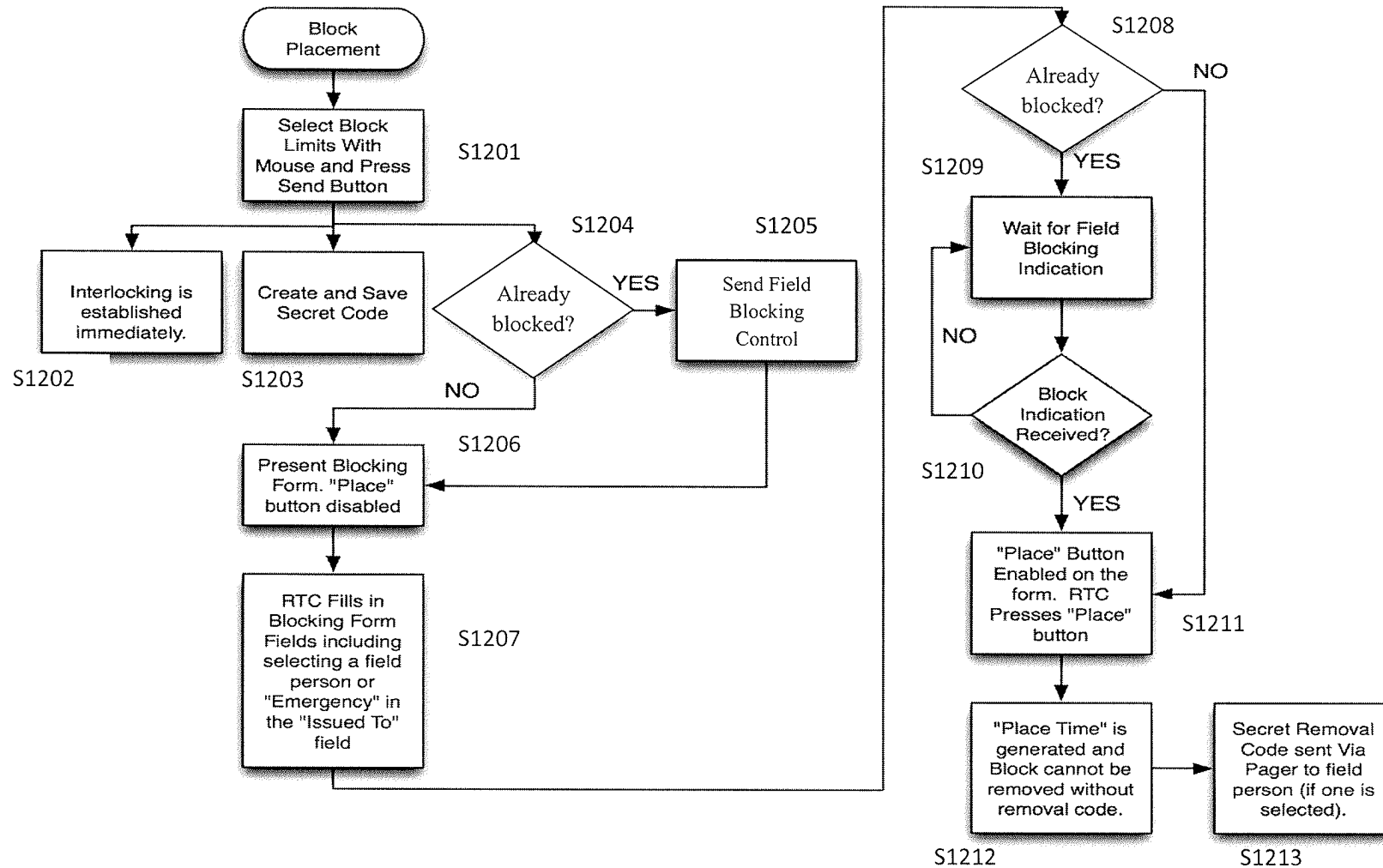
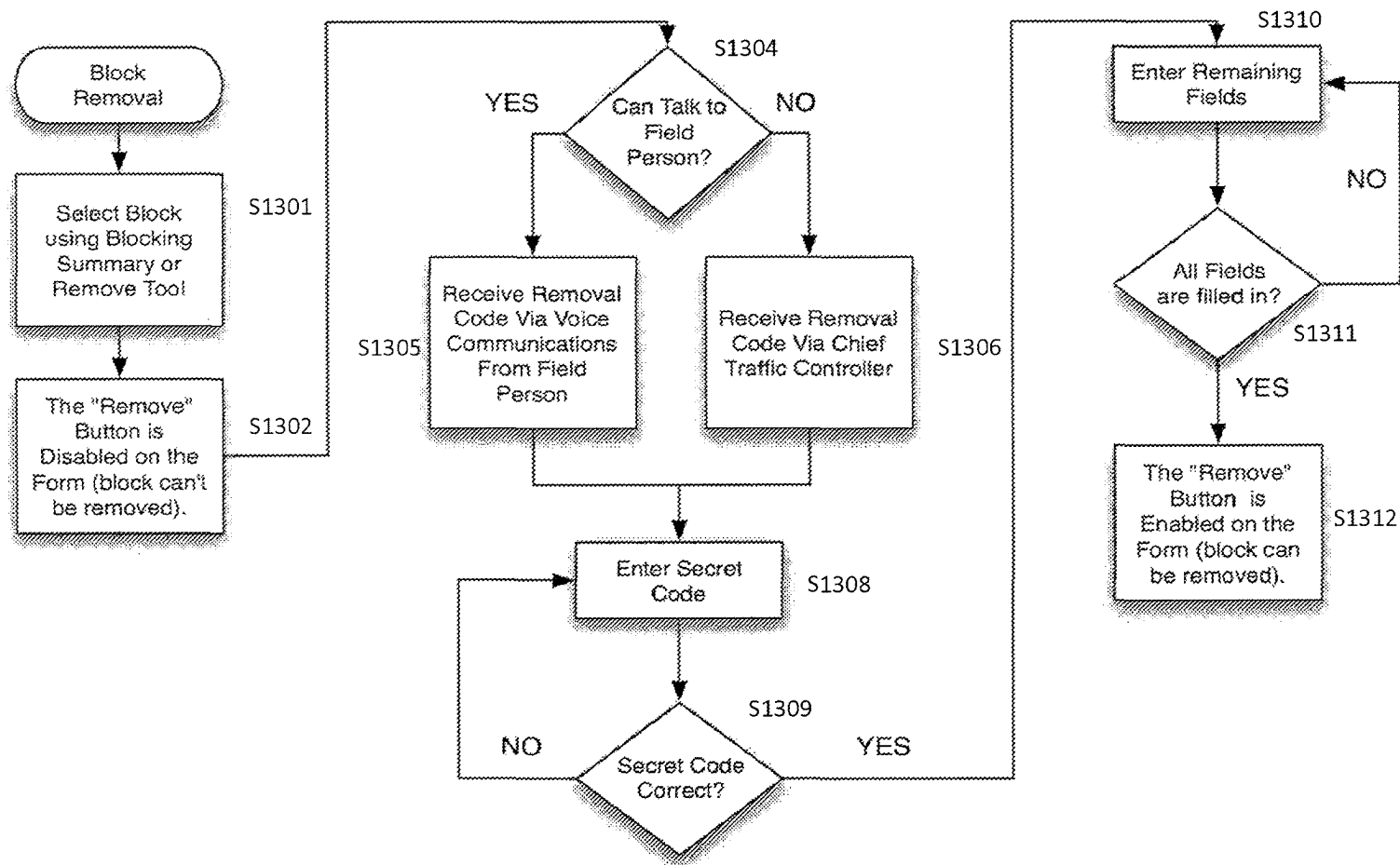
(Amended) **FIGURE 12**

FIGURE 13



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1

TOOLS FOR RAILWAY TRAFFIC CONTROL

Matter enclosed in heavy brackets [] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue; a claim printed with strikethrough indicates that the claim was canceled, disclaimed, or held invalid by a prior post-patent action or proceeding.

CROSS-REFERENCE TO RELATED APPLICATION

This application claims the benefit of U.S. Provisional Application No. 61/893,547, filed Oct. 21, 2013 and entitled "SYSTEM, APPARATUS AND METHOD FOR RAILWAY TRAFFIC CONTROL".

TECHNICAL FIELD

This disclosure relates to railway traffic control, and more specifically, a system, apparatus, and method for railway traffic control to address concerns for safety of railway workers working on or near railroad tracks.

BACKGROUND

Railway transportation is run under strict operational guidelines or rules, in order to operate safely. Most of these guidelines are standard amongst commercial railway traffic. Examples of transport standards include interlock signals, centralized traffic control (CTC), rule 251, etc.

Interlocking signals govern movement within a sector controlled by an interlock. For example, on a specific track line, a track may be divided into sections of 400 to 2500 m, on each of which trains move at a speed depending on an interlocking signal exhibited by an interlock at an entrance to the section. That is, the interlocking signal displays a color system which instructs the conductor of the train, or the train operating by automated response, how to move through the upcoming section of track. Interlocking systems usually incorporate a 3-color system by which the train, or train conductor, is informed to proceed at regular speed, is informed to proceed at a reduced speed or is prohibited from proceeding through the upcoming section.

While interlocking systems can be operated manually, currently most interlocking systems are controlled electronically. One method of controlling all of the interlocks within a rail system is through a centralized traffic control (CTC), or traffic control system (TCS). A CTC is used for monitoring, tracking and operating trains traversing tracks throughout a network. The CTC is controlled by a single person known as a train dispatcher.

In order for the train dispatcher to make appropriate train control decisions regarding how the train should be operated, various information and data must be obtained and presented. Information regarding track conditions, train traffic, scheduling, etc., are presented on a control console which may include a map of the entire rail system controlled by the CTC. Through the control console, the dispatcher has control of each interlock signal (that is, the dispatcher controls the train traffic and flow of train traffic using the interlocks) and is constantly made aware of the positions of trains in the railway system as such positions are electronically reported by signals present throughout the railway system. In addition, in order to provide for safe traffic

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control and avoid accidents or collisions, signals are provided throughout the track network, or interlocks.

The interlocks may be controlled from the CTC in any of various different ways, including, e.g., direct wiring, by pulse codes sent over a wire to distant locations, etc. In addition, interlocks can also be controlled by a native mechanism detecting presence of a train on the track. That is, when a train occupies a certain section of track, the interlock prevents other trains from proceeding onto the same

Further, there are additional safety systems on the train itself, such as automatic train control (ATC). A common feature of many of such automated train control systems is the need for constant or nearly constant communications between onboard train control systems and an offboard hub radio connected to control equipment located along the wayside or in a central office. In some systems, the offboard control equipment generates movement authorities which authorize the train to move in one or more sections of track. In some systems, the offboard equipment informs the onboard train control system of the presence of other trains in the vicinity. In yet other systems, the offboard equipment provides information such as temporary speed restrictions and work zone information to the onboard train control system. Such systems protect against a number of human errors on the part of the train drivers, one of the basics of the system being that the train is provided with a computer which receives traffic information, such as stop signals and speed limits, from a plurality of transmitters along the track. Thus, the computer may bring the train to a standstill regardless of what the train driver does when the train arrives at a stop signal.

Even with all these safety features present in a railway system, railway accidents occur, with many being fatal. For example, one study reported that there were 39 roadway worker accidents that occurred between January 1997 and the end of 2011, in which 41 roadway workers perished while attending to tasks such as inspection, construction, maintenance, or repair of railroad track, bridges, roadway, signal and communication systems, electric traction systems, roadway facilities or roadway maintenance machinery on or near track, operating as flagmen or watchmen/lookouts for other roadway workers, etc.

There remains a need for further safety measures to protect the lives of railway workers.

BRIEF SUMMARY

This disclosure provides tools (in the form of systems, apparatuses, methodologies, etc.) for enhancing railway traffic control, as supplemental measures directed to safety of railway workers.

For example, a centralized railway control system may be adapted (such as via computer hardware, software, or a combination) to include providing on a user terminal a user interface including a block placing part to place a block on one or more specified track sections to permit a railway field worker to enter the track sections while blocking railway traffic to said track sections, generating a removal code and transmitting the removal code to the electronic contact address of the railway field worker, and permitting the block to the track sections to be removed only upon entry of the removal code in the centralized railway control system. Such process may be largely automated via programming such that upon placement, by the block placing part, of the block of railway traffic to the specified track sections, the removal code is automatically transmitted, by a code gen-

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eration part, to the electronic contact address of the railway field worker, and the block of railway traffic to the specified track sections remains in place in the centralized railway control system until the entry of the removal code in the centralized railway control system to cause a block removal part to remove the block on said one or more track sections.

In another aspect, the adaptation may include a RTC user interface to permit a user (e.g., *railway traffic controller (RTC) or train dispatcher*) to specify a track section(s) to be blocked, specify an instruction to the centralized railway control system to block the railway traffic to the specified track section(s), and specify identifying information of the railway field worker performing (or to be performing) work in the specified track section(s).

In another aspect, the adaptation includes a block removal user interface to permit a user to enter the removal code to cause the block removal part to remove the block on said one or more track sections. Such block removal user interface may be provided in any of various ways. For example, the block removal user interface may be provided within a mobile application or web page through which the railway field worker can enter the removal code manually or orally (i.e. including a voice or speech interface part). As another example, the removal code may be embedded in a link in a message transmitted by email or messaging to the electronic contact address of the railway field worker, and the railway field worker can simply cause the removal code to be entered by activating the link in the message received by the railway field worker. In another example, the block removal user interface may be provided on the same user terminal on which the block placing part is disposed. Further, a voice or speech interface part may be disposed on the system-side to process a voice message (such as received via a telephone call from *terminal 103* of the railway field worker), extract the removal code from the voice message, and enter the block removal code. In each instance, the block of railway traffic to the specified track sections remains in place in the centralized railway control system until the entry of the removal code through the block removal user interface. Further, entry of the removal code may also require entry of identification of the user entering the removal code, and removal of the block may also require not only the removal code but also confirmation that the user entering the removal code is authorized to remove the block. The block removal user interface may further require, in addition to entry of the removal code, the user to specify that confirmation that the track sections have been cleared has been obtained from the railway field worker associated with the block, before the block removal user interface permits the removal code to be transmitted to the block removal part.

In another aspect, the system may include a railway control database registering block identifying information, including block limits identifying the one or more blocked track sections, along with the removal code for removing the block of the track sections. Further, the railway control database may register additional information, such as identification of the user who specified the instruction to block the track sections, notes specifying reasons for the block, date and time at which the block was placed, etc. The railway control database may further register block removal information identifying date and time at which the block was removed and identifying the user who entered the removal code and who specified that confirmation that the track sections have been cleared was obtained from the railway field worker associated with the block.

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BRIEF DESCRIPTION OF THE DRAWINGS

The aforementioned and other aspects, features and advantages can be more readily understood from the following detailed description with reference to the accompanying drawings wherein:

FIG. 1A shows a block diagram illustrating a railway control system, in accordance with an exemplary embodiment;

FIG. 1B shows a block diagram illustrating a railway control system, in accordance with another exemplary embodiment;

FIG. 2 shows a block diagram of a computer configured by program execution to be or to include a railway traffic control apparatus, in accordance with an exemplary embodiment;

FIG. 3A shows a block diagram of an exemplary configuration of a terminal;

FIG. 3B shows a block diagram of an exemplary configuration of a computing device;

FIG. 4 shows a schematic diagram illustrating communication flow in the system shown in FIG. 1A or in the system shown in FIG. 1B;

FIG. 5 shows an example of a graphical portrayal of a railway network;

FIGS. 6-9 show examples of a user interface display, in accordance with an exemplary embodiment;

FIG. 10 shows an example of a user interface display that may be provided on the field worker side for triggering block removal;

FIG. 11 shows another example of a user interface display;

FIG. 12 shows a flow chart illustrating a block placement method, in accordance with an exemplary embodiment;

FIG. 13 shows a flow chart illustrating a block removal method, in accordance with an exemplary embodiment;

DETAILED DESCRIPTION

This patent specification describes tools (in the form of methods, apparatuses and systems) that controls train traffic within a railway system using, but not limited to, standardized rules or timetables described in the Background section of this specification.

In describing exemplary embodiments illustrated in the drawings, specific terminology is employed for the sake of clarity. However, the subject matter of this patent specification is not intended to be limited to the specific terminology so selected and it is to be understood that each specific element includes all technical equivalents that operate in a similar manner.

The drawings show examples of implementations of the subject matter of this patent disclosure in several computing environments. However, it should be understood that the subject matter of this disclosure can be utilized by any computing device including but not limited to PDAs (*personal digital assistants*), cell phones, personal, notebook and workstation computers, kiosks, other information terminals, [WIC (or another)] pager, etc. In addition, the subject matter of this disclosure might be provided as services in a modular fashion by other devices connected by a communication network.

Referring now to the drawings, wherein like reference numerals designate identical or corresponding parts throughout the several views, there is described tools (sys-

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tems, apparatuses, methodologies, computer program products, etc.) that can be integrated in a railway traffic control system.

FIG. 1A shows schematically an exemplary embodiment in which a system 100A includes a railway traffic control [terminal] apparatus 105, rail personnel data 104 and a terminal 103, each connected to the network 102. FIG. 1B shows schematically another exemplary embodiment, in which rail personnel contact data 104 is accessed directly by the railway traffic control apparatus 105. While only one terminal is connected to the network 102 in the example shown in FIG. 1A as well as in the example shown in FIG. 1B, it should be appreciated that the network environment can have an arbitrary number of devices (of various types).

The network 102 can be any data network, a local area network, a wide area network or any type of network such as an intranet, an extranet (for example, to provide controlled access to external users, for example through the Internet), a private or public cloud network, the Internet, etc., or a combination thereof. Further, other communications links (such as a virtual private network, a wireless link, etc.) may be used as well for the network 102. In addition, the network 102 preferably uses TCP/IP (Transmission Control Protocol/Internet Protocol), but other protocols such as SNMP (Simple Network Management Protocol) and HTTP (Hypertext Transfer Protocol) can also be used. How devices can connect to and communicate over networks is well-known in the art and is discussed for example, in "How Networks Work", by Frank J. Derfler, Jr. and Les Freed (Que Corporation 2000) and "How Computers Work", by Ron White, (Que Corporation 1999), the entire contents of each of which are incorporated herein by reference.

The rail personnel 104 is a database that can be either connected to or inside the railway traffic control [terminal] apparatus 105. The rail personnel contact data 104 stores information regarding the maintenance workers used for traveling, inspecting and working on blocked rails. For example, the information stored can include the name of the maintenance worker, primary contact, secondary contact, previous assignment, current assignment, etc., as shown via user interface display in FIG. 11.

FIG. 2 shows a [terminal 100A] computer 200A which is configured (such as via one or more programs of instructions executable by a processor [of a computer or another electronic device] with) to be a railway traffic blocking apparatus [101 to include] 105 including a block placer 101A, a code generator 101B, a block remover 101C and a user interface 101D. The [terminal 100A] computer 200A can be any electronic device including a processor, storage and display, such as shown by way of examples in FIGS. 3A and 3B.

The railway traffic blocking apparatus is programmed to control the traffic of an entire railway network. The block placer 101A is configured to stop traffic within a certain length of rail line. That is, once a block is placed, no train can traverse the blocked section of rail. For example, in the case of a railway controlled by multiple interlocks, the block placer 101A causes those interlocks to output a STOP signal, therefore, stopping any train traffic within the rails controlled by that interlock. By doing this, maintenance workers and railway personnel can travel, inspect and work on the rails without the danger of oncoming train traffic. Trains that are scheduled to traverse said blocked tracks either come to a complete stop, electronically or mechanically, before passing the interlock or are rerouted using tracks that are not in a blocked state. However, this disclosure is not limited to a railway traffic control system implementing interlocks. This

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system can be implemented on any configuration in which there is control of the traffic of a railway system.

The code generator 101B is configured to produce a removal or release code, such as a cipher which is random, [pseudo-random,] secret, etc., and stored on the [terminal] computer. A new random cipher may be generated for each instance of traffic blocking. This removal or release code is then sent to [another terminal] terminals belonging to the railway personnel who are scheduled to travel, inspect or work on the specific rails being blocked.

The block remover 101C is programmed to remove the previous block, or plurality of blocks set by the block placer 101A. The block remover 101C is dependent on the code produced by the code generator 101B. As described in detail below, a block cannot be removed without the input of the removal or release code.

The user interface 101D is configured preferably for the ease of use for the railway traffic controller (RTC). As shown by way of examples in FIGS. 6-9 and 11, the user interface 101D displays information and tools needed to enable/disable blocks on rail sections.

The user interface 101D may be a mobile application, a web page or some other software component, on a [terminal] computer (such as a mobile device). Such [terminal] device preferably is configured to communicate through a computer or data network to obtain content and data from an external source. However, it should be appreciated that the inventive aspects described herein can be employed even if the [mobile] device is not configured to connect to a data network, and/or is not connected to a data network.

An example of a configuration of a user terminal (e.g., the terminal 103) or computer is shown schematically in FIG. 3A. In the example of FIG. 3A, terminal device 200 includes a controller (or processor) 202 that communicates with a number of other components, including storage 203, display 204, input/output (such as mouse, touchpad, stylus, microphone and/or speaker with voice/speech interface and/or recognition software, etc.) 205 and a network interface 206, by way of an internal bus 201.

The storage 203 can provide storage for program and data, and may include a combination of assorted conventional storage devices such as buffers, registers and memories [for example, read-only memory (ROM), programmable ROM (PROM), erasable PROM (EPROM), electrically erasable PROM (EEPROM), static random access memory (SRAM), dynamic random access memory (DRAM), non-volatile random access memory (NOVRAM), etc.].

The network interface 206 provides a connection (for example, by way of an Ethernet connection or other network connection which supports any desired network protocol such as, but not limited to TCP/IP, IPX (Internetwork Packet Exchange), IPX/SPX (Internetwork Packet Exchange/Sequenced Packet Exchange), or NetBEUI (NetBIOS Extended User Interface)) to a network (e.g., network 102) to enable the terminal device to communicate with another device through the network.

FIG. 3B shows an exemplary constitution of a computer 300 which can be configured by appropriate programming to operate as the railway traffic control apparatus 105 (FIG. 1A). The computer 300 shown in FIG. 3B includes a processor 302, and various elements connected to the processor 302 by an internal bus 301, such as a memory 303, display 304, keyboard 305 and network interface 306. The processor 302 processes incoming requests transmitted through the network interface 306. The network interface 306 enables the railway traffic control terminal to communicate with other network-connected devices such as a

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terminal (e.g., the terminal **103** of FIG. 1A or FIG. 1B) and receive data or service requests.

Each of the terminal **103**, rail personnel database **104** and railway traffic control apparatus **105** can be configured to communicate with each other through the network **102**. The railway traffic control [terminal] apparatus **105** can be configured to request data from the rail personnel contact data **104** through the network **102**, as shown in FIG. 4. When the railway traffic control apparatus **105** initiates a block on a track section, the railway traffic control apparatus **105** may also designate a worker in associate with the block on the track section. With this information, the railway traffic control apparatus **105** requests the specific personnel data pertaining to the designated worker. The rail personnel contact data retrieves the requested personnel data and sends it to the railway traffic control apparatus **105**. By receiving this data, the railway traffic control apparatus **105** may then generate a release code and save it to an internal storage.

The release code is then sent to the terminal [102] **103**. This terminal [102] **103** is the contact associated with the designated worker, and the electronic address of this terminal is found within the personnel data received from the rail personnel contact data **104**. By this system, only the railway traffic control apparatus **105** and terminal [102] **103** receive the release code generated by the railway traffic control apparatus **105**.

Additionally, FIG. 4 shows the communication between the terminal [102] **103** and the railway traffic control apparatus **105** in the event that a block on a certain track is to be lifted. In order for a block on a certain track to be lifted, the release code has to be input into the railway traffic control apparatus. The terminal [102] **103** sends the release code to the railway traffic control apparatus **105**. The release code is then input into the block remover **101C**. After which, the block is removed and traffic to that section of rail is then allowed.

FIG. 5 illustrates an example of a railway network **500**. Labeled are interlocks A-F which control sections of railway of the railway network **500**. For example, the rail traffic controller (RTC) might choose to block the section of rail corresponding to the track between interlock A and interlock B. This way, train traffic between those two interlocks is prohibited. The railway network is present on screen of the railway traffic control [terminal] apparatus **105** at all times for the convenience of the rail traffic controller. By being on screen at all times, the rail traffic controller knows the status of certain sections of rail in real time.

As shown in the example illustrated in FIG. 5, the railway between interlocks A and B, and interlocks C, D and E is blocked. Train traffic is prohibited between these sections and shown to the railway traffic controller on screen. As further explained below, the railway traffic controller can lift the blocks on these sections of track if the release code is input into the railway traffic control [terminal] apparatus **105**.

FIG. 6 is an exemplary illustration of the user interface of the railway traffic control [terminal] apparatus **105**. The railway traffic controller (RTC) may place blocks on any section of traffic using this user interface. In this exemplary embodiment, the train traffic controller inputs authority, worker and block limits. This information corresponds to the train traffic controller username, maintenance worker designated to work on the specific blocked track and the sections of track being blocked, respectively. In addition, the railway traffic control [terminal] apparatus **105** then time-stamps the order once the block is placed.

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Once the block is put into place, the corresponding section on the railway network **500** displays the section of track being blocked. In addition, the railway traffic control [terminal] apparatus **105** generates a release code, stores the release code, and sends the code to the maintenance worker designated for track work, i.e. maintenance worker 12. As shown in FIG. 6, the railway traffic controller may place blocks on track sections but may not remove the track blocks without the input of the release code in the allotted area labeled release code. FIG. 6 shows that the remove action is dashed out, meaning it cannot be selected (unless a release code is first entered). In the example illustrated in FIG. 6, it is shown that only one worker, maintenance worker 12 is designated to work on track Section A to Section B. However, as shown in later embodiments, the train traffic controller is not limited to the amount of maintenance workers designated for any track section. In addition, the train traffic controller may apply a block to any number of additional track sections.

The blocks are then tabulated by the railway traffic control apparatus **105** as depicted in FIG. 7. The table in FIG. 7 lists all the blocks that are in place and in addition lists blocks that were previously set. The information that can be found in this table includes, but is not limited to, the type of work being done on the track sections, when the block was placed, who is designated to work on the sections of track, who placed the block, when was the block removed and who removed the block.

Additional information can be accessed though this table by highlighting a cell of the table and selecting info, as shown in FIG. 7. For example, by highlighting the cell labeled maintenance worker 12 and selecting info, the train traffic controller may access the bio of the maintenance worker 12, as shown in detail below. The train traffic controller may also highlight a different cell, such as the limits cell label "Sec. A-Sec. B". By selecting this cell and selecting the info command, the past history of maintenance work and operation of the section(s) may be displayed to the train traffic controller.

FIG. 8 shows the user interface of the railway traffic control [terminal] apparatus **105** as the railway traffic controller inputs the release code to remove the block on certain track sections. In the exemplary embodiment of FIG. 8, the remove option is now able to be selected with the input of the release code provided by the designated worker assigned for track work, maintenance worker 12.

Without the input of the release code, the remove option is not available to be selected. In a different embodiment, the release code may be obtained from the storage of the railway traffic control [terminal] apparatus **105**.

In the case where there are multiple maintenance workers assigned to a certain track section, there may be provided one release code to one, multiple or all of the maintenance workers assigned. That is, The train traffic controller may input that the release code be specified to one maintenance worker, preferably a supervisor or foreman, to multiple maintenance workers or to all of the maintenance workers assigned to work on a given track section. Also, in another embodiment, in a case where there are multiple workers assigned for a certain track section, there may be provided multiple unique release codes which would then all be required to be input into the train traffic control [terminal] apparatus **105** by the train traffic controller in order to be able to remove blocks on certain track sections.

In another embodiment, the train traffic controller may be asked to verify that a railway section is cleared before receiving the option to remove a train block. As shown in

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FIG. 9, the user interface displayed by the railway traffic control [terminal] apparatus 105 does not allow a removal of a block until the option corresponding to "Railway Section Cleared" is checked. This option allows for a further protection of the maintenance workers assigned to the block track sections.

FIG. 10 shows an exemplary illustration of a message sent by the railway traffic control [terminal] apparatus 105 to a terminal 103 at a corresponding address of a maintenance worker assigned to work on a blocked track. The message is meant to deliver the release code to the maintenance worker assigned to work on a blocked track. In addition to relaying the code, the message may include, but not limited to, information regarding the section of track that is being blocked, the date and time that the track was blocked, who initiated the track block, and links to quickly respond to the message. By selecting one of the links embedded in the message, the terminal 103 sends the release code to the railway traffic control [terminal] apparatus 105. The code can be transmitted through, but not limited to, text message, e-mail or voice message. In the present embodiment being illustrated, the terminal 103 is depicted as a mobile phone. The terminal 103 could be any communication device such as, but not limited to, mobile phone or smartphone, tablet, [WIC (or another)] pager, PDA, etc.

In another embodiment, once the rail traffic controller unblocks a section of track, the railway traffic control [terminal] apparatus 105 may send a message to the worker, or plurality of workers, associated with working on the previously blocked track in order to inform them that the track has been unblocked and is no longer a safe environment to work in.

FIG. 11 depicts an exemplary embodiment of a profile of a maintenance worker. This profile may be accessed directly by highlighting the corresponding maintenance worker cell in the table depicted in FIG. 7 and selecting the info tab. This command brings up the profile and the maintenance worker and displays information regarding the worker including, but not limited to, the name, age, primary contact, secondary contact, e-mail, last assignment and current assignment of the maintenance worker. Additionally in this screen, the railway traffic controller may contact the maintenance worker directly using one of the plurality of addresses provided.

Next, the method of placing a block on a track section will be described with reference to FIG. 12. In S1201, the rail traffic controller selects the sections to be blocked using the railway traffic control [terminal] apparatus 105. Once the block limits are designated and sent, the railway traffic control [terminal] apparatus 105 [established office] establishes interlocking immediately in S1202. That is, the railway traffic control [terminal] apparatus 105 immediately sends a signal to the corresponding interlocks corresponding to the section of track designated to be blocked. Additionally, the railway traffic control [terminal] apparatus 105 generates and saves a random secret code in S1203.

After a request to block a certain section of track is sent, the railway traffic control [terminal] apparatus 105 checks if there is one or more of the sections currently has a block placed, as shown in S1204. If one or more of the designated sections does not have a block placed, then the railway traffic control [terminal] apparatus 105 opens a user interface for the railway traffic controller to designate a type of block to set and a maintenance worker for the blocked section in S1206. If the railway traffic control terminal sees that a block is already in effect (S1205), then the railway traffic control [terminal] apparatus 105 allows the railway traffic controller

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to change the existing block type and maintenance worker using the same interface. The interface is then opened in S1206.

The railway traffic controller then inputs the type of block and assigns a worker to work on the blocked section. The railway traffic controller also has the option to block the track for purposes of an emergency and not necessarily for maintenance work in S1207. Once the railway traffic controller assigns a block type and/or a corresponding maintenance worker, the railway traffic control [terminal] apparatus 105 checks the status of the selected block in S1208. If the current selected section has an existing block, the railway traffic control [terminal] apparatus 105 waits for a response from the interlocks of the corresponding section to send an indication that a new block can be established in S1209. Once this indication is received in S1210, the railway traffic control [terminal] apparatus 105 enables the place button of the user interface (S1211). If the selected section has no previous active block, the railway traffic control [terminal] apparatus 105 immediately enables the place button on the user interface.

Once the place button is selected, the railway traffic control [terminal] apparatus 105 generates a place time and enables safety measures so that the block cannot be removed without the input of the secret code generated (S1212). Finally, the railway traffic control [terminal] apparatus 105 sends the secret removal code to the corresponding one or more maintenance workers (S1213) if the railway traffic controller has selected maintenance workers for the given block.

FIG. 13 describes a method for removing a block placed on a section of track. In S1301, the railway traffic controller selects an existing block by using either the network rail map, shown in FIG. 5, the remove tool, shown in FIGS. 6, 8 and 9, or the summary table, shown in FIG. 7. The remove button is disabled without the input of the secret code from either the maintenance worker or the railway traffic control [terminal] apparatus 105 (S1302). In S1304, the railway traffic control [terminal] apparatus 105 checks if there is a maintenance worker that is eligible to transmit the random secret code. If there is an eligible maintenance worker available (S1304, YES), the maintenance worker transmits the random secret code to the railway traffic control [center] apparatus 105 (S1305). If there is no maintenance worker available to transmit the random secret code (S1304, NO), the code can be retrieved from the train traffic control [terminal] apparatus 105 by the train traffic controller (S1306).

Once the secret code is received, the secret code may be input to the designated field in S1308. The railway traffic control [terminal] apparatus 105 checks the secret code with the code saved in its memory in S1309. If the code is incorrect[,] (S1309, NO), the railway traffic control [terminal] apparatus 105 will prompt the user to input the code again (S1308). If the code is correct (S1309, YES), the railway traffic control [terminal] apparatus 105 will prompt the user to enter information into any remaining fields in S1310. In S1311, the railway traffic control [terminal] apparatus 105 checks that all information input into all fields is correct and that all fields are filled in. After this check is performed by the railway traffic control [terminal] apparatus 105, the remove button is enabled on the form (S1312) and the railway traffic controller may remove the block on the corresponding track section.

The aforementioned specific embodiments are illustrative, and many variations can be introduced on these embodiments without departing from the spirit of the dis-

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closure or from the scope of the appended claims. For example, elements and/or features of different examples and illustrative embodiments may be combined with each other and/or substituted for each other within the scope of this disclosure and appended claims.

The orders in which the steps are performed in the aforementioned methods are not limited to those shown in the examples of FIGS. 12 and 13, and may be switched as long as similar results are achieved. Also, it should be noted that the methods illustrated in the examples of FIGS. 12 and 13 may be implemented using any of the embodiments shown in FIGS. 1A-1B.

Further, conventional systems can be modified to include the aspects described herein. As an example, a means may be added to a conventional interlock system by which the railway worker has partial control of the interlock system at the times that maintenance work is needed on a certain train block. In such modification, a system, apparatus and/or method may be provided to control the interlocks in a railway system as an interface between the railway workers and the interlock control. Thus, in a case in which maintenance is to be performed on a certain rail block, which is controlled by an interlock, the interlock can be configured to send out a stop signal for all incoming trains, to block train traffic to such portion of the rail system. In addition, once the interlock is placed in a "stop traffic" state, a release code is transmitted to an electronic contact address corresponding to the railway worker.

Once a block has been placed, the interlock remains in a blocked state, until the maintenance worker supplies the release code, which was received at the time the interlock started, and the release code is entered in the interlock control system. So long as the block is in place, the maintenance worker can perform on-track work, without interference of oncoming train traffic. After the maintenance worker finishes the assigned work and is clear of the train tracks, he/she may then supply the interlock control system with the release code, and the interlock control system in turn can release the interlock over the block.

Accordingly, the railway worker has more control over the traffic through the rail block in which the worker is working, and fatal on-track accidents can be reduced.

Additional variations may be apparent to one of ordinary skill in the art from reading U.S. Provisional Application No. 61/893,547, filed Oct. 21, 2013 and entitled "SYSTEM, APPARATUS AND METHOD FOR RAILWAY TRAFFIC CONTROL", the entire contents of which are incorporated herein by reference.

What is claimed is:

1. A centralized railway control system comprising:
 - a rail personnel contact database registering, for each railway personnel, an electronic contact address of the railway personnel; and
 - a railway traffic control apparatus configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, for controlling access to railway tracks, said railway traffic control apparatus comprising a processor, a non-transitory medium storing one or more programs of executable instructions, and a network interface through which the railway traffic control apparatus communicates via a network with a user terminal,
 wherein execution of said one or more programs of executable instructions configures the railway traffic control apparatus comprising the processor to include:

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a block placing part to place a block on one or more specified track sections in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to block railway traffic to the specified track sections and thereby to permit a railway field worker to enter the track sections [while blocking railway traffic to said track sections];

a code generation part to generate a removal code, retrieve the electronic contact address of the railway field worker from the rail personnel contact database, and transmit the removal code to the electronic contact address of the railway field worker; and

a block removal part to remove only upon entry of the removal code by said centralized control operation from the railway control apparatus, the block placed by the block placing part on said one or more track sections.

2. The centralized railway control system of claim 1, wherein the railway traffic control apparatus further comprises: a [RTC] railway traffic controller (RTC) user interface to permit a user to specify said one or more track sections to be blocked, specify an instruction to the centralized railway control system to block the railway traffic to the specified track sections, and specify identifying information of the railway field worker to be performing work in the specified track sections.

3. The centralized railway control system of claim 1, further comprising:

a railway control database registering block identifying information, including block limits identifying the one or more blocked track sections, along with the removal code for removing the block of the track sections.

4. The centralized railway control system of claim 1, further comprising:

a railway control database registering (a) identification of the user who specified the instruction to block the track sections and (b) block identifying information, including block limits identifying the one or more blocked track sections, notes specifying reasons for the block, and date and time at which the block was placed.

5. The centralized railway control system of claim 1, wherein upon placement by the block placing part of the block of railway traffic to said one or more specified track sections, the code generation part transmits the removal code to the electronic contact address of the railway field worker, and the block of railway traffic to said one or more specified track sections remains in place in the centralized railway control system until the entry of the removal code in the centralized railway control system to cause the block removal part to remove the block on said one or more track sections.

6. The centralized railway control system of claim 1, wherein the railway traffic control apparatus further comprises:

a block removal user interface to permit a user to enter the removal code to cause the block removal part to remove the block on said one or more track sections, wherein the block of railway traffic to said one or more specified track sections remains in place in the centralized railway control system until the entry of the removal code through the block removal user interface.

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7. The centralized railway control system of claim 6, wherein the block removal user interface further requires, in addition to the entry of the removal code, the user to specify that confirmation that the track sections have been cleared has been obtained from the railway field worker associated with the block, before the block removal user interface permits the removal code to be transmitted to the block removal part, and

the centralized railway control system further comprises a railway control database registering (a) block identifying information identifying the one or more blocked track sections, date and time at which the block was placed and identifying [information] the railway field worker associated with the block, and (b) block removal information identifying date and time at which the block was removed and identifying the user who entered the removal code and specified that confirmation that the track sections have been cleared was obtained from the railway field worker associated with the block.

[8. The centralized railway control system of claim 1, further comprising:

a voice processing part configured to receive a voice message and extract the removal code from the voice message.]

9. The centralized railway control system of claim 1, wherein the code generation part transmits an electronic message to the electronic contact address of the railway field worker, and the electronic message transmitted to the electronic contact address of the railway field worker includes the removal code and includes an embedded link for activating a return transmission of the removal code to the block removal part of the centralized railway control system.

10. A railway traffic control apparatus *configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network*, for controlling access to railway tracks, said railway traffic control apparatus comprising:

a block placing part to place a block on one or more [selected] specified track sections in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to block railway traffic to the specified track sections and thereby to permit a railway field worker to enter the track sections [while blocking railway traffic to said track sections];

a code generation part to generate a removal code, determine an electronic contact address of the railway field worker by accessing a rail personnel contact database registering, for each railway personnel, electronic contact information of the railway personnel, and transmit the removal code to the electronic contact address of the railway field worker; and

a block removal part to remove only upon entry of the removal code by said centralized control operation from the railway traffic control apparatus, the block placed by the block placing part on said one or more track sections for the railway field worker.

11. The railway traffic control apparatus of claim 10, further comprising: a [RTC] railway traffic controller (RTC)

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user interface to permit a user to specify [said one or more] track sections to be blocked, specify an instruction to the [centralized] railway traffic control [system] apparatus to block the railway traffic to the specified track sections, and specify identifying information of the railway field worker to be performing work in the specified track sections.

12. The railway traffic control apparatus of claim 10, wherein block identifying information, including block limits identifying the one or more blocked track sections, is registered in a railway control database, along with the removal code for removing the block of the track sections.

13. The railway traffic control apparatus of claim 10, wherein block identifying information, including block limits identifying the one or more blocked track sections, notes specifying reasons for the block, and date and time at which the block was placed, are registered in a railway control database, along with identification of the user who specified the instruction to block the track sections.

14. The railway traffic control apparatus of claim 10, wherein upon placement by the block placing part of the block of railway traffic to said one or more specified track sections, the code generation [code] part transmits the removal code to the electronic contact address of the railway field worker, and the block of railway traffic to said one or more specified track sections remains in place in the [centralized] railway traffic control [system] apparatus until the entry of the removal code in the [centralized] railway traffic control [system] apparatus to cause the block removal part to remove the block on said one or more track sections.

15. The railway traffic control apparatus of claim 10, further comprising: a block removal user interface to permit a user to enter the removal code to cause the block removal part to remove the block on said one or more specified track sections, wherein the block of railway traffic to said one or more specified track sections remains in place in the [centralized] railway traffic control [system] apparatus until the entry of the removal code through the block removal user interface.

16. The railway traffic control apparatus of claim 15, wherein the block removal user interface further requires, in addition to the entry of the removal code, the user to specify that confirmation that the track sections have been cleared has been obtained from the railway field worker associated with the block, before the block removal user interface permits the removal code to be transmitted to the block removal part, and

block identifying information identifying the one or more blocked track sections, date and time at which the block was placed and identifying [information] the railway field worker associated with the block is registered in a railway control database, along with block removal information identifying date and time at which the block was removed and identifying the user who entered the removal code and specified that confirmation that the track sections have been cleared was obtained from the railway field worker associated with the block.

[17. The railway traffic control apparatus of claim 10, further comprising:

a voice processing part configured to receive a voice message and extract the removal code from the voice message.]

18. The railway traffic control apparatus of claim 10, wherein the code generation part transmits an electronic message to the electronic contact address of the railway field worker, and the electronic message transmitted to the electronic contact address of the railway field worker includes

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the removal code and includes an embedded link for activating a return transmission of the removal code to the block removal part of the [centralized] railway traffic control [system] apparatus.

19. A method for controlling railway access using a railway traffic control apparatus of a centralized railway control system [to control access to railway tracks] configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, the method comprising:

providing a user interface [on a user terminal] of the railway traffic control apparatus, including a block placing part to place a block on one or more specified track sections in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to block railway traffic to the specified track sections and thereby to permit a railway field worker to enter the track sections [while blocking railway traffic to said track sections];

generating a removal code, determining an electronic contact address of the railway field worker by accessing a rail personnel contact database registering, for each railway personnel, electronic contact information of the railway personnel, and transmitting the removal code to the electronic contact address of the railway field worker; and

permitting the block to said one or more track sections to be removed only upon entry of the removal code [in the centralized railway control system] by said centralized control operation from the railway traffic control apparatus.

20. A railway traffic control apparatus configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, the railway traffic control apparatus comprising a processor and configured to:

place a block on one or more sections of railway track in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to prevent trains from traversing the one or more sections of railway track;

generate a secret release code associated with the blocked one or more sections of railway track; transmit the secret release code to a user terminal via a network; receive the secret release code via the network; and responsive to receiving the secret release code from the terminal, remove the block from the one or more sections of railway track.

21. The railway traffic control apparatus of claim 20, wherein the block is placed via an interlocking signal prohibiting trains from traversing the one or more sections of railway track.

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22. The railway traffic control apparatus of claim 20, wherein the railway traffic control apparatus is configured to place the block by causing one or more of the plurality of railway traffic interlocks to display a STOP signal.

23. The railway traffic control apparatus of claim 20, wherein only the railway traffic control apparatus and the user terminal receive the secret release code generated by the railway traffic control apparatus.

24. The railway traffic control apparatus of claim 20, wherein the railway traffic control apparatus is further configured to:

store the secret release code in a memory of the railway traffic control apparatus.

25. The railway traffic control apparatus of claim 20, wherein the railway traffic control apparatus is further configured to:

generate and store block removal information in response to removing the block from the one or more sections of railway track.

26. The railway traffic control apparatus of claim 25, wherein the block removal information comprises a date and time when the block was removed and identification information of a user who entered the secret removal code.

27. The railway traffic control apparatus of claim 20, wherein the railway traffic control apparatus is configured to transmit the secret release code to the user terminal by transmitting a message to the user terminal, the message comprising one or more embedded links.

28. The railway traffic control apparatus of claim 27, wherein the railway traffic control apparatus is configured to receive the secret release code transmitted via the network in response to selection of at least one of the one or more embedded links in the message, on the user terminal.

29. The railway traffic control apparatus of claim 27, wherein the message comprises a text message or an email.

30. A method for controlling railway access using a railway traffic control apparatus configured for centralized control of traffic of a centrally controllable railway network including plural railways and a plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, the method comprising:

placing a block on one or more sections of railway track in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway traffic control apparatus, the railway traffic control apparatus controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network, to prevent trains from traversing the one or more sections of railway track;

generating a secret release code associated with the blocked one or more sections of railway track;

transmitting the secret release code to a user terminal via a network;

receiving the secret release code via the network; and responsive to receiving the secret release code from the terminal, removing the block from the one or more sections of railway track.

31. The method of claim 30, wherein the block is placed via an interlocking signal prohibiting trains from traversing the one or more sections of railway track.

32. The method of claim 30, wherein the railway traffic control apparatus is configured to place the block by causing one or more of the plurality of railway traffic interlocks to display a STOP signal.

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33. The method of claim 30, wherein only the railway traffic control apparatus and the user terminal receive the secret release code generated by the railway traffic control apparatus.

34. The method of claim 30, further comprising:
storing the secret release code in a memory of the railway traffic control apparatus.

35. The method of claim 30, further comprising:
generating and storing block removal information in response to removing the block from the one or more sections of railway track.

36. The method of claim 35, wherein the block removal information comprises a date and time when the block was removed and identification information of a user who entered the secret removal code.

37. The method of claim 30, wherein transmitting the secret release code comprises transmitting a message to the user terminal, the message comprising one or more embedded links.

38. The method of claim 37, wherein the secret release code is transmitted via the network in response to selection of at least one of the one or more embedded links in the message, on the user terminal, and is received by the railway traffic control apparatus.

39. The method of claim 37, wherein the message comprises a text message or an email.

40. A system comprising:

a railway control apparatus comprising a processor and a memory device, the railway control apparatus configured to communicate with a plurality of railway traffic interlocks and a user terminal via a network and to perform centralized control of traffic of a centrally controllable railway network including plural railways and the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway net-

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work, wherein the processor is configured by execution of computer program instructions to cause the railway control apparatus to:

receive a selection of track sections to block in any of said plural railways constituting said railway network that is managed by centralized control operation from the railway control apparatus, wherein each selected track section corresponds to one or more railway traffic interlocks amongst the plurality of railway traffic interlocks dispersed in said plural railways constituting said railway network;

responsive to receiving the selection, generate a secret code associated with the selected track sections;

responsive to generating the secret code, save the secret code in the memory device;

associate the secret code with a remote user of the user terminal;

transmit a block signal to the corresponding one or more railway traffic interlocks to place a block on the selected track sections; and

transmit the secret code to the remote user of the user terminal.

41. The system of claim 40, wherein the processor configured by execution of computer program instructions additionally causes the railway control apparatus to:

receive the secret code from the user terminal via the network;

verify the secret code by comparing the secret code received from the user terminal with the secret code stored in the memory device;

receive an instruction to remove the block from the selected track sections, after verifying the secret code; and

responsive to the instruction to remove the block received after verifying the secret code, transmit a block removal signal to the corresponding railway traffic interlocks.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : RE47,835 E
APPLICATION NO. : 15/928955
DATED : February 4, 2020
INVENTOR(S) : Ross Pirtle

Page 1 of 1

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

On the Title Page

Item (22) Add, just before the Cross-Reference to Relation Applications section starts at Column 1, Line 11 of the subject reissue patent, the following notice, which is required under 37 C.F.R. § 1.177(a), that multiple reissue applications have been filed for seeking reissue of U.S. Patent No. 9,403,545:

Signed and Sealed this
Eighth Day of December, 2020

A handwritten signature in black ink, appearing to read "Andrei Iancu", written in a cursive style.

Andrei Iancu
Director of the United States Patent and Trademark Office

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : RE47,835 E
APPLICATION NO. : 15/928955
DATED : February 4, 2020
INVENTOR(S) : Pirtle

Page 1 of 1

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

At Column 1, under the heading "CROSS-REFERENCE TO RELATED APPLICATION," please replace Lines 14-15 (approx.), with the following:

--NOTICE: More than one reissue application has been filed for the reissue of U.S. Patent No. 9,403,545 B2. The reissue applications are U.S. Reissue Patent Application Serial No. 16/709,126, filed on December 10, 2019, which is a continuation reissue application of U.S. Reissue Patent Application Serial No. 15/928,955, filed on March 22, 2018, now U.S. Reissue Patent No. RE47,835 E, issued February 4, 2020, which is a reissue application of 14/519,727, filed on October 21, 2014, now U.S. Patent No. 9,403,545 B2, issued August 2, 2016, which claims the benefit of U.S. Provisional Patent Application No. 61/893,547, filed on October 21, 2013, now expired, and entitled--

This certificate supersedes the Certificate of Correction issued December 8, 2020.

Signed and Sealed this
First Day of June, 2021



Drew Hirshfeld
*Performing the Functions and Duties of the
Under Secretary of Commerce for Intellectual Property and
Director of the United States Patent and Trademark Office*

EXHIBIT C



US00RE49115E

(19) **United States**
 (12) **Reissued Patent**
Pirtle

(10) **Patent Number:** **US RE49,115 E**
 (45) **Date of Reissued Patent:** ***Jun. 28, 2022**

(54) **TOOLS FOR RAILWAY TRAFFIC CONTROL**

(71) Applicant: **RAILWARE, INC.**, Hauppauge, NY
 (US)

(72) Inventor: **Ross Pirtle**, Commack, NY (US)

(73) Assignee: **RAILWARE, INC.**, Hauppauge, NY
 (US)

(*) Notice: This patent is subject to a terminal disclaimer.

(21) Appl. No.: **16/709,126**

(22) Filed: **Dec. 10, 2019**

Related U.S. Patent Documents

Reissue of:

(64) Patent No.: **9,403,545**
 Issued: **Aug. 2, 2016**
 Appl. No.: **14/519,727**
 Filed: **Oct. 21, 2014**

U.S. Applications:

(63) Continuation of application No. 15/928,955, filed on Mar. 22, 2018, now Pat. No. Re. 47,835, which is an application for the reissue of Pat. No. 9,403,545.

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B61L 25/06 (2006.01)
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(52) **U.S. Cl.**
 CPC **B61L 27/20** (2022.01); **B61L 23/06** (2013.01); **B61L 25/06** (2013.01); **B61L 27/00** (2013.01); **B61L 25/08** (2013.01)

(58) **Field of Classification Search**
 CPC .. B61L 27/0038; B61L 27/0005; B61L 27/02;
 B61L 27/00; B61L 23/00;
 (Continued)

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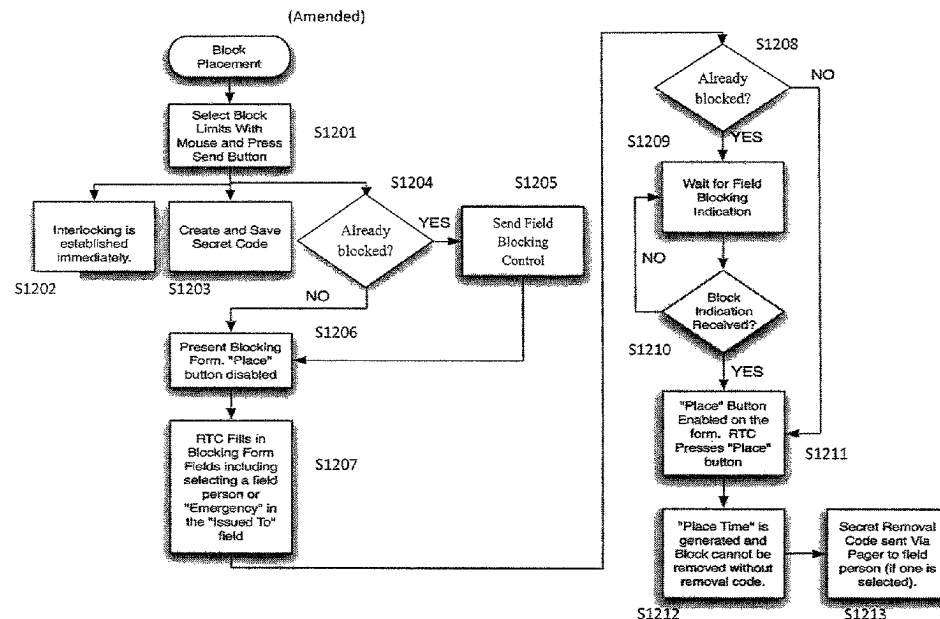
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Primary Examiner — Peter C English

(57) **ABSTRACT**

Tools [(such as system, apparatus, methodology, etc.)] may be provided to control traffic over a railway track section, *and more particularly*, when a railway worker is working on or near the track section, *a block is placed to prevent trains from traversing the track section.* [Move particularly, when traffic over the track section is to be blocked] *Further*, a release code is generated and sent to [an electronic contact address of the railway worker. Traffic through the track section is blocked until the release code is entered in the system] *a user terminal. The block is removed from the track section when the release code is received by the system.*

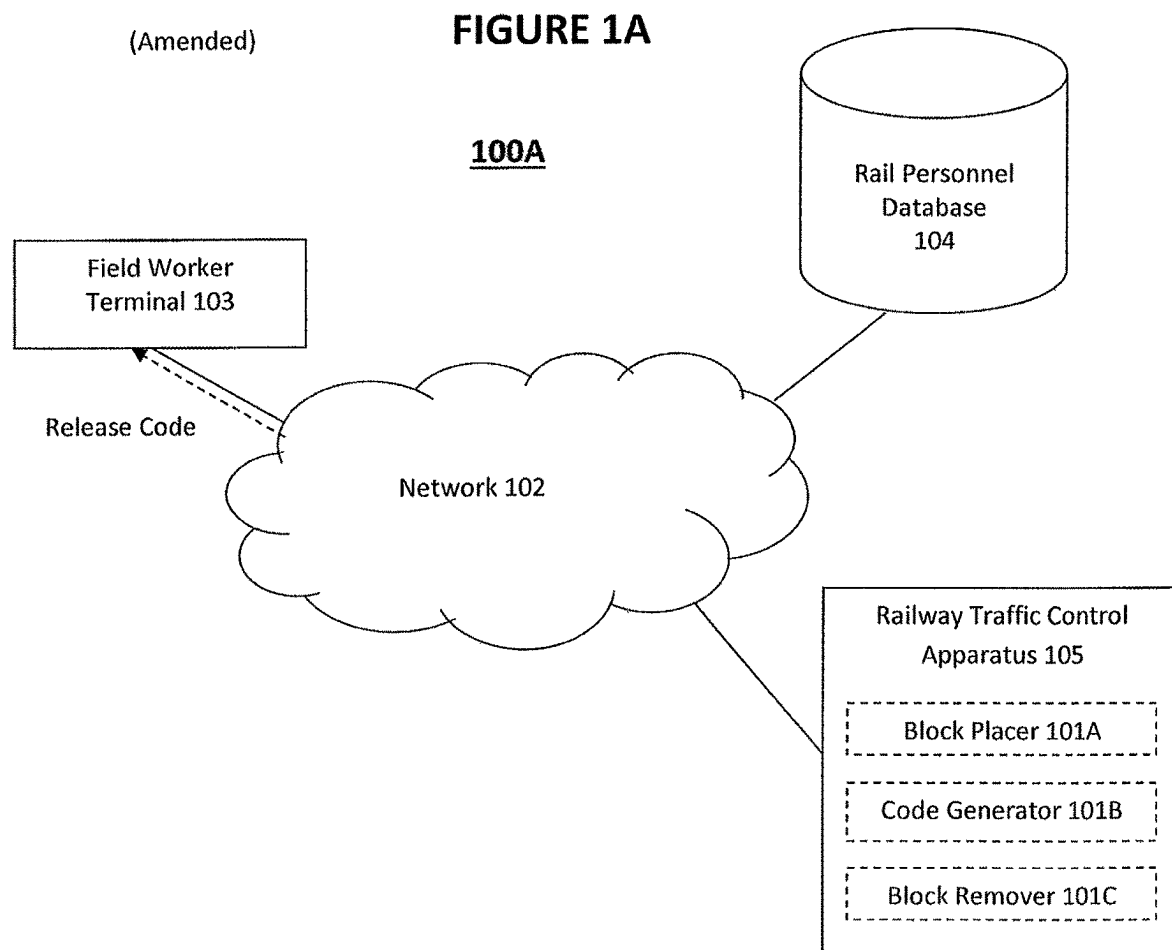
17 Claims, 11 Drawing Sheets



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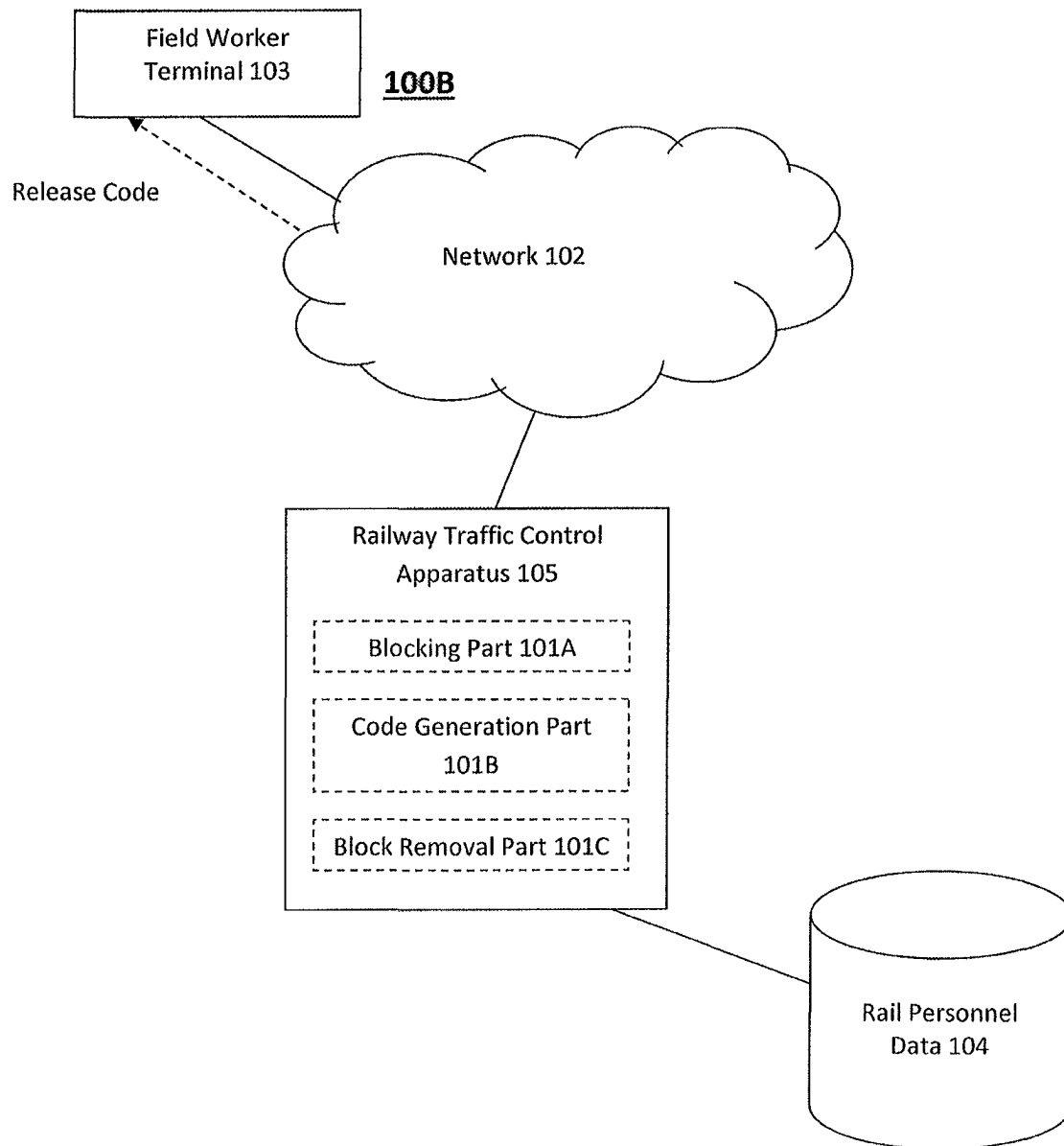
Page 2

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(58)	Field of Classification Search CPC B61L 23/06; B61L 23/10; B61L 19/06; B61L 2019/065; B61L 25/06; B61L 25/08; B61L 27/20 See application file for complete search history.	2013/0187010	A1 *	7/2013	Kim B61L 3/221 246/33
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(Amended)

FIGURE 1B



(Amended)

FIGURE 2

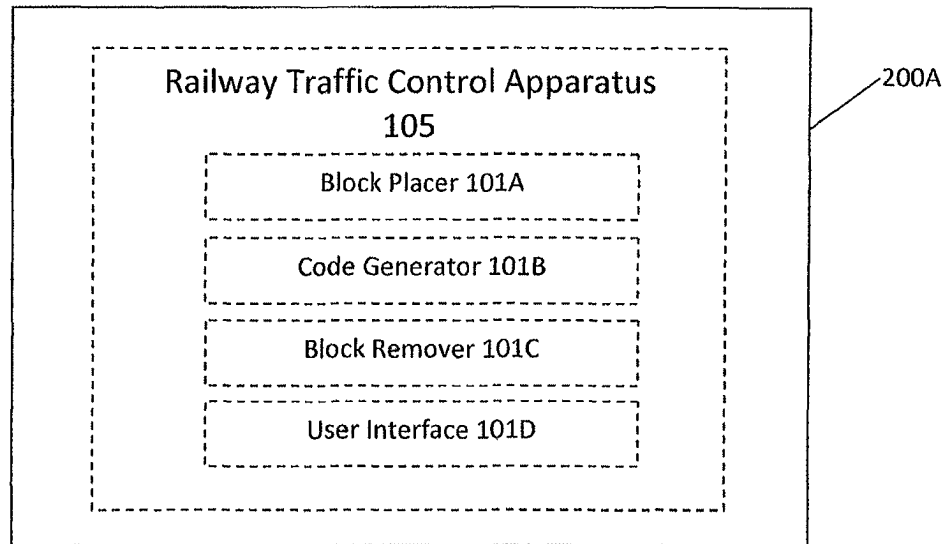
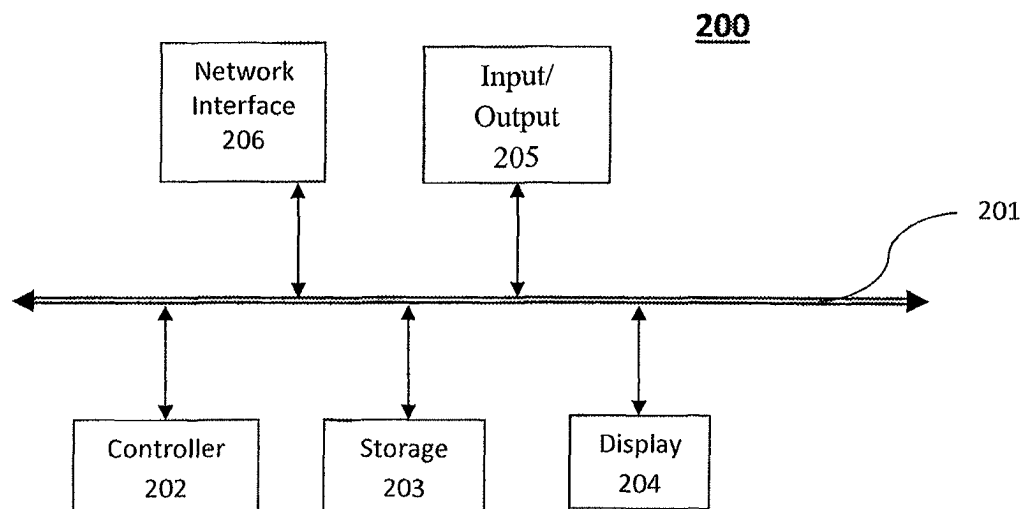


FIGURE 3A



(Amended) **FIGURE 3B**

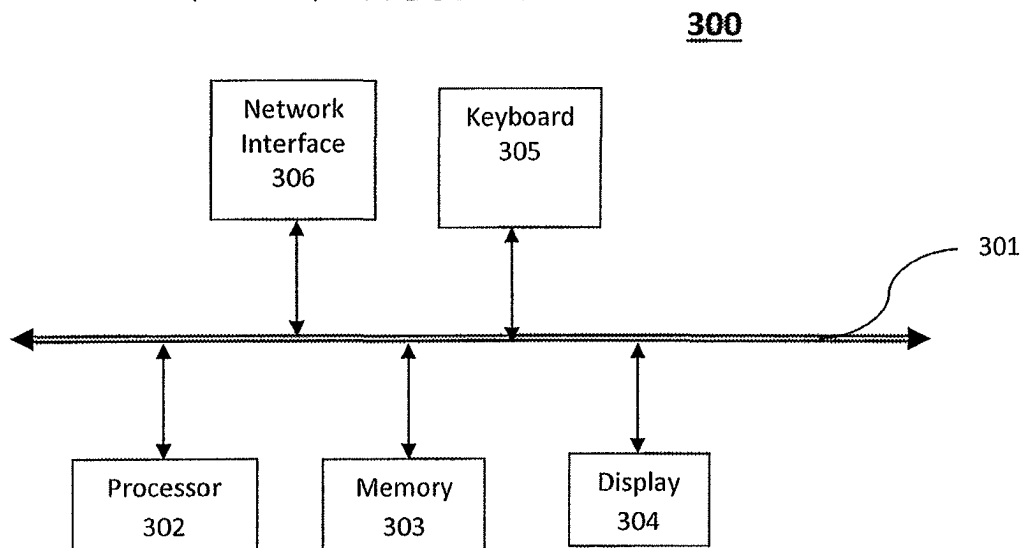
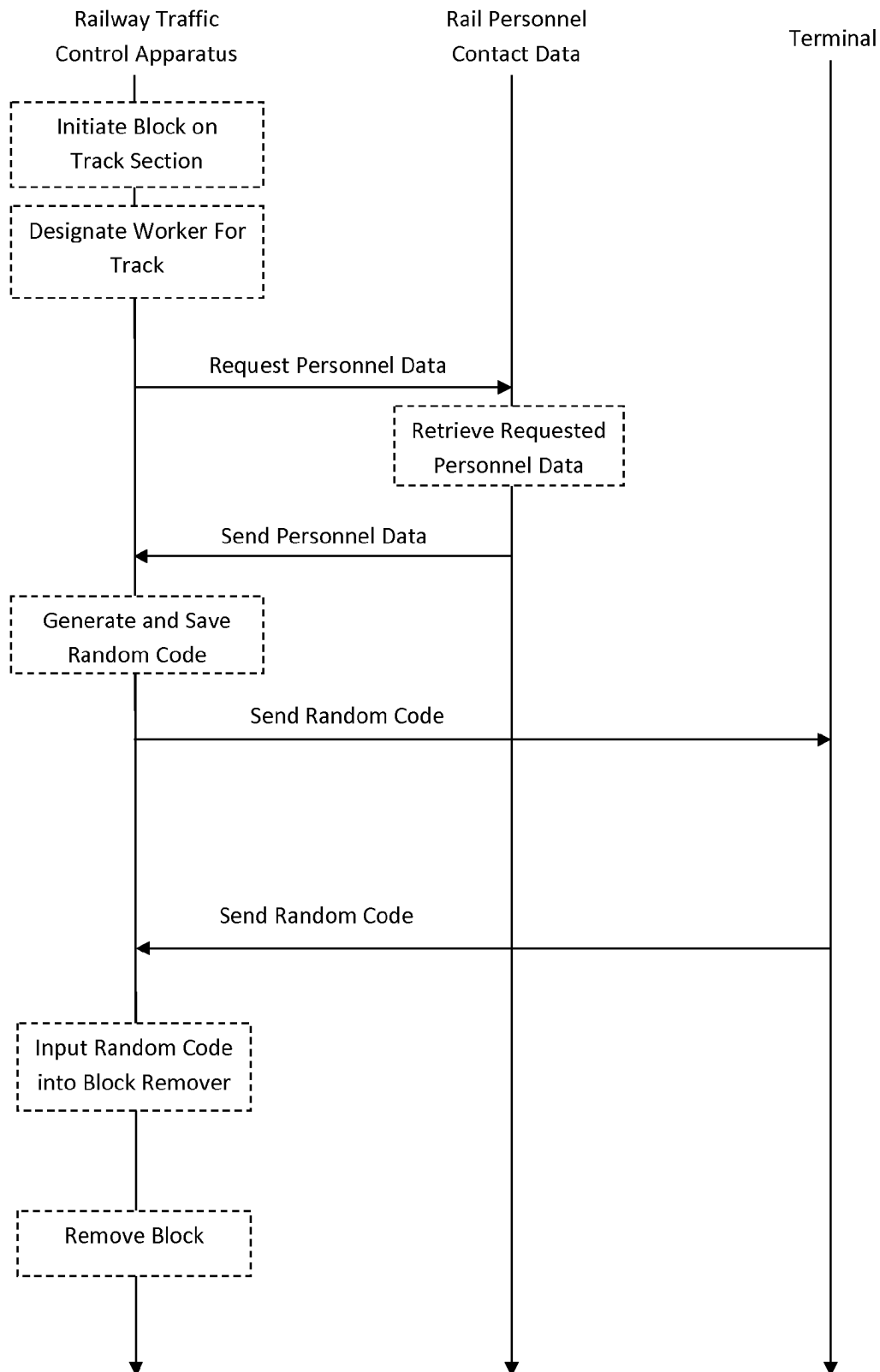


FIGURE 4

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FIGURE 5

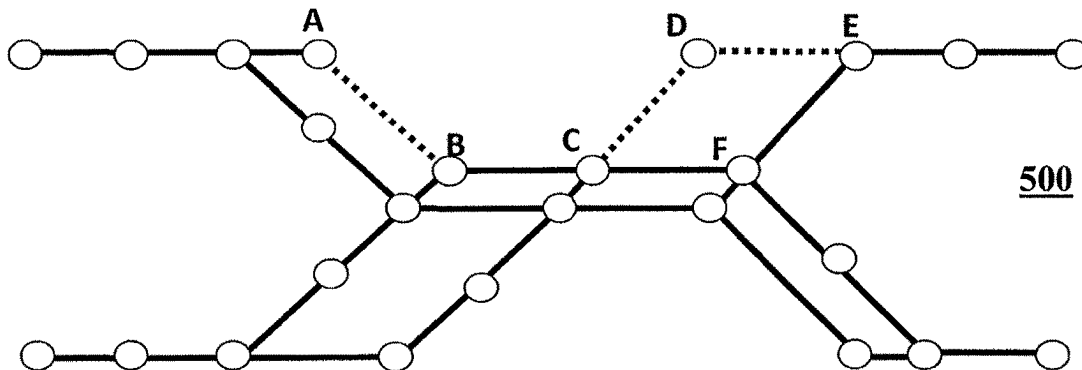
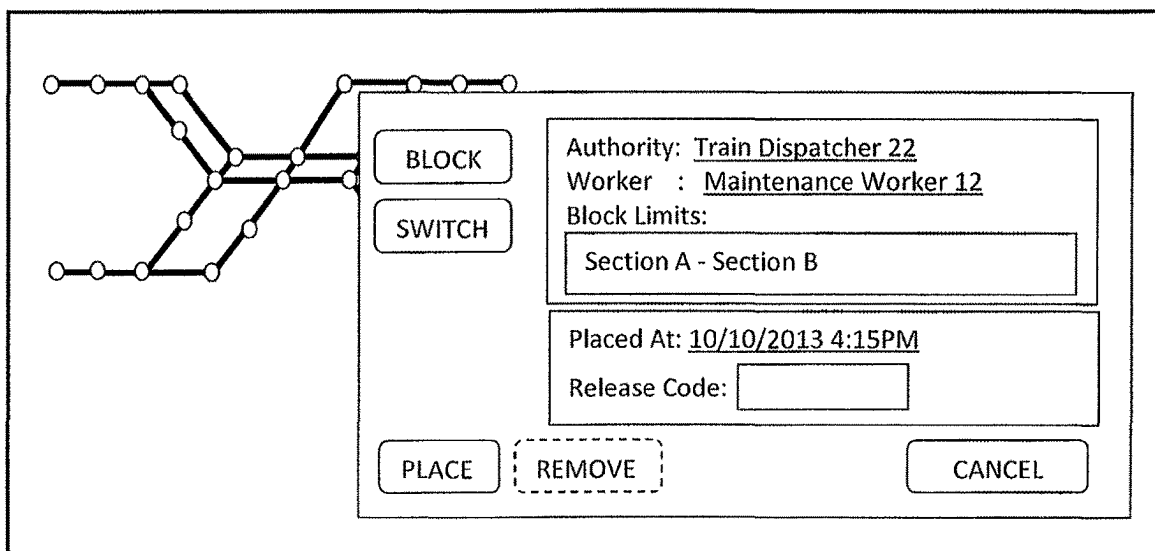


FIGURE 6



U.S. Patent

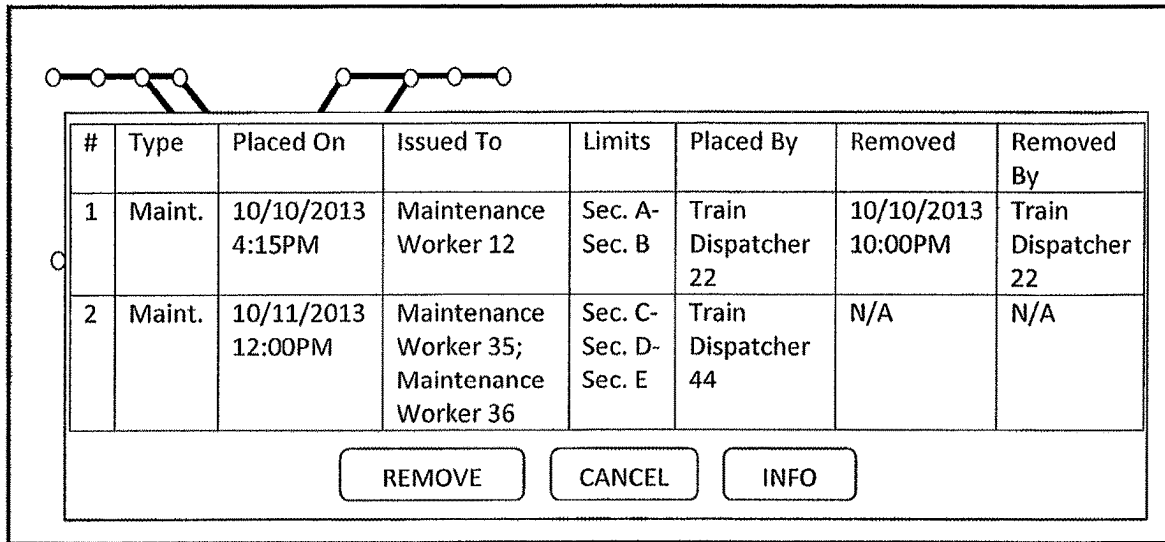
Jun. 28, 2022

Sheet 7 of 11

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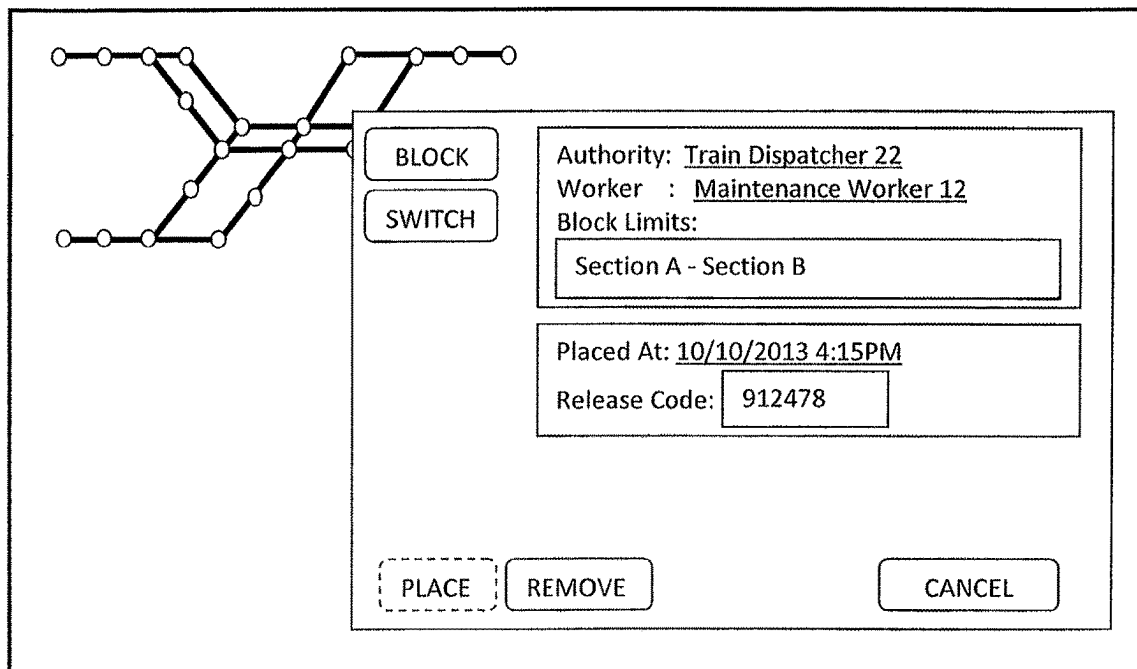
FIGURE 7



#	Type	Placed On	Issued To	Limits	Placed By	Removed	Removed By
1	Maint.	10/10/2013 4:15PM	Maintenance Worker 12	Sec. A- Sec. B	Train Dispatcher 22	10/10/2013 10:00PM	Train Dispatcher 22
2	Maint.	10/11/2013 12:00PM	Maintenance Worker 35; Maintenance Worker 36	Sec. C- Sec. D- Sec. E	Train Dispatcher 44	N/A	N/A

REMOVE CANCEL INFO

FIGURE 8



BLOCK SWITCH

Authority: Train Dispatcher 22
 Worker : Maintenance Worker 12
 Block Limits:
Section A - Section B

Placed At: 10/10/2013 4:15PM
 Release Code: 912478

PLACE REMOVE CANCEL

FIGURE 9

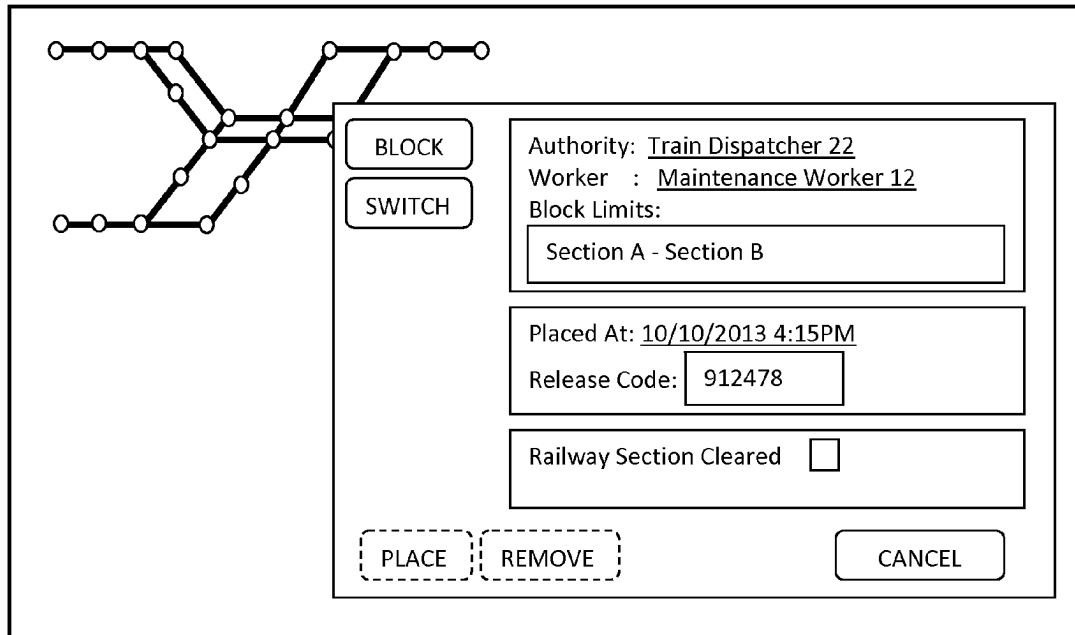


FIGURE 10

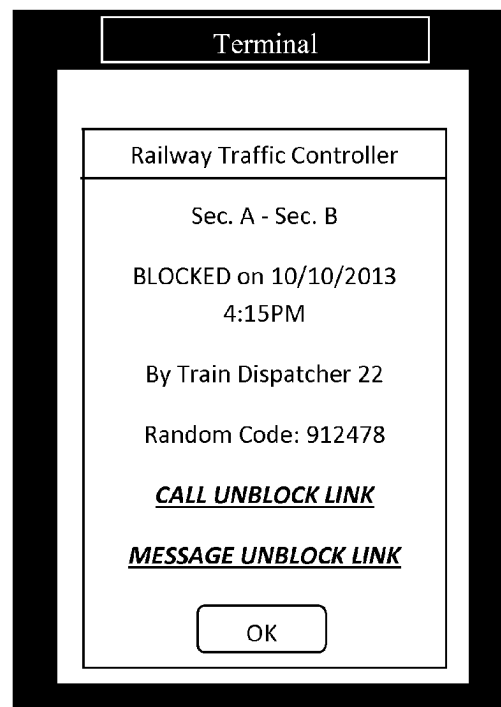
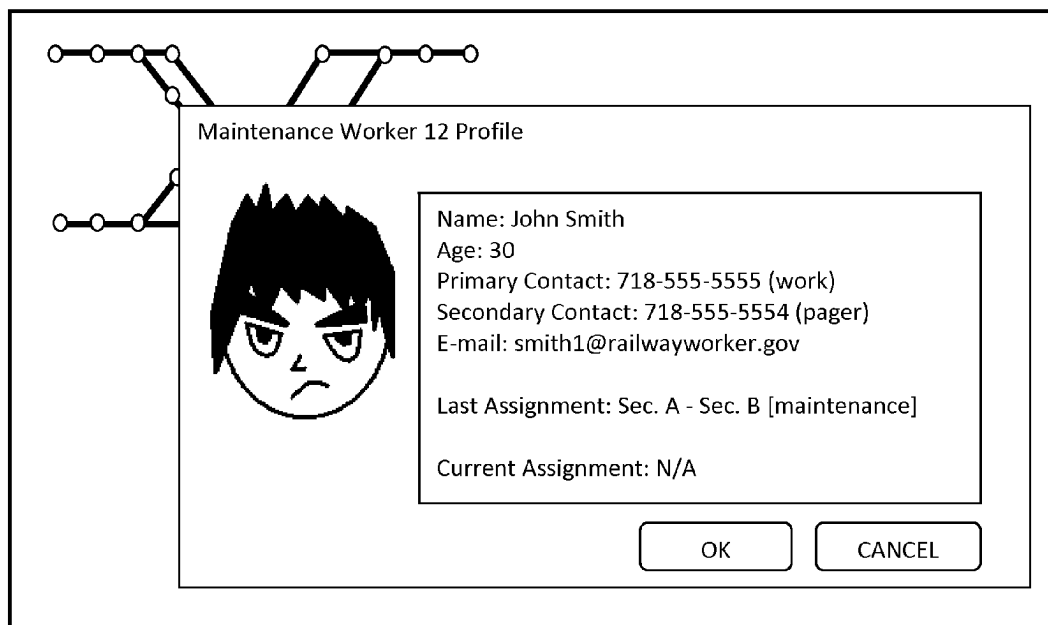


FIGURE 11



The diagram shows a railway track layout with several signal boxes. A window titled "Maintenance Worker 12 Profile" is open, displaying the profile of John Smith. The window includes a cartoon illustration of a worker's head and a list of personal and professional details. At the bottom of the window are "OK" and "CANCEL" buttons.

Maintenance Worker 12 Profile



Name: John Smith
Age: 30
Primary Contact: 718-555-5555 (work)
Secondary Contact: 718-555-5554 (pager)
E-mail: smith1@railwayworker.gov

Last Assignment: Sec. A - Sec. B [maintenance]
Current Assignment: N/A

OK CANCEL

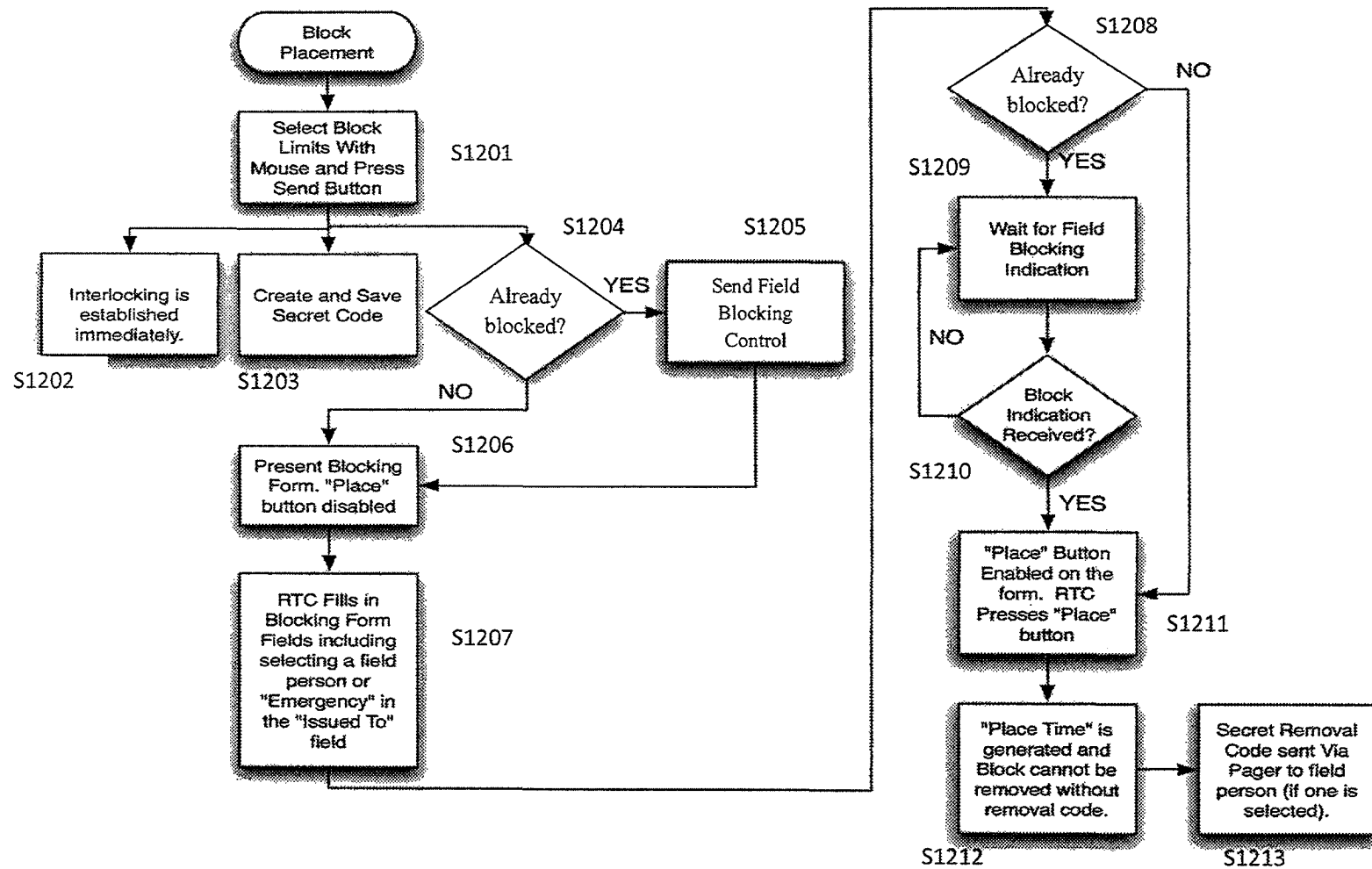
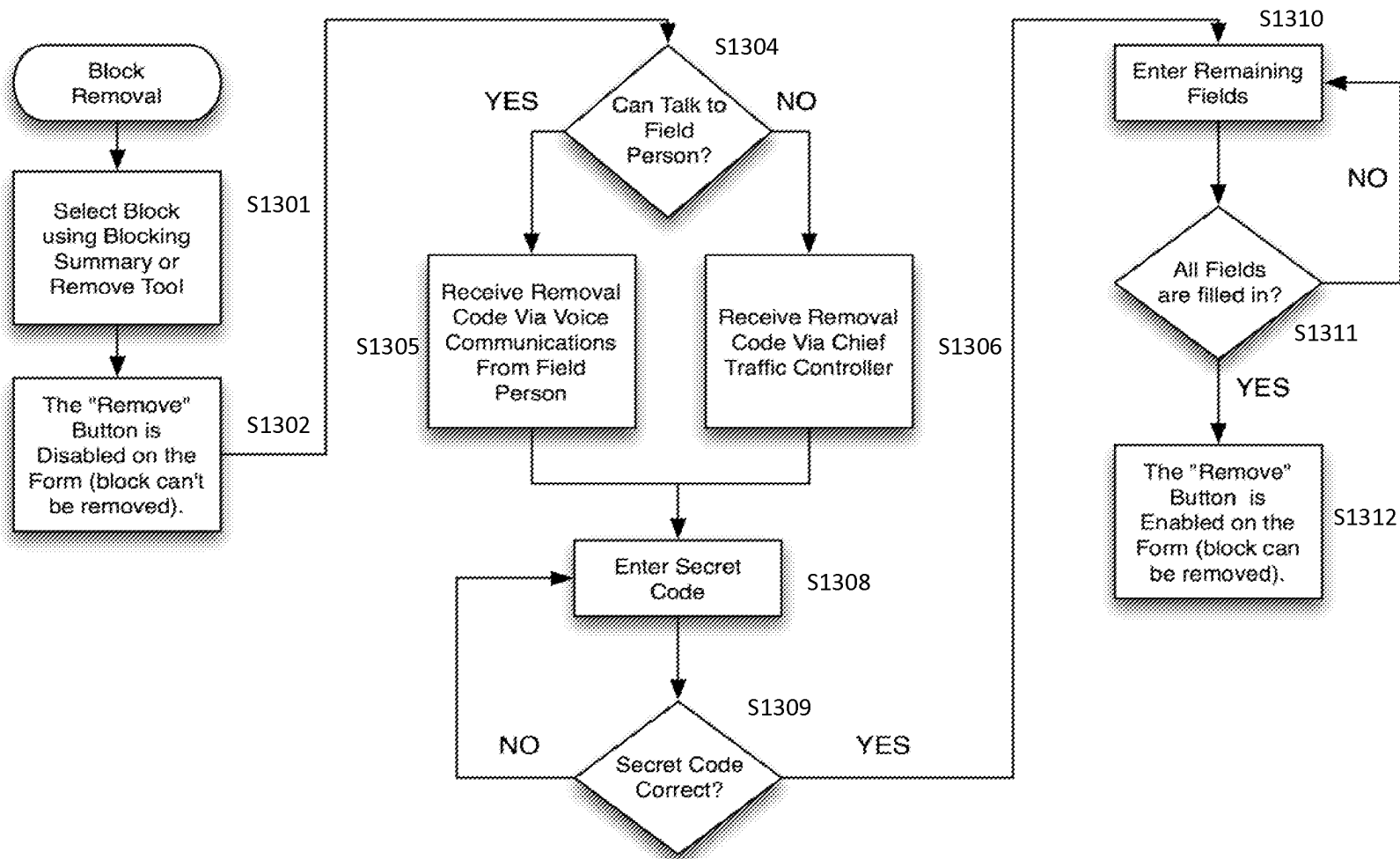
(Amended) **FIGURE 12**

FIGURE 13

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TOOLS FOR RAILWAY TRAFFIC CONTROL

Matter enclosed in heavy brackets [] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue; a claim printed with strikethrough indicates that the claim was canceled, disclaimed, or held invalid by a prior post-patent action or proceeding.

CROSS-REFERENCE TO RELATED [APPLICATION] APPLICATIONS

[This application] *Notice: The following multiple reissue applications have been filed for reissue of U.S. Pat. No. 9,403,545:*

(1) *Reissue application Ser. No. 15/928,955 filed on Mar. 22, 2018 and reissued as U.S. Reissue Pat. No. RE47,835;*

(2) *This Reissue application Ser. No. 16/709,126, filed on Dec. 10, 2019, which is a reissue continuation of Reissue application Ser. No. 15/928,955.*

U.S. Pat. No. 9,403,545 claims the benefit of U.S. Provisional Application No. 61/893,547, filed Oct. 21, 2013 and entitled "SYSTEM, APPARATUS AND METHOD FOR RAILWAY TRAFFIC CONTROL".

TECHNICAL FIELD

This disclosure relates to railway traffic control, and more specifically, a system, apparatus, and method for railway traffic control to address concerns for safety of railway workers working on or near railroad tracks.

BACKGROUND

Railway transportation is run under strict operational guidelines or rules, in order to operate safely. Most of these guidelines are standard amongst commercial railway traffic. Examples of transport standards include interlock signals, centralized traffic control (CTC), rule 251, etc.

Interlocking signals govern movement within a sector controlled by an interlock. For example, on a specific track line, a track may be divided into sections of 400 to 2500 m, on each of which trains move at a speed depending on an interlocking signal exhibited by an interlock at an entrance to the section. That is, the interlocking signal displays a color system which instructs the conductor of the train, or the train operating by automated response, how to move through the upcoming section of track. Interlocking systems usually incorporate a 3-color system by which the train, or train conductor, is informed to proceed at regular speed, is informed to proceed at a reduced speed or is prohibited from proceeding through the upcoming section.

While interlocking systems can be operated manually, currently most interlocking systems are controlled electronically. One method of controlling all of the interlocks within a rail system is through a centralized traffic control (CTC), or traffic control system (TCS). A CTC is used for monitoring, tracking and operating trains traversing tracks throughout a network. The CTC is controlled by a single person known as a train dispatcher.

In order for the train dispatcher to make appropriate train control decisions regarding how the train should be operated, various information and data must be obtained and presented. Information regarding track conditions, train traffic, scheduling, etc., are presented on a control console which may include a map of the entire rail system controlled

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by the CTC. Through the control console, the dispatcher has control of each interlock signal (that is, the dispatcher controls the train traffic and flow of train traffic using the interlocks) and is constantly made aware of the positions of trains in the railway system as such positions are electronically reported by signals present throughout the railway system. In addition, in order to provide for safe traffic control and avoid accidents or collisions, signals are provided throughout the track network, or interlocks.

The interlocks may be controlled from the CTC in any of various different ways, including, e.g., direct wiring, by pulse codes sent over a wire to distant locations, etc. In addition, interlocks can also be controlled by a native mechanism detecting presence of a train on the track. That is, when a train occupies a certain section of track, the interlock prevents other trains from proceeding onto the same

Further, there are additional safety systems on the train itself, such as automatic train control (ATC). A common feature of many of such automated train control systems is the need for constant or nearly constant communications between onboard train control systems and an offboard hub radio connected to control equipment located along the wayside or in a central office. In some systems, the offboard control equipment generates movement authorities which authorize the train to move in one or more sections of track. In some systems, the offboard equipment informs the onboard train control system of the presence of other trains in the vicinity. In yet other systems, the offboard equipment provides information such as temporary speed restrictions and work zone information to the onboard train control system. Such systems protect against a number of human errors on the part of the train drivers, one of the basics of the system being that the train is provided with a computer which receives traffic information, such as stop signals and speed limits, from a plurality of transmitters along the track. Thus, the computer may bring the train to a standstill regardless of what the train driver does when the train arrives at a stop signal.

Even with all these safety features present in a railway system, railway accidents occur, with many being fatal. For example, one study reported that there were 39 roadway worker accidents that occurred between January 1997 and the end of 2011, in which 41 roadway workers perished while attending to tasks such as inspection, construction, maintenance, or repair of railroad track, bridges, roadway, signal and communication systems, electric traction systems, roadway facilities or roadway maintenance machinery on or near track, operating as flagmen or watchmen/lookouts for other roadway workers, etc.

There remains a need for further safety measures to protect the lives of railway workers.

BRIEF SUMMARY

This disclosure provides tools (in the form of systems, apparatuses, methodologies, etc.) for enhancing railway traffic control, as supplemental measures directed to safety of railway workers.

For example, a centralized railway control system may be adapted (such as via computer hardware, software, or a combination) to include providing on a user terminal a user interface including a block placing part to place a block on one or more specified track sections to permit a railway field worker to enter the track sections while blocking railway traffic to said track sections, generating a removal code and transmitting the removal code to the electronic contact

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address of the railway field worker, and permitting the block to the track sections to be removed only upon entry of the removal code in the centralized railway control system. Such process may be largely automated via programming such that upon placement, by the block placing part, of the block of railway traffic to the specified track sections, the removal code is automatically transmitted, by a code generation part, to the electronic contact address of the railway field worker, and the block of railway traffic to the specified track sections remains in place in the centralized railway control system until the entry of the removal code in the centralized railway control system to cause a block removal part to remove the block on said one or more track sections.

In another aspect, the adaptation may include a RTC user interface to permit a user (e.g., *railway traffic controller (RTC) or train dispatcher*) to specify a track section(s) to be blocked, specify an instruction to the centralized railway control system to block the railway traffic to the specified track section(s), and specify identifying information of the railway field worker performing (or to be performing) work in the specified track section(s).

In another aspect, the adaptation includes a block removal user interface to permit a user to enter the removal code to cause the block removal part to remove the block on said one or more track sections. Such block removal user interface may be provided in any of various ways. For example, the block removal user interface may be provided within a mobile application or web page through which the railway field worker can enter the removal code manually or orally (i.e. including a voice or speech interface part). As another example, the removal code may be embedded in a link in a message transmitted by email or messaging to the electronic contact address of the railway field worker, and the railway field worker can simply cause the removal code to be entered by activating the link in the message received by the railway field worker. In another example, the block removal user interface may be provided on the same user terminal on which the block placing part is disposed. Further, a voice or speech interface part may be disposed on the system-side to process a voice message (such as received via a telephone call from the railway field worker, extract the removal code from the voice message, and enter the block removal code. In each instance, the block of railway traffic to the specified track sections remains in place in the centralized railway control system until the entry of the removal code through the block removal user interface. Further, entry of the removal code may also require entry of identification of the user entering the removal code, and removal of the block may also require not only the removal code but also confirmation that the user entering the removal code is authorized to remove the block. The block removal user interface may further require, in addition to entry of the removal code, the user to specify that confirmation that the track sections have been cleared has been obtained from the railway field worker associated with the block, before the block removal user interface permits the removal code to be transmitted to the block removal part.

In another aspect, the system may include a railway control database registering block identifying information, including block limits identifying the one or more blocked track sections, along with the removal code for removing the block of the track sections. Further, the railway control database may register additional information, such as identification of the user who specified the instruction to block the track sections, notes specifying reasons for the block, date and time at which the block was placed, etc. The railway control database may further register block removal

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information identifying date and time at which the block was removed and identifying the user who entered the removal code and who specified that confirmation that the track sections have been cleared was obtained from the railway field worker associated with the block.

BRIEF DESCRIPTION OF THE DRAWINGS

The aforementioned and other aspects, features and advantages can be more readily understood from the following detailed description with reference to the accompanying drawings wherein:

FIG. 1A shows a block diagram illustrating a railway control system, in accordance with an exemplary embodiment;

FIG. 1B shows a block diagram illustrating a railway control system, in accordance with another exemplary embodiment;

FIG. 2 shows a block diagram of a railway traffic control apparatus, in accordance with an exemplary embodiment;

FIG. 3A shows a block diagram of an exemplary configuration of a terminal;

FIG. 3B shows a block diagram of an exemplary configuration of a computing device;

FIG. 4 shows a schematic diagram illustrating communication flow in the system shown in FIG. 1A or in the system shown in FIG. 1B;

FIG. 5 shows an example of a graphical portrayal of a railway network;

FIGS. 6-9 show examples of a user interface display, in accordance with an exemplary embodiment;

FIG. 10 shows an example of a user interface display that may be provided on the field worker side for triggering block removal;

FIG. 11 shows another example of a user interface display;

FIG. 12 shows a flow chart illustrating a block placement method, in accordance with an exemplary embodiment;

FIG. 13 shows a flow chart illustrating a block removal method, in accordance with an exemplary embodiment;

DETAILED DESCRIPTION

This patent specification describes tools (in the form of methods, apparatuses and systems) that controls train traffic within a railway system using, but not limited to, standardized rules or timetables described in the Background section of this specification.

In describing exemplary embodiments illustrated in the drawings, specific terminology is employed for the sake of clarity. However, the subject matter of this patent specification is not intended to be limited to the specific terminology so selected and it is to be understood that each specific element includes all technical equivalents that operate in a similar manner.

The drawings show examples of implementations of the subject matter of this patent disclosure in several computing environments. However, it should be understood that the subject matter of this disclosure can be utilized by any computing device including but not limited to PDAs (*personal digital assistants*), cell phones, personal, notebook and workstation computers, kiosks, other information terminals, [WIC (or another)] pager, etc. In addition, the subject matter of this disclosure might be provided as services in a modular fashion by other devices connected by a communication network.

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Referring now to the drawings, wherein like reference numerals designate identical or corresponding parts throughout the several views, there is described tools (systems, apparatuses, methodologies, computer program products, etc.) that can be integrated in a railway traffic control system.

FIG. 1A shows schematically an exemplary embodiment in which a system 100A includes a railway traffic control apparatus (i.e., terminal) 105, rail personnel data 104 and a terminal 103, each connected to the network 102. FIG. 1B shows schematically another exemplary embodiment, in which rail personnel contact data 104 is accessed directly by the railway traffic control apparatus 105. While only one terminal 103 is connected to the network 102 in the example shown in FIG. 1A as well as in the example shown in FIG. 1B, it should be appreciated that the network environment can have an arbitrary number of devices (of various types).

The network 102 can be any data network, a local area network, a wide area network or any type of network such as an intranet, an extranet (for example, to provide controlled access to external users, for example through the Internet), a private or public cloud network, the Internet, etc., or a combination thereof. Further, other communications links (such as a virtual private network, a wireless link, etc.) may be used as well for the network 102. In addition, the network 102 preferably uses TCP/IP (Transmission Control Protocol/Internet Protocol), but other protocols such as SNMP (Simple Network Management Protocol) and HTTP (Hypertext Transfer Protocol) can also be used. How devices can connect to and communicate over networks is well-known in the art and is discussed for example, in "How Networks Work", by Frank J. Derfler, Jr. and Les Freed (Que Corporation 2000) and "How Computers Work", by Ron White, (Que Corporation 1999), the entire contents of each of which are incorporated herein by reference.

The rail personnel 104 is a database that can be either connected to or inside the railway traffic control terminal 105. The rail personnel contact data 104 stores information regarding the maintenance workers used for traveling, inspecting and working on blocked rails. For example, the information stored can include name of the maintenance worker, primary contact, secondary contact, previous assignment, current assignment, etc. as shown via user interface display in FIG. 11.

FIG. 2 shows a [terminal 100A] computer 200A which is configured (such as via one or more programs of instructions executable by a processor [of a computer or another electronic device] with) to be a railway traffic blocking apparatus [101 to include] 105 including a block placer 101A, a code generator 101B, a block remover 101C and a user interface 101D. The [terminal 100A] computer 200A can be any electronic device including a processor, storage and display, such as shown by way of examples in FIGS. 3A and 3B.

The railway traffic blocking apparatus is programmed to control the traffic of an entire railway network. The block placer 101A is configured to stop traffic within a certain length of rail line. That is, once a block is placed, no train can traverse the blocked section of rail. For example, in the case of a railway controlled by multiple interlocks, the block placer 101A causes those interlocks to output a STOP signal, therefore, stopping any train traffic within the rails controlled by that interlock. By doing this, maintenance workers and railway personnel can travel, inspect and work on the rails without the danger of oncoming train traffic. Trains that are scheduled to traverse said blocked tracks either come to a complete stop, electronically or mechanically, before pass-

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ing the interlock or are rerouted using tracks that are not in a blocked state. However, this disclosure is not limited to a railway traffic control system implementing interlocks. This system can be implemented on any configuration in which there is control of the traffic of a railway system.

The code generator 101B is configured to produce a removal or release code, such as a cipher which is random, [pseudo-random,] secret, etc., and stored on the [terminal] computer. A new random cipher may be generated for each instance of traffic blocking. This removal or release code is then sent to [another terminal] terminals belonging to the railway personnel who are scheduled to travel, inspect or work on the specific rails being blocked.

The block remover 101C is programmed to remove the previous block, or plurality of blocks set by the block placer 101A. The block remover 101C is dependent on the code produced by the code generator 101B. As described in detail below, a block cannot be removed without the input of the removal or release code.

The user interface 101D is configured preferably for the ease of use for the railway traffic controller (RTC). As shown by way of examples in FIGS. 6-9 and 11, the user interface 101D displays information and tools needed to enable/disable blocks on rail sections.

The user interface 101D may be a mobile application, a web page or some other software component, on a terminal device. Such terminal preferably is configured to communicate through a computer or data network to obtain content and data from an external source. However, it should be appreciated that the inventive aspects described herein can be employed even if the mobile device is not configured to connect to a data network, and/or is not connected to a data network.

An example of a configuration of a user terminal (e.g., the terminal 103) or computer is shown schematically in FIG. 3A. In the example of FIG. 3A, terminal device 200 includes a controller (or processor) 202 that communicates with a number of other components, including storage 203, display 204, input/output (such as mouse, touchpad, stylus, microphone and/or speaker with voice/speech interface and/or recognition software, etc.) 205 and a network interface 206, by way of an internal bus 201.

The storage 203 can provide storage for program and data, and may include a combination of assorted conventional storage devices such as buffers, registers and memories [for example, read-only memory (ROM), programmable ROM (PROM), erasable PROM (EPROM), electrically erasable PROM (EEPROM), static random access memory (SRAM), dynamic random access memory (DRAM), non-volatile random access memory (NOVRAM), etc.].

The network interface 206 provides a connection (for example, by way of an Ethernet connection or other network connection which supports any desired network protocol such as, but not limited to TCP/IP, IPX (Internetwork Packet Exchange), IPX/SPX (Internetwork Packet Exchange/Sequenced Packet Exchange), or NetBEUI (NetBIOS Extended User Interface)) to a network (e.g., network 102) to enable the terminal device to communicate with another device through the network.

FIG. 3B shows an exemplary constitution of a computer 300 which can be configured by appropriate programming to operate as the railway traffic control apparatus 105 (FIG. 1A). The computer 300 shown in FIG. 3B includes a processor 302, and various elements connected to the processor 302 by an internal bus 301, such as a memory 303, display 304, keyboard 305 and network interface 306. The processor 302 processes incoming requests transmitted

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through the network interface **306**. The network interface **306** enables the railway traffic control terminal to communicate with other network-connected devices such as a terminal (e.g., the terminal **103** of FIG. 1A or FIG. 1B) and receive data or service requests.

Each of the terminal **103**, rail personnel database **104** and railway traffic control apparatus **105** can be configured to communicate with each other through the network **102**. The railway traffic control terminal **105** can be configured to request data from the rail personnel contact data **104** through the network **102**, as shown in FIG. 4. When the railway traffic control apparatus **105** initiates a block on a track section, the railway traffic control apparatus **105** may also designate a worker in association with the block on the track section. With this information, the railway traffic control apparatus **105** requests the specific personnel data pertaining to the designated worker. The rail personnel contact data retrieves the requested personnel data and sends it to the railway traffic control apparatus **105**. By receiving this data, the railway traffic control apparatus **105** may then generate a release code and save it to an internal storage.

The release code is then sent to the terminal **[102] 103**. This terminal **[102] 103** is the contact associated with the designated worker, and the electronic address of this terminal is found within the personnel data received from the rail personnel contact data **104**. By this system, only the railway traffic control apparatus **105** and terminal **[102] 103** receive the release code generated by the railway traffic control apparatus **105**.

Additionally, FIG. 4 shows the communication between the terminal **[102] 103** and the railway traffic control apparatus **105** in the event that a block on a certain track is to be lifted. In order for a block on a certain track to be lifted, the release code has to be input into the railway traffic control apparatus. The terminal **[102] 103** sends the release code to the railway traffic control apparatus **105**. The release code is then input into the block remover **101C**. After which, the block is removed and traffic to that section of rail is then allowed.

FIG. 5 illustrates an example of a railway network **500**. Labeled are interlocks A-F which control sections of railway of the railway network **500**. For example, the rail traffic controller (RTC) might choose to block the section of rail corresponding to the track between interlock A and interlock B. This way, train traffic between those two interlocks is prohibited. The railway network is present on screen of the railway traffic control terminal **105** at all times for the convenience of the rail traffic controller. By being on screen at all times, the rail traffic controller knows the status of certain sections of rail in real time.

As shown in the example illustrated in FIG. 5, the railway between interlocks A and B, and interlocks C, D and E is blocked. Train traffic is prohibited between these sections and shown to the railway traffic controller on screen. As further explained below, the railway traffic controller can lift the blocks on these sections of track if the release code is input into the railway traffic control terminal **105**.

FIG. 6 is an exemplary illustration of the user interface of the railway traffic control terminal **105**. The railway traffic controller (RTC) may place blocks on any section of traffic using this user interface. In this exemplary embodiment, the train traffic controller inputs authority, worker and block limits. This information corresponds to the train traffic controller username, maintenance worker designated to work on the specific blocked track and the sections of track

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being blocked, respectively. In addition, the railway traffic control terminal **105** then timestamps the order once the block is placed.

Once the block is put into place, the corresponding section on the railway network **500** displays the section of track being blocked. In addition, the railway traffic control terminal **105** generates a release code, stores the release code, and sends the code to the maintenance worker designated for track work, i.e. maintenance worker 12. As shown in FIG. 6, the railway traffic controller may place blocks on track sections but may not remove the track blocks without the input of the release code in the allotted area labeled release code. FIG. 6 shows that the remove action is dashed out, meaning it cannot be selected (unless a release code is first entered). In the example illustrated in FIG. 6, it is shown that only one worker, maintenance worker 12 is designated to work on track Section A to Section B. However, as shown in later embodiments, the train traffic controller is not limited to the amount of maintenance workers designated for any track section. In addition, the train traffic controller may apply a block to any number of additional track sections.

The blocks are then tabulated by the railway traffic control apparatus **105** as depicted in FIG. 7. The table in FIG. 7 lists all the blocks that are in place and in addition lists blocks that were previously set. The information that can be found in this table includes, but is not limited to, the type of work being done on the track sections, when the block was placed, who is designated to work on the sections of track, who placed the block, when was the block removed and who removed the block.

Additional information can be accessed through this table by highlighting a cell of the table and selecting info, as shown in FIG. 7. For example, by highlighting the cell labeled maintenance worker 12 and selecting info, the train traffic controller may access the bio of the maintenance worker 12, as shown in detail below. The train traffic controller may also highlight a different cell, such as the limits cell label "Sec. A-Sec. B". By selecting this cell and selecting the info command, the past history of maintenance work and operation of the section(s) may be displayed to the train traffic controller.

FIG. 8 shows the user interface of the railway traffic control terminal **105** as the railway traffic controller inputs the release code to remove the block on certain track sections. In the exemplary embodiment of FIG. 8, the remove option is now able to be selected with the input of the release code provided by the designated worker assigned for track work, maintenance worker 12.

Without the input of the release code, the remove option is not available to be selected. In a different embodiment, the release code may be obtained from the storage of the railway traffic control terminal **105**.

In the case where there are multiple maintenance workers assigned to a certain track section, there may be provided one release code to one, multiple or all of the maintenance workers assigned. That is, The train traffic controller may input that the release code be specified to one maintenance worker, preferably a supervisor or foreman, to multiple maintenance workers or to all of the maintenance workers assigned to work on a given track section. Also, in another embodiment, in a case where there are multiple workers assigned for a certain track section, there may be provided multiple unique release codes which would then all be required to be input into the train traffic control terminal **105** by the train traffic controller in order to be able to remove blocks on certain track sections.

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In another embodiment, the train traffic controller may be asked to verify that a railway section is cleared before receiving the option to remove a train block. As shown in FIG. 9, the user interface displayed by the railway traffic control terminal 105 does not allow a removal of a block until the option corresponding to "Railway Section Cleared" is checked. This option allows for a further protection of the maintenance workers assigned to the block track sections.

FIG. 10 shows an exemplary illustration of a message sent by the railway traffic control [terminal] apparatus 105 to a terminal 103 at a corresponding address of a maintenance worker assigned to work on a blocked track. The message is meant to deliver the release code to the maintenance worker assigned to work on a blocked track. In addition to relaying the code, the message may include, but not limited to, information regarding the section of track that is being blocked, the date and time that the track was blocked, who initiated the track block, and links to quickly respond to the message. By selecting one of the links embedded in the message, the terminal 103 sends the release code to the railway traffic control [terminal] apparatus 105. The code can be transmitted through, but not limited to, text message, e-mail or voice message. In the present embodiment being illustrated, the terminal 103 is depicted as a mobile phone. The terminal 103 could be any communication device such as, but not limited to, mobile phone or smartphone, tablet, [WIC (or another)] pager, PDA, etc.

In another embodiment, once the rail traffic controller unblocks a section of track, the railway traffic control [terminal] apparatus 105 may send a message to the worker, or plurality of workers, associated with working on the previously blocked track in order to inform them that the track has been unblocked and is no longer a safe environment to work in.

FIG. 11 depicts an exemplary embodiment of a profile of a maintenance worker. This profile may be accessed directly by highlighting the corresponding maintenance worker cell in the table depicted in FIG. 7 and selecting the info tab. This command brings up the profile and the maintenance worker and displays information regarding the worker including, but not limited to, the name, age, primary contact, secondary contact, e-mail, last assignment and current assignment of the maintenance worker. Additionally in this screen, the railway traffic controller may contact the maintenance worker directly using one of the plurality of addresses provided.

Next, the method of placing a block on a track section will be described with reference to FIG. 12. In S1201, the rail traffic controller selects the sections to be blocked using the railway traffic control terminal 105. Once the block limits are designated and sent, the railway traffic control terminal 105 [established office] establishes interlocking immediately in S1202. That is, the railway traffic control terminal 105 immediately sends a signal to the corresponding interlocks corresponding to the section of track designated to be blocked. Additionally, the railway traffic control terminal 105 generates and saves a random secret code in S1203.

After a request to block a certain section of track is sent, the railway traffic control terminal 105 checks if there is one or more of the sections currently has a block placed, as shown in S1204. If one or more of the designated sections does not have a block placed, then the railway traffic control terminal 105 opens a user interface for the railway traffic controller to designate a type of block to set and a maintenance worker for the blocked section in S1206. If the railway traffic control terminal sees that a block is already in effect (S1205), then the railway traffic control terminal 105

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allows the railway traffic controller to change the existing block type and maintenance worker using the same interface. The interface is then opened in S1206.

The railway traffic controller then inputs the type of block and assigns a worker to work on the blocked section. The railway traffic controller also has the option to block the track for purposes of an emergency and not necessarily for maintenance work in S1207. Once the railway traffic controller assigns a block type and/or a corresponding maintenance worker, the railway traffic control terminal 105 checks the status of the selected block in S1208. If the current selected section has an existing block, the railway traffic control terminal 105 waits for a response from the interlocks of the corresponding section to send an indication that a new block can be established in S1209. Once this indication is received in S1210, the railway traffic control terminal 105 enables the place button of the user interface (S1211). If the selected section has no previous active block, the railway traffic control terminal 105 immediately enables the place button on the user interface.

Once the place button is selected, the railway traffic control terminal 105 generates a place time and enables safety measures so that the block cannot be removed without the input of the secret code generated (S1212). Finally, the railway traffic control terminal 105 sends the secret removal code to the corresponding one or more maintenance workers (S1213) if the railway traffic controller has selected maintenance workers for the given block.

FIG. 13 describes a method for removing a block placed on a section of track. In S1301, the railway traffic controller selects an existing block by using either the network rail map, shown in FIG. 5, the remove tool, shown in FIGS. 6, 8 and 9, or the summary table, shown in FIG. 7. The remove button is disabled without the input of the secret code from either the maintenance worker or the railway traffic control terminal 105 (S1302). In S1304, the railway traffic control terminal 105 checks if there is a maintenance worker that is eligible to transmit the random secret code. If there is an eligible maintenance worker available (S1304, YES), the maintenance worker transmits the random secret code to the railway traffic control center 105 (S1305). If there is no maintenance worker available to transmit the random secret code (S1304, NO), the code can be retrieved from the train traffic control terminal 105 by the train traffic controller (S1306).

Once the secret code is received, the secret code may be input to the designated field in S1308. The railway traffic control terminal 105 checks the secret code with the code saved in its memory in S1309. If the code is incorrect, (S1309, NO), the railway traffic control terminal 105 will prompt the user to input the code again (S1308). If the code is correct (S1309, YES), the railway traffic control terminal will prompt the user to enter information into any remaining fields in S1310. In S1311, the railway traffic control terminal 105 checks that all information input into all fields is correct and that all fields are filled in. After this check is performed by the railway traffic control terminal 105, the remove button is enabled on the form (S1312) and the railway traffic controller may remove the block on the corresponding track section.

The aforementioned specific embodiments are illustrative, and many variations can be introduced on these embodiments without departing from the spirit of the disclosure or from the scope of the appended claims. For example, elements and/or features of different examples and illustrative embodiments may be combined with each other

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and/or substituted for each other within the scope of this disclosure and appended claims.

The orders in which the steps are performed in the aforementioned methods are not limited to those shown in the examples of FIGS. 12 and 13, and may be switched as long as similar results are achieved. Also, it should be noted that the methods illustrated in the examples of FIGS. 12 and 13 may be implemented using any of the embodiments shown in FIGS. 1A-1B.

Further, conventional systems can be modified to include the aspects described herein. As an example, a means may be added to a conventional interlock system by which the railway worker has partial control of the interlock system at the times that maintenance work is needed on a certain train block. In such modification, a system, apparatus and/or method may be provided to control the interlocks in a railway system as an interface between the railway workers and the interlock control. Thus, in a case in which maintenance is to be performed on a certain rail block, which is controlled by an interlock, the interlock can be configured to send out a stop signal for all incoming trains, to block train traffic to such portion of the rail system. In addition, once the interlock is placed in a “stop traffic” state, a release code is transmitted to an electronic contact address corresponding to the railway worker.

Once a block has been placed, the interlock remains in a blocked state, until the maintenance worker supplies the release code, which was received at the time the interlock started, and the release code is entered in the interlock control system. So long as the block is in place, the maintenance worker can perform on-track work, without interference of oncoming train traffic. After the maintenance worker finishes the assigned work and is clear of the train tracks, he/she may then supply the interlock control system with the release code, and the interlock control system in turn can release the interlock over the block.

Accordingly, the railway worker has more control over the traffic through the rail block in which the worker is working, and fatal on-track accidents can be reduced.

Additional variations may be apparent to one of ordinary skill in the art from reading U.S. Provisional Application No. 61/893,547, filed Oct. 21, 2013 and entitled “SYSTEM, APPARATUS AND METHOD FOR RAILWAY TRAFFIC CONTROL”, the entire contents of which are incorporated herein by reference.

What is claimed is:

[1. A centralized railway control system comprising:

a rail personnel contact database registering, for each railway personnel, an electronic contact address of the railway personnel; and

a railway traffic control apparatus for controlling access to railway tracks, said railway traffic control apparatus comprising a processor, a non-transitory medium storing one or more programs of executable instructions, and a network interface through which the railway traffic control apparatus communicates via a network with a user terminal,

wherein execution of said one or more programs of executable instructions configures the processor to include:

a block placing part to place a block on one or more specified track sections to permit a railway field worker to enter the track sections while blocking railway traffic to said track sections;

a code generation part to generate a removal code, retrieve the electronic contact address of the railway field worker from the rail personnel contact database,

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and transmit the removal code to the electronic contact address of the railway field worker; and a block removal part to remove only upon entry of the removal code, the block placed by the block placing part on said one or more track sections.]

[2. The centralized railway control system of claim 1, wherein the railway traffic control apparatus further comprises:

a RTC user interface to permit a user to specify said one or more track sections to be blocked, specify an instruction to the centralized railway control system to block the railway traffic to the specified track sections, and specify identifying information of the railway field worker to be performing work in the specified track sections.]

[3. The centralized railway control system of claim 1, further comprising:

a railway control database registering block identifying information, including block limits identifying the one or more blocked track sections, along with the removal code for removing the block of the track sections.]

[4. The centralized railway control system of claim 1, further comprising:

a railway control database registering (a) identification of the user who specified the instruction to block the track sections and (b) block identifying information, including block limits identifying the one or more blocked track sections, notes specifying reasons for the block, and date and time at which the block was placed.]

[5. The centralized railway control system of claim 1, wherein upon placement by the block placing part of the block of railway traffic to said one or more specified track sections, the code generation part transmits the removal code to the electronic contact address of the railway field worker, and the block of railway traffic to said one or more specified track sections remains in place in the centralized railway control system until the entry of the removal code in the centralized railway control system to cause the block removal part to remove the block on said one or more track sections.]

[6. The centralized railway control system of claim 1, wherein the railway traffic control apparatus further comprises:

a block removal user interface to permit a user to enter the removal code to cause the block removal part to remove the block on said one or more track sections, wherein the block of railway traffic to said one or more specified track sections remains in place in the centralized railway control system until the entry of the removal code through the block removal user interface.]

[7. The centralized railway control system of claim 6, wherein the block removal user interface further requires, in addition to the entry of the removal code, the user to specify that confirmation that the track sections have been cleared has been obtained from the railway field worker associated with the block, before the block removal user interface permits the removal code to be transmitted to the block removal part, and

the centralized railway control system further comprises a railway control database registering (a) block identifying information identifying the one or more blocked track sections, date and time at which the block was placed and identifying information the railway field worker associated with the block, and (b) block removal information identifying date and time at which the block was removed and identifying the user who

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entered the removal code and specified that confirmation that the track sections have been cleared was obtained from the railway field worker associated with the block.]

[8. The centralized railway control system of claim 1, further comprising:

a voice processing part configured to receive a voice message and extract the removal code from the voice message.]

[9. The centralized railway control system of claim 1, wherein the code generation part transmits an electronic message to the electronic contact address of the railway field worker, and the electronic message transmitted to the electronic contact address of the railway field worker includes the removal code and includes an embedded link for activating a return transmission of the removal code to the block removal part of the centralized railway control system.]

[10. A railway traffic control apparatus for controlling access to railway tracks, said railway traffic control apparatus comprising:

a block placing part to place a block on one or more selected track sections to permit a railway field worker to enter the track sections while blocking railway traffic to said track sections;

a code generation part to generate a removal code, determine an electronic contact address of the railway field worker by accessing a rail personnel contact database registering, for each railway personnel, electronic contact information of the railway personnel, and transmit the removal code to the electronic contact address of the railway field worker; and

a block removal part to remove only upon entry of the removal code, the block placed by the block placing part on said one or more track sections for the railway field worker.]

[11. The railway traffic control apparatus of claim 10, further comprising:

a RTC user interface to permit a user to specify said one or more track sections to be blocked, specify an instruction to the centralized railway control system to block the railway traffic to the specified track sections, and specify identifying information of the railway field worker to be performing work in the specified track sections.]

[12. The railway traffic control apparatus of claim 10, wherein block identifying information, including block limits identifying the one or more blocked track sections, is registered in a railway control database, along with the removal code for removing the block of the track sections.]

[13. The railway traffic control apparatus of claim 10, wherein block identifying information, including block limits identifying the one or more blocked track sections, notes specifying reasons for the block, and date and time at which the block was placed, are registered in a railway control database, along with identification of the user who specified the instruction to block the track sections.]

[14. The railway traffic control apparatus of claim 10, wherein upon placement by the block placing part of the block of railway traffic to said one or more specified track sections, the code generation code transmits the removal code to the electronic contact address of the railway field worker, and the block of railway traffic to said one or more specified track sections remains in place in the centralized railway control system until the entry of the removal code in the centralized railway control system to cause the block removal part to remove the block on said one or more track sections.]

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[15. The railway traffic control apparatus of claim 10, further comprising:

a block removal user interface to permit a user to enter the removal code to cause the block removal part to remove the block on said one or more track sections, wherein the block of railway traffic to said one or more specified track sections remains in place in the centralized railway control system until the entry of the removal code through the block removal user interface.]

[16. The railway traffic control apparatus of claim 15, wherein the block removal user interface further requires, in addition to the entry of the removal code, the user to specify that confirmation that the track sections have been cleared has been obtained from the railway field worker associated with the block, before the block removal user interface permits the removal code to be transmitted to the block removal part, and

block identifying information identifying the one or more blocked track sections, date and time at which the block was placed and identifying information the railway field worker associated with the block is registered in a railway control database, along with block removal information identifying date and time at which the block was removed and identifying the user who entered the removal code and specified that confirmation that the track sections have been cleared was obtained from the railway field worker associated with the block.]

[17. The railway traffic control apparatus of claim 10, further comprising:

a voice processing part configured to receive a voice message and extract the removal code from the voice message.]

[18. The railway traffic control apparatus of claim 10, wherein the code generation part transmits an electronic message to the electronic contact address of the railway field worker, and the electronic message transmitted to the electronic contact address of the railway field worker includes the removal code and includes an embedded link for activating a return transmission of the removal code to the block removal part of the centralized railway control system.]

[19. A method for a centralized railway control system to control access to railway tracks, the method comprising:

providing a user interface on a user terminal including a block placing part to place a block on one or more specified track sections to permit a railway field worker to enter the track sections while blocking railway traffic to said track sections;

generating a removal code, determining an electronic contact address of the railway field worker by accessing a rail personnel contact database registering, for each railway personnel, electronic contact information of the railway personnel, and transmitting the removal code to the electronic contact address of the railway field worker; and

permitting the block to said one or more track sections to be removed only upon entry of the removal code in the centralized railway control system.]

20. A railway control apparatus for centralized control of a centrally controllable railway network including plural railways and a plurality of railway interlocks dispersed in said plural railways, comprising:

a processor for controlling a plurality of track sections in the railway network, wherein each track section is associated with a corresponding interlock and is disposed in any of said plural railways of said railway

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network that is managed by centralized control operation from the railway control apparatus, the processor controlling, by said centralized control operation, one or more interlocks amongst the plurality of railway interlocks dispersed in said plural railways of said railway network, to block railway traffic to one or more specified track sections; and
 a memory device storing computer-executable instructions, wherein execution of the computer-executable instructions by the processor causes the railway control apparatus to:
 receive a selection of at least one track section amongst the plurality of track sections;
 transmit a block signal to the corresponding interlock associated with the at least one selected track section, to place a block on the selected track section by said centralized control operation from the railway control apparatus;
 generate a secret code associated with the at least one selected track section; and
 transmit the secret code to a remote user terminal.

21. The railway control apparatus of claim 20, wherein execution of the computer-executable instructions by the processor causes the railway control apparatus to store the secret code in the memory device.

22. The railway control apparatus of claim 21, wherein execution of the computer-executable instructions by the processor causes the railway control apparatus to:
 receive a second secret code;
 determine that the second secret code and the secret code stored in the memory device are the same; and
 responsive to determining that the second secret code and the secret code stored in the memory device are the same, release the block on the at least one selected track section.

23. The railway control apparatus of claim 21, wherein execution of the computer-executable instructions by the processor causes the railway control apparatus to:
 receive a second secret code;
 determine that the second secret code and the secret code stored in the memory device are not the same; and
 responsive to determining that the second secret code and the secret code stored in the memory device are not the same, maintaining the block on the at least one selected track section.

24. The railway control apparatus of claim 20, wherein the secret code is transmitted to the remote user terminal by messaging or email.

25. The railway control apparatus of claim 20, wherein the remote user terminal is a mobile phone, a smartphone, a tablet computer, a pager, or a personal digital assistant, and execution of the computer-executable instructions by the processor causes the railway control apparatus to transmit the secret code to said mobile phone, smartphone, tablet computer, pager, or personal digital assistant.

26. The railway control apparatus of claim 20, further comprising:
 a network interface, wherein execution of the computer-executable instructions by the processor causes the railway control apparatus to transmit the secret code to the remote user terminal via the network interface.

27. The railway control apparatus of claim 20, wherein only the railway control apparatus and the remote user terminal receive the secret code.

28. The railway control apparatus of claim 20, wherein the secret code is generated by a random process.

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29. The railway control apparatus of claim 20, further comprising:
 a rail personnel database comprising information related to a plurality of rail personnel;
 wherein execution of the computer-executable instructions by the processor causes the railway control apparatus to:
 retrieve specific personnel data from the rail personnel database; and
 determine an electronic address of the remote user terminal to which the secret code is to be transmitted.

30. A railway control apparatus comprising:
 a processor for controlling a plurality of track sections in a railway network, wherein each track section is associated with a corresponding interlock; and
 a memory device storing computer-executable instructions, wherein execution of the computer-executable instructions by the processor causes the railway control apparatus to:
 receive a selection of at least one track section amongst the plurality of track sections;
 responsive to receiving the selection of the at least one track section, determine that the at least one selected track section has an existing block;
 receive a signal from the corresponding interlock of the at least one selected track section that a new block can be established;
 responsive to receiving the signal that a new block can be established, transmit a block signal to the corresponding interlock associated with the at least one selected track section, to place a block on the at least one selected track section;
 generate a secret code associated with the at least one selected track section; and
 transmit the secret code to a remote user terminal.

31. A method comprising:
 receiving, by a processor, a selection of at least one selected track section in a centrally controlled railway network, wherein each track section corresponds to an interlock;
 responsive to receiving the selection of the at least one selected track section, determining, by the processor, that the at least one selected track section has an existing block;
 receiving, by the processor, a signal from the corresponding interlock of the at least one selected track section that a new block can be established;
 responsive to receiving the signal that a new block can be established, transmitting, by the processor, a block signal to the corresponding interlock of the selected at least one selected track section to place a block on the selected at least one selected track section;
 generating, by the processor, a secret code associated with the selected at least one selected track section;
 transmitting, by the processor, the secret code to a remote user terminal.

32. The method of claim 31, further comprising:
 storing the secret code in a memory device.

33. The method of claim 32, further comprising:
 receiving, by the processor, a second secret code;
 determining, by the processor, that the second secret code and the secret code stored in the memory device are the same; and
 responsive to determining that the second secret code and the secret code stored in the memory device are the

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same, releasing, by the processor, the block on the selected at least one selected track section.

34. *The method of claim 32, further comprising:*

receiving, by the processor, a second secret code;

determining, by the processor, that the second secret code 5
and the secret code stored in the memory device are not
the same; and

responsive to determining that the second secret code and
the secret code stored in the memory device are not the
same, maintaining the block on the selected at least one 10
selected track section.

35. *The method of claim 31, wherein only the processor*
and the remote user terminal receive the secret code.

36. *The method of claim 31, further comprising:*

retrieving, by the processor, specific personnel data from 15
a rail personnel database; and

determining, by the processor, an electronic address of the
remote user terminal to which the secret code is to be
transmitted.

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